

Feb. 13, 1945.

W. REINERS ET AL

2,369,606

WINDING FRAME

Filed March 13, 1941

6 Sheets-Sheet 1

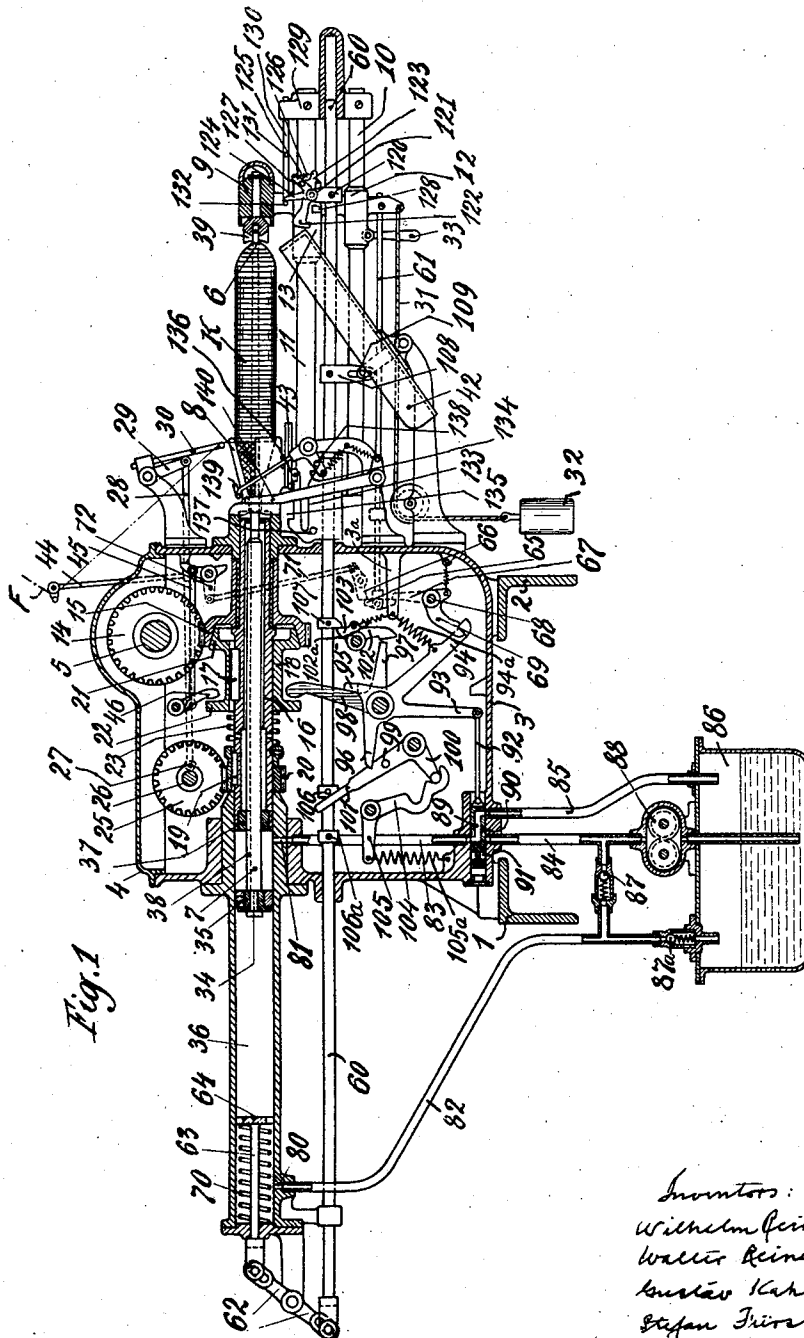


Fig. 1

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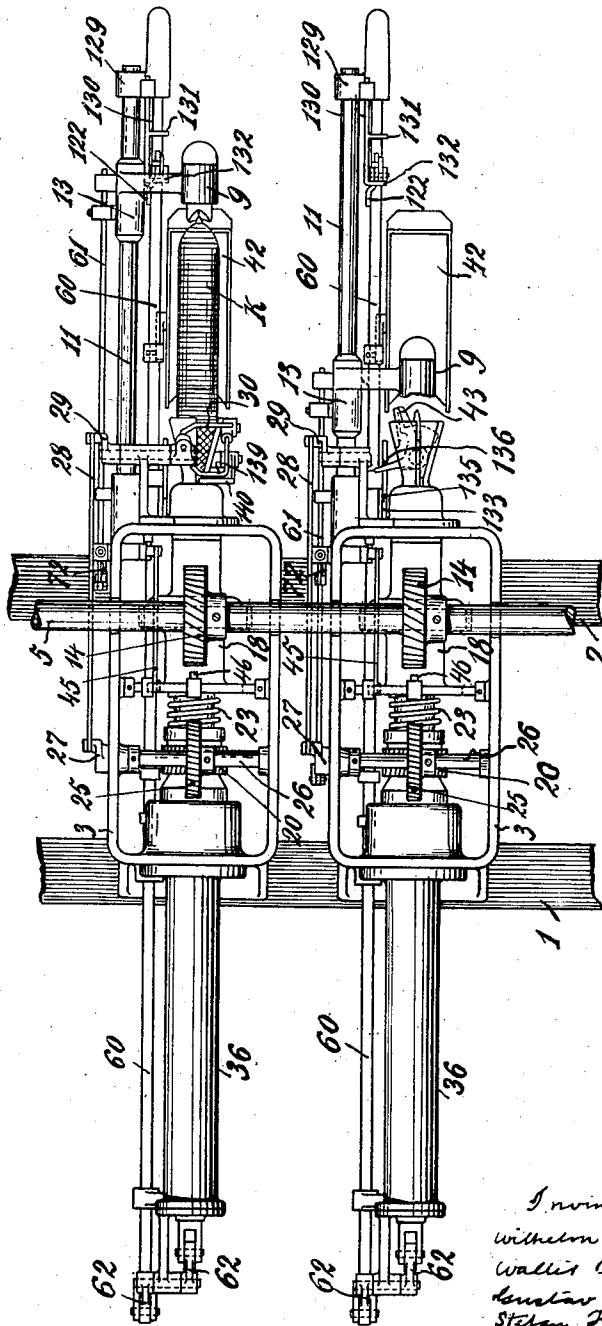
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WINDING FRAME

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6 Sheets-Sheet 2

Fig. 2.



