Feb. 17, 1931. E. W. LARSEN 1,793,104

STRAND HANDLING APPARATUS

Filed Oct. 12, 1929

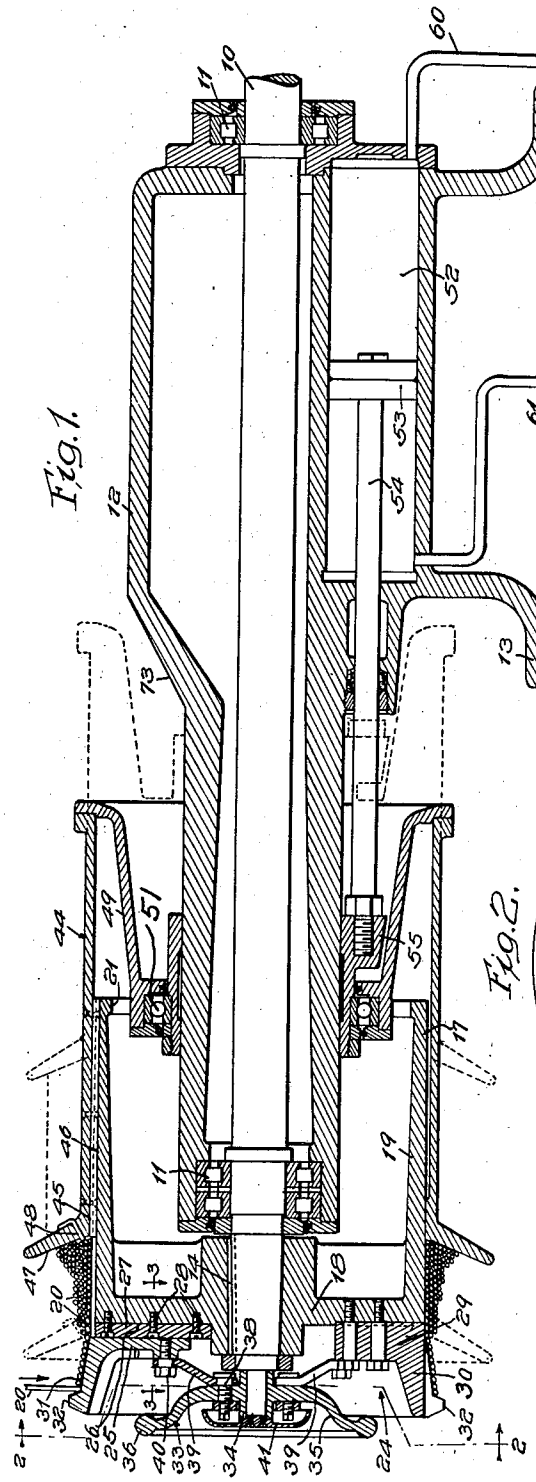


Fig. 1.

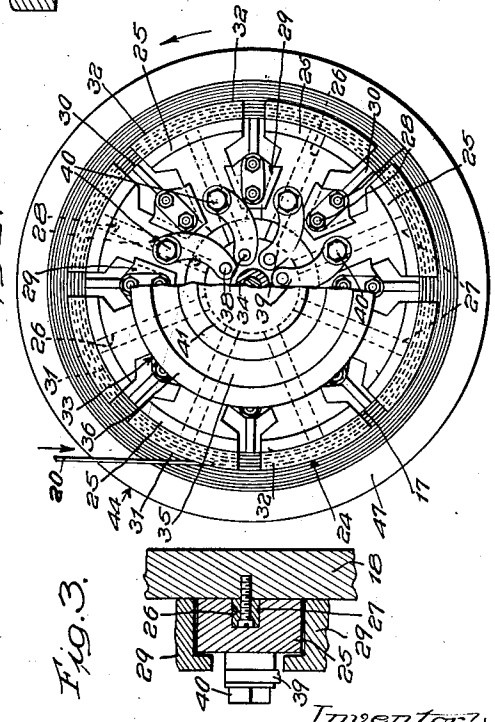


Fig. 2.

Fig. 3.

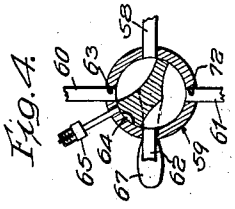


Fig. 4.

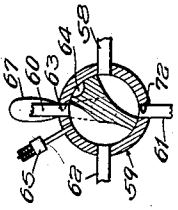


Fig. 5.

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Patented Feb. 17, 1931 1,793,104

UNITED STATES PATENT OFFICE

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STRAND-HANDLING APPARATUS

Application filed October 12, 1929. Serial No. 399,178.