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WINDING FRAME

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6 Sheets-Sheet 3

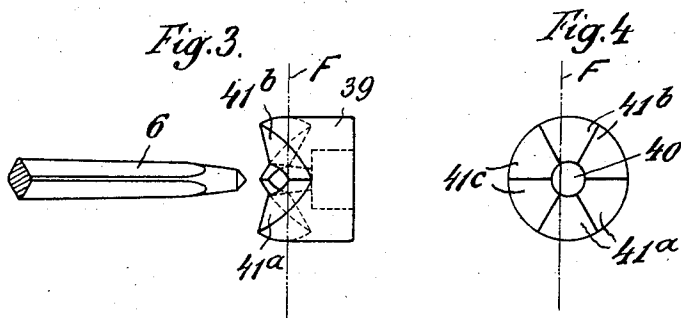
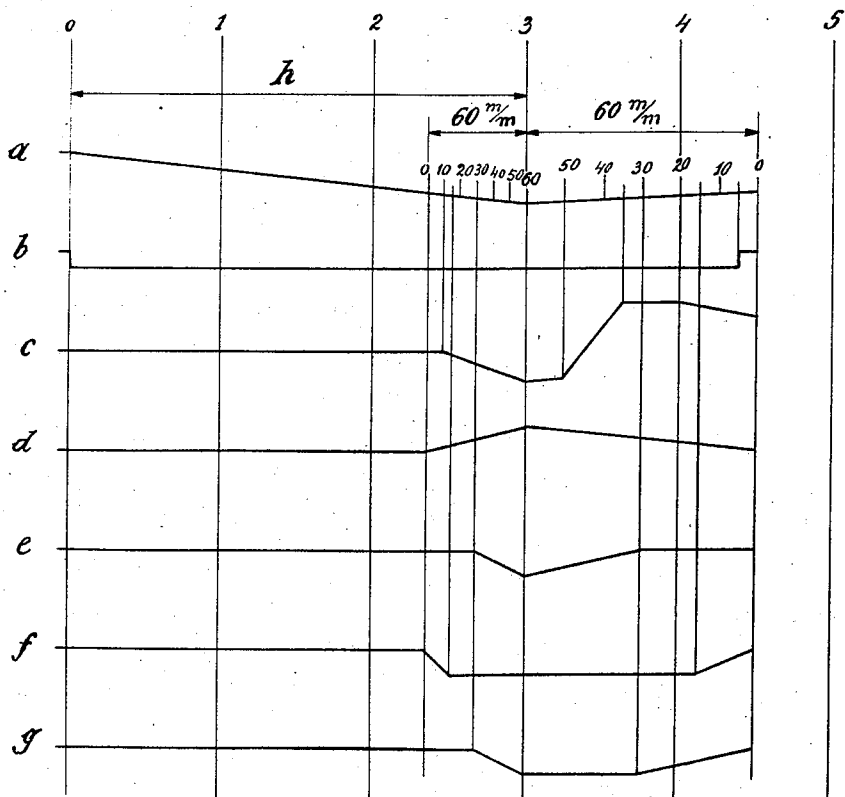


Fig. 5.



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WINDING FRAME

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6 Sheets-Sheet 4

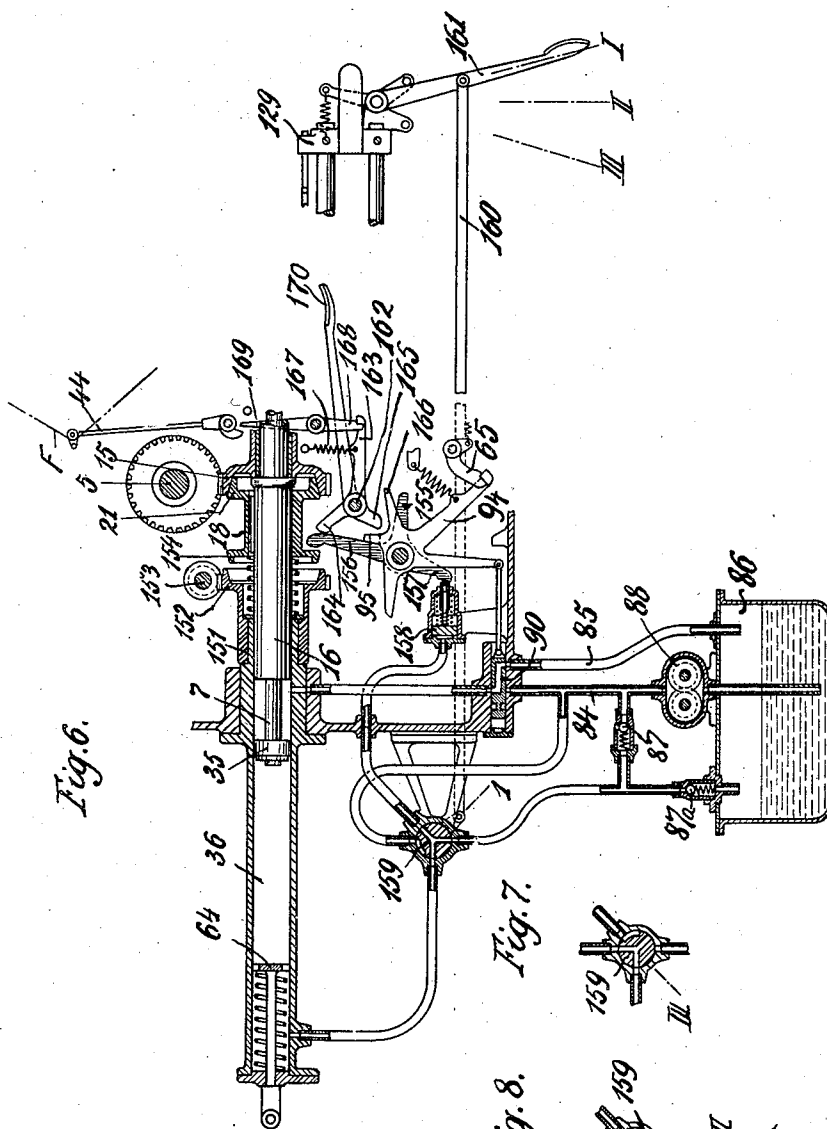
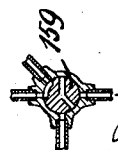


Fig. 6.

Fig. 7.

Fig. 8.



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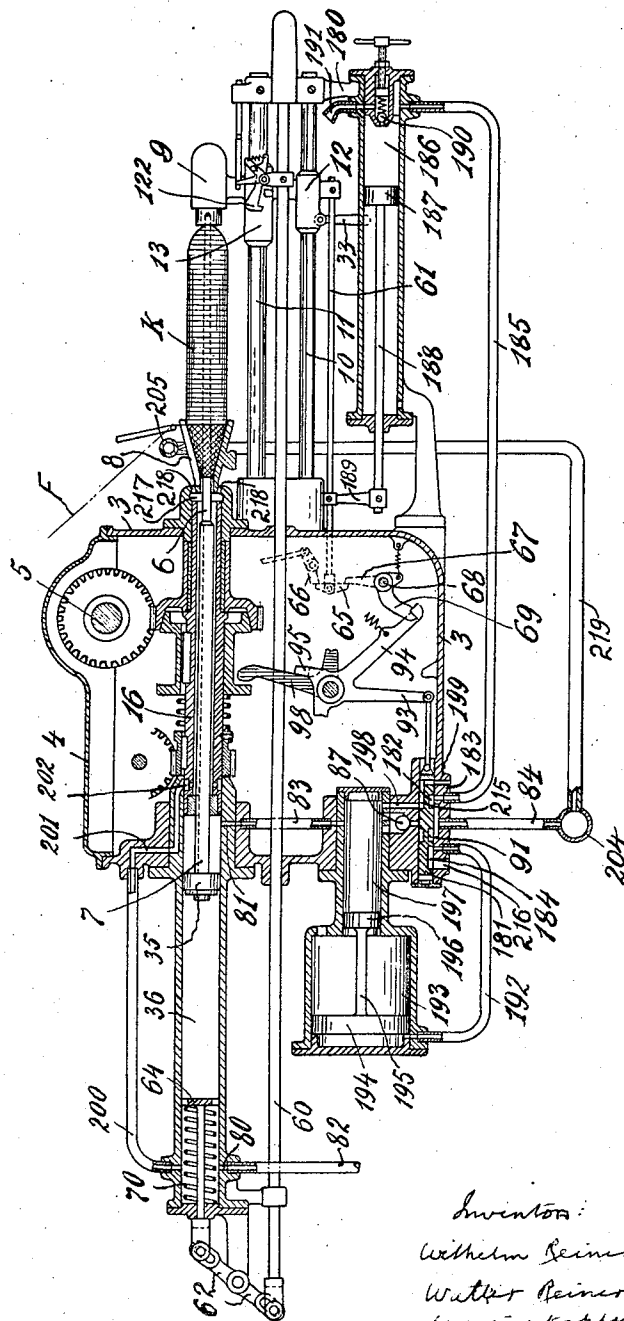
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6 Sheets-Sheet 5

Fig. 9.



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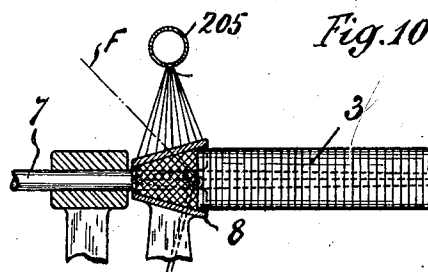


Fig. 10

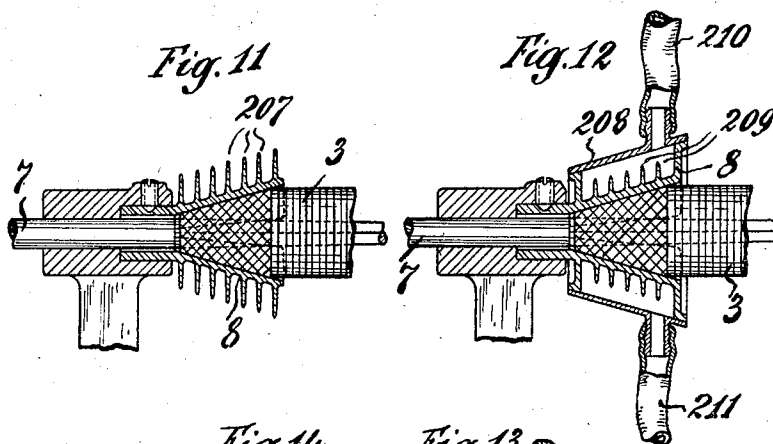


Fig. 11

Fig. 12

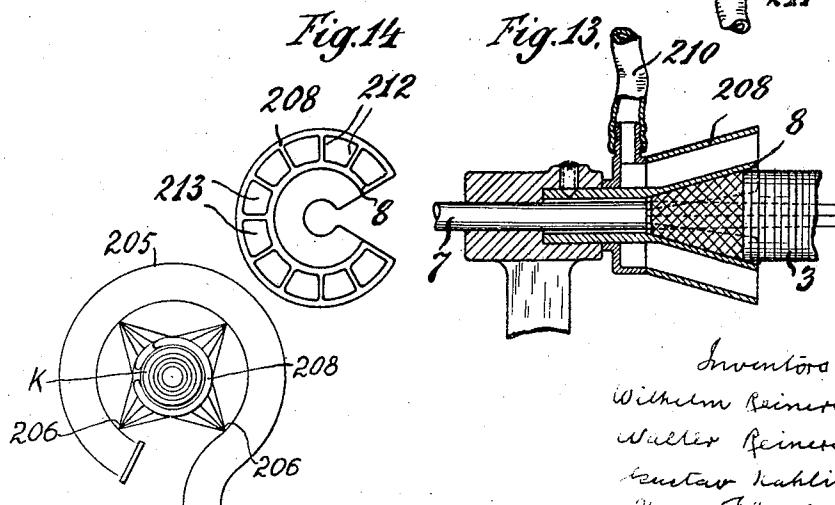


Fig. 14

Fig. 13

Fig. 15

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UNITED STATES PATENT OFFICE

2,369,606

WINDING FRAME

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Application March 13, 1941, Serial No. 383,084
In Germany August 9, 1939

24 Claims. (Cl. 242—32)

The operations which take place at the exchange of bobbins in a winding machine call for the starting and execution of a number of manipulations, for which special accumulators of force and appurtenances, in the form of springs, weighted ropes, levers, cam discs and the like are kept ready at the individual winding points, or for groups of winding points. The individual forces required of these special accumulators are generally not large, so that restoring them to ready condition by re-tensioning, counter-pull and the like, even in quick running and sensitive winding frames with automatic change of bobbins, does not encounter any difficulties. The force required for the pulling out of winding spindles, or the actuation of arrangements for replacing bobbins or the like is, however, considerable. It is further not only required instantaneously but must also overcome appreciable resistances up to the starting of the desired movements.

The invention starts, therefore from the idea: to automatically accumulate and keep ready the last mentioned force, on the one hand, but so that its effect can be cut out directly at any time, and, on the other hand, to derive the remaining bobbin changing manipulations substantially from this force. According to the invention this is attained by taking the force required for the bobbin-changing from a fluid medium, and a control element at first influenced alone by this medium, later controls the other bobbin changing manipulations. The resistance opposed at the beginning to the bobbin changing is accounted for according to the invention, by placing the fluid medium under increased pressure, before it becomes effective. Any known liquid or gaseous medium may be used as the fluid medium.

In a particular application of the idea of the invention, to winding frames in which the winding spindle extends through the cop to be built up, or through the tube on which the same is wound, the winding spindle is equipped at one end with a piston which moves to and fro in a cylinder to which the fluid medium is supplied. A bobbin exchange control mechanism is provided comprising an actuator located in the path of movement of said piston and shiftable in the direction of the axis of the cylinder, and hingedly connected with a control rod which controls the various bobbin exchanging manipulations. This special form offers the further advantage, that the bobbin exchange control mechanism, which may be held in its initial position for instance by spring force, presses in turn upon the spindle pis-

ton, after the pressure of the fluid medium behind the piston has decreased, and thereby pushes the spindle again into the appurtenant tailstock.

By this special construction a considerable simplification and acceleration of the bobbin changing is attained, also in the production of tubeless cops. In order to facilitate the re-knotting of broken thread ends, in conformity with this acceleration, and in order to save time, the invention provides further details which assist the retraction of the tubeless cop from the winding funnel and the finding of the broken thread end at the cop point and further ensure against a premature initiation of the bobbin changing manipulations, which might otherwise occur as a result of the bobbin movements necessary for finding and knotting the thread and the like. According to the invention the slow reverse rotation of the bobbin for finding the thread, known in cross-winding frames, is one of the manipulations utilized.

Also the holding of the starting end of the thread at the beginning of the building-up of a fresh tubeless cop is improved according to the invention, in that the tailstock is equipped with notches extending obliquely to its axis and the winding funnel with an auxiliary thread-guide which swings the thread to a position in front of the funnel and thereby brings it into the range of the notches.

In the original solution of the problem a separate reserve or delivery point of the fluid medium was provided for each winding point. In the further development of the idea of the invention considerable simplification in the construction of the whole machine was found to be possible, if a common reserve and delivery point for the fluid medium is coordinated to the winding points, or groups of winding points, and each winding point is equipped with a piston compressor, which starts to operate at the beginning of the bobbin changing, and causes a pressure increase of the fluid medium to become effective against the spindle piston. The fluid medium can then also be rendered useful through corresponding branch conduits for continuously pressing the cop into the winding funnel, in the production of tubeless cops, or for instance cops on short tubes.

The use of flowing media in the winding frames led further to the proposition of providing blowing arrangements at each winding point, said arrangements preventing the collecting of flying dust, particularly disagreeable in rapidly running full-automatic winding frames, and also

preventing overheating of certain machine elements.

When using gaseous flowing media these media may be used according to the invention for the blowing arrangements as well as for the source of power. The invention provides further that the blowing pressure at the initiation of the bobbin changing is temporarily increased, so that the gas, for instance the air taken from a general service-conduit for air under pressure, blows the corresponding points impulsively.

In order to further improve the cooling of certain machine elements and to make it possible to employ higher winding speeds also in funnel winding frames, the jacket of the winding funnel has, according to the invention, a special heat transmitting shape or it is made of material of good heat conductivity. With the same object in view the winding funnels may be equipped, according to the invention, with longitudinal, transverse or spiral-shaped cooling ribs or the like, whereby a better cooling is attained. The winding funnel may further be surrounded, according to the invention, by a double wall and in the hollow space thus produced may be provided with no cooling ribs, or with very short cooling ribs. Finally, closed passages may be formed by the ribs, in double wall winding funnels according to the invention, whereby also a cooling with cooling liquid is rendered possible.

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

Fig. 1 shows a winding point in vertical section,

Fig. 2, two neighbouring winding points in top plan view, the cover of the casing being removed,

Fig. 3, interengaging parts of spindle and tailstock in side elevation,

Fig. 4, the tailstock part in front view,

Fig. 5, a diagram of the bobbin changing manipulations,

Fig. 6, another construction of a winding point in vertical section, all parts not necessary for the explanation being omitted,

Figs. 7 and 8, sectional views of the main valve shown in Fig. 6, in two different positions,

Fig. 9, another form of construction of a winding point in vertical section,

Fig. 10, a simple winding funnel in axial section,

Fig. 11, a winding funnel with cooling ribs, also in section,

Fig. 12, an axial section through a jacketed winding funnel with cooling ribs on the wall, with admission and discharge conduits for the cooling medium,

Fig. 13, a corresponding section through a jacketed winding funnel with separated passages,

Fig. 14, the winding funnel as shown in Fig. 13 in end view, and Fig. 15 shows a view of a tube surrounding the winding funnel.

Similar parts are designated by similar reference numerals in the different embodiments of the invention.

On the transverse girders 1, 2 of the winding frame (Figs. 1 and 2) the individual winding points are fixed side by side, by means of their casings 3, and in any desired number. The casing walls serve as bearing carriers, oil containers or oil sump and so forth, as usual in such constructions, and they are closed at the top by covers 4. A shaft 5 serves as source of power for all winding points. The tubeless cop K which is to be built up is wound directly on the

front end 6 of the winding spindle 7 between the winding funnel 8, the foot of which may be screwed into the casing 3, and the shiftable tailstock 9. Rods 10, 11 serve for guiding the tailstock 9 and certain feeding elements, said head sliding on the rods by means of bushes 12 and 13. The winding spindle 7 is driven from shaft 5 through the intermediary of a gear wheel 14 meshing with a gear wheel 15 equipped with an inner cone, the hub of gear wheel 15 being mounted on a long bush 16 serving at the same time as journal for the spindle 7. A clutch sleeve 18 revolves together with the bush 16 being slidably connected thereto by a spline 17. The bush 16 also has fixedly keyed to it by a key 19, a gear wheel 20. One end of sleeve 18 forms a clutch cone 21 and its other end a flange 22. The clutch cone 21 engages under the action of a spring 23 with the inner conical surface of gear wheel 15.

A thread guide 30 is moved from the gear wheel 20 by a gear wheel 25, shaft 26, crank 27, rod 28 and oscillatable arm 29. The thread guide 30 moves to and fro in front of a lateral slit of the winding funnel 8. During the laying of the thread layer in process of formation, the growing cop K is pressed into the winding funnel 8 by a pull rope 31 attached to the slidable bush 12 and tensioned by means of a weight 32 or the like. The cop can be pulled out of the funnel, for instance when a thread breaks, by a handle 33 pivotally mounted on bush 12 and provided with an eccentric clamp surface to cam against the rod 10, for securing the bush 12 in any desired position thereon. The winding spindle 6 together with the cop K can follow this movement without difficulty, as its end 34 bears a piston 35 which slides in a cylinder 36 as the spindle 7 slides in an inner ring 37 of the driving bush 16. A guide groove 38 receives a key of ring 37 to maintain the driving connection between main shaft 5 and winding spindle 6, 7, when the clutch 15, 21 is engaged.

The front end of winding spindle 6 or the bottom end of the cop K bears against the tailstock 9 in a specially constructed counter-cone 39, as shown in Figs. 3 and 4. This counter-cone 39 has three notches 41a, 41b and 41c cut obliquely to the axis of the spindle, the thread F being adapted to be caught in the apexes of two adjacent notches and clamped in the bore 40 of the cone when the spindle 6 is pushed in. This form of construction presents further the advantage, that the thread is centered also when the counter-cone does not revolve. For receiving a finished cop and for severing the thread the usual tipping tray 42 and scissors 43 are provided. The stop motion 44 is connected by a rod 45 with a short oscillatable arm 46 adapted to be thrust against the flange 22 to release the clutch 15, 21 when the thread breaks.

A control rod 60 forms part of a control mechanism for energizing several devices concerned with the exchange of cops. The control rod 60 is connected by a lever 62 with a sliding rod 63 in the cylinder 36, the contact and guiding head 64 of said rod being adapted to be shifted against the action of a spring 70 in a manner which will be hereinafter described. A control rod 61 fixed at one end to the slidable bush 12 gradually moves to the right as the cop grows. It carries at the other end a small tipping lever 65, which arrives in the position shown in Fig. 1 as the cop approaches full length and there engages two levers 66, 67. The lever 67 controls by a shaft 68 a con-

trol lever 69, whereas the lever 66 can be rocked by the stop motion 44 through rods 71, 72, to a position out of the path of lever 65.

The cop changing manipulations themselves, after the cop has reached full length and they have been started, are propagated hydraulically by oil pressure. With this object in view, two passages 80, 81 are provided near the ends of cylinder 36 and connected with an oil reservoir 86 by tubes 82, 83, 84 and 85. A gear pump 88 or the like serves for producing pressure, and check valves 87 and 87a serve for conducting the flow and for pressure equalization. Tube 83 may be connected by a slide valve 90 either with tube 85, through an angular bore 89, in the position shown in Fig. 1, or with tube 84, through an annular groove 91. The slide 90 is articulated by a rod 92 with a star lever 93, 94, 95 and 96, the arm 95 of this star lever engaging behind an elbow lever 97, 98 mounted on the same shaft as the star lever. A pin 99 of an elbow lever 100, 101 is adapted to act on arm 96 of the star lever, and with an arm 97 of this elbow lever a short two-armed lever or pawl 102, 103, cooperates. The star lever and the two-armed lever 102, 103 are directly influenced by springs 94a and 102a connected to a stationary post 3a, and the elbow lever 100, 101 is spring-controlled through the intermediary of a notch-lever 104, 105 influenced by a spring 105a. The lever arm 101 can be influenced from the control rod 60 by abutments 106 and 106a, the lever arm 103 by an abutment 107 and the tipping tray 42 by a hinge 108, 109.

A small bracket 120 is fixed on the front end of control rod 60 and carries a pin 121, on which a two armed lever 122, 123 and an elbow lever 124, 125 are pivotally mounted. The lever arms 123 and 125 are connected by a spring 126, the relative angular movement of these arms being limited by a pin 127. The slidable bush 13 has a lug 128 behind which the hooked lever arm 122 may engage, and a connecting piece 129 of the rods 10, 11 has a short rod 130, between abutments 131, 132 of which rod the lever arm 124 moves. This mechanism serves to temporarily couple the tailstock 9 with the control rod 60 in a manner to be described.

A cam plate 133 is fixed on control rod 60 and equipped with an oblique cam face 134, scissors controlling abutments 135, 136 and an ejector actuating pin 137. The inclined cam face 134 acts upon the guide pin 138 of an auxiliary thread guide 139, whereas the abutments 135, 136 operate the scissors 43 and the pin 137 actuates an oscillatable arm 140 serving as ejector.

The operation of the arrangement illustrated in Figs. 1 to 4 is as follows:

After the thread F hanging from the thread guide 30 has been clamped between the front end of spindle 6 and the counter-zone 39, the usual building up of the cop begins. The tailstock 9 gradually moves forward under the pressure of the accumulating thread layers, in the right hand direction as shown in the drawings. The spindle, which starts the winding with its left end against the guide disc 64, follows up the movement of the tailstock, being pressed to the right by the low pressure maintained in the left end of cylinder 36 through the check valve 87, under the control of check valve 87a. This pressure is insufficient to overcome the force exerted upon the tailstock by the weight 32, but is sufficient to cause the spindle to follow any movement of the tailstock to the right. If a thread breaks during the building up of the cop, the stop motion 44 rocks to-

wards the left and thereby separates the clutch 15, 21. The operative then grasps the handle 33 and pulls the tailstock toward her, that is, to the right in Fig. 1. The spindle, with the cop thereon, follows the movement of the tailstock to the right, due to the moderate pressure of the fluid on the left side of the piston 35. When the cop has moved out far enough to bring its nose clear of the funnel 8, the position of the tailstock and spindle is secured by clamping the handle 33 against the guide bar 10. Even if the cop has already attained nearly its full length, so that the tipping lever 65 is brought into engagement with the lever 67 when the tailstock is pulled to the right, it does not release the detent 69, because the stop lever 66 has been rocked out of the path of tipping lever 65 by the falling of the stop motion lever 44. Thus the bobbin changing operation is not prematurely started.

After the re-knotting of the thread the bush 42 is released by means of the handle 33 and the cop pulled again into the funnel under the influence of the weight 32. When the nose of cop K is again in the winding funnel 8, the stop motion 44 is moved forward in the usual manner, the clutch 15, 21 closed and the winding proceeding continues.

When the cop K has reached the predetermined length, the tipping lever 65 strikes the levers 66, 67. As the lever 66 is for the time being held in its position by the stop motion 44, the lever 67 is rocked in clockwise direction in the form of construction shown, whereby the locking lever 69 liberates the rotary star, so that this star under the action of its pull spring 94a can cause the following control movements.

The arm 95 of the rotary star presses the arm 98 of the elbow lever 97, 98, rockable together with the rotary star on the same shaft, against the flange 22 of bush 18 and thereby releases the clutch 15, 21. At the same time the arm 93 of the rotary star pulls forward the rod 92 and thereby brings the annular groove 91 into register with the pipes 83 and 84, thus connecting the pump 88 with the aperture 81 in the cylinder 36. Under the pressure of the fluid from pump 88 the piston 35 is shifted to the left, which first pulls the spindle 6 out of the finished cop K and then presses the plate 64 toward the left end of cylinder 36. The control rod 60 is thereby moved towards the right. The front end of the lever arm 102 of the pawl 102, 103 engages then under the arm 97 of the elbow lever 97, 98 whereby the clutch is held in the inoperative position. At the same time the arm 101 of the elbow lever 100, 101 is turned in clockwise direction, so that the pin 99 rocks the arm 96 of the star lever into the position shown in Fig. 1 and therewith pushes the slide 90 back into its original position, so that, when the piston 35 of the spindle 6, 7 moves forward to the right, as presently described, the oil in front of this piston can flow back through the tubes 83, 85 to the oil reservoir 86. The notch lever 104, 105 assists the elbow lever 100, 101 to oscillate beyond its dead point position. Owing to the movement of the rod 60 towards the right the arm 124 at the front end of this rod is moved away from the abutment 132, so that the hook of arm 122 engages behind the lug 128 and thereby, when the rod 60 continues to move, moves the bush 13, and thereby the tailstock 9 toward the right. The cop K thereby loses its bottom end support. Further, the movement of the cam plate 133 towards the right causes the pin 137 to push

to the right the ejector 140 moving in the slit of the winding funnel 8; thus, the nose end of cop K is also removed from the funnel 8 which supports the same. The cop drops into the tray 42 which has meanwhile been rocked by the hinges 108, 109 in clockwise direction, to a position, which corresponds to the oblique position assumed by the cop, when sliding out of the funnel. As the pin 138 of the auxiliary thread guide 139 strikes against the inclined surface 134 of the forward moving cam plate, as the cop is being ejected from the funnel the thread F is also moved forward toward the mouth of the funnel independently of the position of the thread guide 30, so that the thread trailing from the cop as it drops into the tray 42 will hang in a nearly vertical position between the blades of the scissors 43, which have meanwhile been opened by abutment 135 (Fig. 2). During the latter part of the movement of the rod 60 to the right, the arm 124 yields to the abutment 131 and passes under the same, tensioning spring 126 which pulls it up on the right side of the abutment. Early in the return movement of the rod 60, which is caused by the compressed spring 70 and which begins when the slide valve 90 cuts off the pressure supply to the right side of piston 35 and opens the right end of cylinder 36 to the return conduit 85, the arm 124 is tilted clockwise by the abutment 131. The pin 127 bears against the lever end 123 and tilts the lever 122 out of engagement with lug 128. The tailstock, thus released, and previously cleared of the spindle 6 and cop K, is pulled quickly to the left, where it is arrested in its starting position. In this position the bight of the thread lying between the auxiliary thread guide 139 and the scissors 43 is engaged by the notched face of the counter cone 39 and moved by the inclined surfaces thereof to the position shown in Fig. 4, for example (the exact position depending upon the momentary angular position of the counter cone). The movement of the control rod 60 to the left is accompanied by a movement of the spindle to the right, under the direct action of the guide disc 64 against its left end. The movement of the spindle to the right is slower than the return movement of the tailstock to the left, due to a certain stiffness of the spring 70 and the back pressure of the oil which must be forced out of the right end of cylinder 36. Consequently the tip of the spindle 6, which was previously moved some distance to the left of the large end of the funnel 8, does not reach the counter cone 39 until the latter has engaged the bight of the thread and moved it to the position shown in Fig. 4. The tip of the spindle enters the bore of the counter cone shortly after and clamps the thread therein. This is followed by the shearing of the thread between the spindle and the finished cop by the shears 43, operated by the abutment 136. The tray 42 reaches the position shown in Fig. 1 at about this time and the cop slips off, being caught, for instance, on a conveying band (not shown).

The whole cop changing procedure is shown in the diagram, Fig. 5, the time and travel indicated being merely illustrative. The diagrams of the individual elements which take part in this procedure are designated as follows: *a* for the spindle 6, 7; *b* for the clutch 15, 21; *c* for the counter-cone 39; *d* for the tipping tray 42; *e* for the ejector 140; *f* for the auxiliary thread guide 139; *g* for the scissors 43. The time intervals are indicated in seconds by 0, 1, 2, 3, 4 and 5.

After the correct length of the cop has been attained, the spindle first moves a distance h of 260 mm. (in Figs. 1, 2 and 6 towards the left, in Fig. 5 towards the right) and in time intervals of three seconds. For the last 60 mm. the piston 35 pushes the plate 64 in front of it. During the last travel of 60 mm. of the spindle 6, 7 the rod 60 is at the same time moved towards the right. In the diagram shown in Fig. 5 it is indicated by corresponding projections in downward direction which movements are initiated and carried through during this travel of rod 60. These movements can also be seen directly from the diagram, with the aid of the above description.

After these movements have been carried out, i. e. after the three seconds given by way of example, the backward movement of rod 60 begins and therewith, under the influence of the cylinder spring 70, the forward movement of plate 64 and of piston 35. As the spring 70 must move plate 64 and piston 35 in opposition to the still filled cylinder 36, and as spring 70 possesses further a certain stiffness, a slightly longer time is required for the return movement of the rod 60 into its initial position, i. e. for carrying out the travel of 60 mm., as is also indicated in the diagram. Also in this instance the corresponding movements are shown according to time and travel by projections in downward direction.

In order to facilitate the finding of the broken end when a thread has broken, a bush 151 with inner cone 152 is rotatably mounted on the cylinder 36, as shown in Fig. 6, and can be driven by a shaft 153. The flange 154 of bush 151 is constructed as clutch cone, so that the driving bush 16 of spindle 6, 7 can be brought under the action of shaft 153 instead of under the action of shaft 5. The shaft 153 revolves considerably slower than the shaft 5 and in opposite direction, so that at the backward movement of spindle 6, 7 and of cop K, the thread end can be easily found. The engaging of clutch 152, 154 is effected by a three-armed lever 155, 156, 157 behind the arm 156 of which the arm 95 of the star lever engages as in the first form of construction. The arm 157 itself is under the action of a pressure piston 158 which is hydraulically driven as soon as the three-way cock 159 is turned into position II (Fig. 8), for instance by means of a rod 160. This rod 160 can be moved by a handle or a pedal through the intermediary of a lever 161.

Hydraulic force may also be used for pulling the cop K out of the winding funnel 8 for finding the end of the broken thread. For this purpose the cock 159 is turned into the position III shown in Fig. 7, whereby the pump pressure acts upon the piston 35 from the left, at the side of plate 64 and somewhat shifts the spindle 6, 7.

Fig. 6 shows another construction of the means 66, 71, 72 for preventing the premature initiation of the bobbin changing operation when the cop K is pulled back at breaking of the thread, especially when the full length of cop has approximately been attained.

A three-armed lever 163, 164, 165 is mounted on a pin 162 and can be turned from the stop motion 44, or by means of a handle 170. A spring 167 holds this lever in the locking position in engagement with a pawl 168, 169. At the breaking of the thread the lever 163, 164, 165, as can be seen from the drawings, is liberated as the stop motion 44 owing to the rocking of the locking pawl 168, 169. The arm 164 then acts

against arm 156 and thereby releases the clutch 15, 21 without, however, closing the clutch 152, 154, whereas the arm 165 strikes against an additional arm 186 of the star lever and thereby locks this star against rotation; that is, prevents a premature initiation of the cop changing operation.

In the form of construction shown in Fig. 9 the liquid container 86 and the pump 88 for each winding point are omitted and replaced by a conduit 204 for pressure medium common for all winding points, this conduit being connected with the spindle retracting cylinder 36 by means of a pipe 84, a groove 91 of a slide valve 181, a check valve 87, a cylinder 197 of a differential piston compressor 193—197, a pipe 83, and a port 81 in the cylinder 36. The control of slide valve 181 is effected in the same manner as that of slide valve 80 as shown in Figs. 1 and 6, through a star lever 93, 94, 95.

As the pressure medium from conduit 204 is permanently at disposal, the tailstock 9 can also be moved towards the cop K in order to press the same into the funnel 8, by means of the same pressure medium, instead of by counter-weight 32 as described with reference to Fig. 1.

With this object in view the main slide valve 181 has, besides the annular groove 91, a longitudinal recess 182. A cylinder 186, which may be fixed on the connecting piece 180 of the guide rods 40, 41, can be connected by a conduit 185 with the distribution point 181 for the fluid medium. A piston 187 slides in the cylinder 186, one end of this piston being connected by piston rod 188 and a rigid arm 189 thereon with the control rod 61 and, as the rod is connected with the slidable bush 12 of the tailstock 9, tends to push the cop K into the winding funnel 8, as soon as an overpressure exists in the cylinder 186. A discharge port 191 is further provided on the head of cylinder 186, being connected with the cylinder space through a check valve 190. The discharge port acts as blast nozzle directed towards the winding point, when a sufficiently high overpressure is produced in the cylinder 186, assuming that a gaseous fluid medium is used.

The distribution point or slide valve 181 is further connected through a conduit 192 with a cylinder 193 of a differential piston compressor, in which slides a large piston 194 connected by a rod 195 to a smaller piston 196. This piston 196 slides in the other cylinder 197 of the compressor which at the same time brings into connection the conduits 83 and 84, when the slide valve 181 is in the proper position, with groove 91 in register with the pipe 84. In this position of the slide valve a recess 184 thereof connects pipe 84 to pipe 192. The cylinder 197 may besides also be connected by a conduit 198 through a duct 215 of valve 181 with a conduit 199 terminating in the atmosphere. The pipe 192 communicates with the atmosphere through ducts 184 and 216, in the position of the valve shown in Fig. 9.

Finally a conduit 200, 201 is provided, which communicates with the cylinder 36 at one end and terminates at the other end in an annular groove 202 in the driving bush 16, said bush having passages leading from said groove to the space surrounding spindle 7. The right end of the space surrounding spindle 7 terminates in an annular groove 217 from which ports 218 direct jets of cooling fluid along the funnel 8.

About the operation of the form of construction just described the following may be said:

During the building-up of cop K the slide valve

181 is in the position, which can be directly seen from the drawings, i. e. the conduit 84, branched for instance from the general conduit 204 for air under pressure, communicates with the cylinder 186 by means of the conduit 185 and, by means of piston 187, rod 188, transverse piece 189 and rod 61, presses the tailstock 9 towards the left and thereby forces the cop K into the winding funnel 8. The valve 190 is then adjusted so that part of the air under pressure blows from the nozzle 191 onto the winding point. When the tailstock 9 is moved to the right, as it is when the main control rod 60 moves to the right and the hook 122 engages, or when the thread breaks and the hand lever 33 is pulled to the right, a sudden increase of pressure occurs in the cylinder 186. This is particularly so when the conduit 185 is closed at the distribution point by movement of the slide valve 181 to the right. The sudden increase of pressure momentarily strengthens the force of the blast from nozzle 191, so that the settling of flying dust is prevented in a particularly effective manner, just at the time when the bobbin changing is being carried out.

In a similar manner air is blown with increased pressure through the conduit 200 and the clearance space in the spindle guide, towards the nose of the cop, as soon as the piston 35 is moved towards the left for pulling out the spindle 6, 7 from the cop K.

In order to overcome more easily the starting resistance which the spindle opposes to the retraction, the slide valve 181, in its movement towards the right as shown, not only connects the conduits 83, 84 by means of the annular groove 91, but it establishes simultaneously the connection between the conduit 84 and the conduit 192 through recess 184. Consequently the fluid medium in the cylinder 197 is compressed in the ratio of the surfaces of the pistons 194 and 196 and with corresponding increase of pressure acts upon the piston 35 at the first moment.

According to the invention the elements subject to heating have to be cooled, and this means chiefly the winding funnel. To realize this idea, a feed pipe 205 for cooling air has above the funnel 8, as shown in Fig. 10, an air outlet 206 for the cooling air, through which outlet the air current can flush along the winding funnel over its whole extent. The tube 205 may also concentrically surround the winding funnel 8 wholly or partly, as shown in Fig. 15, have several air outlets 206 and be connected with main conduit 204, by a pipe 219 (Fig. 9).

In Fig. 11 the winding funnel 8 has ribs 207 for increasing the cooling effect.

Fig. 12 shows a winding funnel with double wall 208 and with short cooling ribs 209, the admission and discharge conduits 210, 211 for the cooling medium being elastic, so that the winding funnels may be movably arranged, if desired.

Figs. 13 and 14 show finally a winding funnel with double wall 208 and continuous ribs 212, by which passages 213 are formed.

The winding funnels according to Figs. 12 to 14 are especially suitable, owing to their enclosing walls for the use of liquid cooling media, as well as for air cooling provided means for discharging the cooling medium, as well as for supplying it, are provided, as in Fig. 12.

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

1. In a winding frame, rotary cop supporting means comprising a spindle and tailstock both

mounted to shift axially, spindle sliding means adapted to be operated by a fluid pressure medium to move said spindle axially away from said tailstock, and control means operated by said spindle when so moved, to move said tailstock in the opposite direction.

2. In a winding frame, rotary cop supporting means comprising a spindle and tailstock both mounted to shift axially, spindle sliding means adapted to be operated by a fluid pressure medium to move said spindle axially away from said tailstock, and control means comprising an actuating member adapted to be engaged by said spindle when the latter has completed a part of said movement, for moving said tailstock in the opposite direction.

3. In a winding frame, rotary cop supporting means comprising a spindle and tailstock mounted to shift axially, said spindle having a piston thereon, a cylinder in which said piston is guided, means to supply a fluid pressure medium to said cylinder on the side of said piston toward said tailstock, whereby to move said piston and spindle away from said tailstock, and control means comprising an actuating member adapted to be engaged by said piston when the latter has completed a part of its movement, for moving said tailstock in the opposite direction.

4. In a winding frame, rotary cop supporting means comprising a spindle and tailstock both mounted to shift axially, a winding funnel surrounding said spindle and having a thread traverse slot therein, traversing thread guide means adapted to guide thread into said slot, yielding means urging said tailstock toward said winding funnel, means adapted to be operated by a fluid pressure medium to retract said spindle from a cop wound thereon and held by said funnel, and control means for moving said tailstock away from said funnel, including an actuating member adapted to be moved by said spindle after the latter has completed a part of its retracting movement.

5. A winding frame as described in claim 4, wherein an ejector is mounted so as to move through the slot of said funnel close to said spindle, whereby to eject a cop held in said funnel, said control means including means for operating said ejector.

6. A winding frame as described in claim 3, wherein said control means includes a hook device engageable with a part of said tailstock upon movement of said mechanical means by said piston.

7. In a winding frame, rotary cop supporting means comprising a spindle and tailstock both mounted to shift axially, a winding funnel surrounding said spindle and having a thread traverse slot therein, traversing thread guide means adapted to guide thread into said slot, yielding means urging said tailstock toward said winding funnel, means adapted to be operated by a fluid pressure medium to retract said spindle from a cop wound thereon and held by said funnel, reciprocal control means yieldingly urged in one direction and including an actuating member adapted to be moved by said spindle after the latter has completed a part of its retraction movement, to move said control means in the other direction, means for coupling said tailstock to said control means during its movement by said spindle, and means for uncoupling said tailstock from said control means to permit both to return independently.

8. In a winding frame, rotary cop supporting

means comprising a spindle and tailstock both mounted to shift axially, means for causing said spindle and tailstock to move progressively in one direction as the thread accumulates on the spindle, spindle retracting means adapted to be operated by a fluid pressure medium to retract said spindle from a cop wound thereon, and means to start the supply of fluid pressure medium to said spindle retracting means, said starting means including a limit element movable progressively with said tailstock and spindle and adapted to operate said starting means upon reaching a predetermined point in its progressive movement.

9. A winding frame as described in claim 8 wherein stop motion control means are provided to prevent release of the fluid pressure medium to said spindle retracting means by movement of said limit element after breakage of the thread.

10. A winding frame as described in claim 4, having normally disengaged means to rotate said spindle reversely, and means for engaging the same.

11. A winding frame as described in claim 4, having normally disengaged means to rotate said spindle reversely, and fluid pressure operated means for engaging said reverse rotation means.

12. In a winding frame, a plurality of rotary cop supporting means each comprising a spindle and tailstock both mounted to shift axially, a drive shaft common to all of said cop supporting means and means for connecting the individual spindles thereto, each spindle having associated therewith spindle retracting means adapted to be actuated by a fluid pressure medium to move the spindle away from its appertaining tailstock, and control means associated with each spindle to be operated thereby when said spindle is so moved, to move the appertaining tailstock in the opposite direction.

13. In a winding frame, a plurality of winding units each comprising a spindle and tailstock both mounted to shift axially, each spindle having associated therewith spindle retracting means adapted to be operated by a fluid pressure medium to move the spindle axially away from the appertaining tailstock, supply means common to all said winding units for holding a supply of the fluid medium under pressure, means for conveying the fluid medium from said common supply means to the individual spindle retracting means, and means associated with each winding unit for supplying an initial unit of the fluid medium to said retracting means at pressure higher than that in said common supply means.

14. A winding frame as described in claim 13, wherein the means for supplying an initial unit of the fluid medium to said retracting means comprises a differential cylinder and piston unit, means for placing the larger cylinder thereof in communication with said common supply means, means for placing the smaller cylinder thereof in communication with the fluid conveying means appertaining to the same winding unit, and a check valve located in said conveying means between said smaller cylinder and said common supply means.

15. In a winding frame, rotary cop supporting means comprising a spindle and tailstock both mounted to shift axially, means to move said spindle and tailstock progressively in one axial direction from a starting position to a limit position as the winding proceeds, said tailstock comprising a rotary counter-cone having a bore to receive the tip of said spindle and notches in

the face thereof toward said spindle adapted to position a thread held against said face across said bore, means operable automatically upon arrival of said spindle and tailstock in said limit position to retract said spindle so that its tip moves reversely beyond the starting position of said tailstock, means to move said tailstock from said limit position to said starting position, means to hold a thread in position to be engaged by the face of said counter-cone as said tailstock arrives at starting position, and means to move said spindle toward said tailstock after the return of the latter to starting position, thereby to clamp the thread in said bore.

16. In a winding frame, rotary cop supporting means comprising a spindle and tailstock both mounted to shift axially, a casing in which said spindle is housed, a winding funnel secured to said casing and surrounding said spindle, means for supplying a fluid pressure medium to the space within said casing, said casing having ports to direct a blast of the fluid pressure medium along said winding funnel.

17. In a winding frame, rotary cop supporting means comprising a spindle, a tailstock cooperating therewith and mounted to shift axially, a winding funnel surrounding said spindle with its large end directed toward said tailstock, a stationary cylinder, a piston guided in said cylinder, means for supplying a fluid pressure medium to said cylinder, and means connecting said piston with said tailstock, said piston being movable by the fluid pressure medium supplied to said cylinder to press said tailstock toward said winding funnel.

18. A winding frame as described in claim 17, wherein a nozzle discharge port is provided on said cylinder directed toward said winding funnel, said nozzle being adapted to discharge an impulsive jet of the fluid pressure medium toward said winding funnel upon movement of said tailstock and piston in the direction to compress the fluid pressure medium in said cylinder.

19. In a machine for winding a strand of yarn or the like onto a cop, a rotary cop supporting means comprising a spindle around which the cop is formed and an axially aligned tailstock, spindle sliding means for moving said spindle axially away from said tailstock, and control means operated by said spindle when so moved to simultaneously move said tailstock in the opposite direction.

20. In a machine for winding a strand of yarn or the like onto a cop, a rotary cop supporting means comprising a spindle around which the cop is formed and an axially aligned tailstock, said tailstock adapted to be operated by a fluid pressure medium to move said tailstock axially of said spindle, spindle sliding means for moving said spindle axially away from said tailstock, control means operated by said spindle when so moved to move said tailstock in the opposite direction under the influence of said fluid pressure medium.

21. In a machine for winding a strand of yarn or the like onto a cop, a rotary cop supporting means comprising a spindle around which the cop is formed and an axially aligned tailstock, both the spindle and tailstock being mounted to

move axially, a stationary winding funnel, means for normally urging said cop into yielding engagement with said funnel, and fluid pressure operated means for axially shifting said cop and associated spindle and tailstock simultaneously in the same direction to thereby move said cop out of engagement with said funnel during the repair of a broken strand.

22. In a machine for winding a strand of yarn or the like onto a cop, a rotary cop supporting means comprising a spindle around which the cop is formed and an axially aligned tailstock, both the spindle and tailstock being mounted to move axially, a stationary winding funnel, means for normally urging said cop into yielding engagement with said funnel, a stop motion operable upon the breaking of a thread, means for automatically moving said spindle away from said tailstock upon the completion of said cop to thereby initiate a doffing operation, fluid pressure operated means for axially shifting said cop and associated spindle and tailstock simultaneously in the same direction to thereby move said cop out of engagement with said funnel during the repair of a broken strand, and means controlled by the actuation of said stop motion for preventing premature initiation of said doffing operation when said cop is moved out of engagement with said funnel.

23. In a machine for winding a strand of yarn or the like onto a cop, a rotary cop supporting means comprising a spindle around which the cop is formed and an axially aligned tailstock, both the spindle and tailstock being mounted to move axially, a stationary winding funnel, means for normally urging said cop into yielding engagement with said funnel, manual means for axially shifting said cop and associated spindle and tailstock simultaneously in the same direction to thereby move said cop out of engagement with said funnel during the repair of a broken strand, a control means automatically operable upon the completion of a cop for shifting said spindle and tailstock in opposite directions to thereby doff the cop from said spindle, a stop motion adapted to stop said winding machine upon the breakage of a strand, and means operable upon the actuation of said stop motion for rendering said control means ineffective whereby a premature shifting of said spindle and tailstock in opposite directions will be prevented when the manual shifting means is operated.

24. In a machine for winding a strand of yarn or the like onto a cop, a rotary cop supporting means comprising a spindle around which the cop is formed and an axially aligned tailstock normally engaging the end of said spindle, both the spindle and the tailstock being mounted to move axially, a control means automatically operable upon completion of a cop for simultaneously shifting said spindle and tailstock in opposite directions, and means for preventing said cop from shifting with said spindle whereby the cop is doffed.

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