This invention relates to strand handling apparatus, and more particularly to a coil take-up apparatus for use with metal strand working apparatus.

The primary object of this invention is to provide an improved apparatus for efficiently coiling strand upon an arbor and an expeditious removal of the completed coil therefrom.

In accordance with the general features of this invention a horizontal, rotary spindle has rotatably secured at its outer end a coiling arbor, the outer end face of the latter abutting the inner end face of a hand wheel and link actuated collapsible ring comprising a plurality of segments, each having a flanged, tapered peripheral strand receiving face. The segments are guided radially upon the outer end face of the arbor by means of cooperating keyways and keys formed in and fixed upon the segments and arbor, respectively. Rotatably secured to but longitudinally slidable upon the periphery of the arbor is a fluid controlled collar provided with a tapered outer end face which serves to form the strand being wound upon the arbor into a coil and to thereafter eject the completed coil from the arbor when the segmental ring is collapsed.

Other objects and advantages of this invention will more fully appear from the following detailed description, taken in connection with the accompanying drawing, which illustrates one embodiment of this invention, wherein

Fig. 1 is a vertical longitudinal section of the improved coil take-up apparatus, the motive fluid control mechanism for the strand coil forming collar being illustrated in partial diagrammatic form;

Fig. 2 is a partial vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail section taken on the line 3—3 of Fig. 1, and

Figs. 4 and 5 are detail sectional views on a reduced scale of a control valve shown in Fig. 1 for the motive fluid mechanism and illustrates different controlling positions thereof in the operation of the apparatus.

Referring now to the drawing in detail wherein like reference numerals indicate similar parts throughout the several views, a horizontally disposed driving spindle 10, which is continuously rotated by suitable mechanism (not shown) is journaled adjacent each end upon roller bearings 11—11 suitably mounted in a housing or frame 12 provided with a base 13, which in practice may be supported in a take-up compartment of a wire drawing machine (not shown). Fixed to a shouldered, outer or left end, as viewed in Fig. 1, of the spindle 10, by means of a key and a keyway 14 is a cup-shaped circular coiling arbor 17, the spindle projecting through a vertical end wall 18 of the arbor. A cylindrical wall portoin 19 of the arbor 17 is of a suitable length to receive varying lengths of coiled wire 20 thereon and extends toward the right, which end is open as shown at 21. Mounted upon the vertical end wall 18 of the arbor 17 is a collapsible ring 24, comprising in the present instance eight equally spaced segmental elements 25 arranged to slide radially upon the outer face of the wall, by means of spline connections comprising keyways 26 and keys 27 (Fig. 3) formed in each of the segmental elements and fixed to the wall, respectively. Secured to the vertical end wall 18 of the arbor 17 by screws 28 are a plurality of blocks 29 which serve to hold the segmental elements 25 in position upon the keys 27, one of the blocks being positioned between each two segmental elements and overlapping for a short distance the adjacent opposite sides of the elements, as clearly shown in Fig. 3, thereby preventing the elements from moving away from the keys.

A comparatively narrow central portion 30 of each of the blocks 29 extends outward and is aligned with the periphery of the arbor 17 (Figs. 1 and 2) to form a support or guide for the coil of wire 20 during its removal from the apparatus, at which time the ring 24 is collapsed, as will be described in the operation of the apparatus. The position of the supporting or guiding end surfaces of the central portions 30 of the blocks 29 relative to the periphery of the arbor 17 is clearly shown at the lower left corner of Fig. 1. The opposite sides of the blocks 29 serve as stop

surfaces for the adjacent segmental elements 25 when the latter are moved inwardly to their collapsed position, to be referred to later.

Each of the segmental elements 25 when in its operated position, as shown in Figs. 1 and 2, is spaced from each of the adjacent elements and serves to receive the oncoming wire 20 from the wire drawing machine upon a tapered peripheral surface 31, which at its inner end is substantially flush with the diameter of the arbor 17 and its outer end, which is outside the diameter of the arbor, is provided with a flange 32 for retaining the wire thereon. The wire 20 is received upon the tapered surfaces 31 of the elements 25 at the outer ends thereof and spirals downwardly thereon in the form of a single layer of coiled wire until it moves onto the periphery of the arbor 17, and then due to means to be presently described is caused to bulge outwardly to provide a coil of multiple layers. Rotatably mounted upon the portion of the spindle 10 which projects through the vertical wall 18 of the arbor 17 is a circular hand wheel 33 provided with a hub 34 extending from both sides of a web portion 35 upon the periphery of which is formed a circular hand grip 36. Pivoted to the web portion 35 adjacent the periphery of the hub 34 by a plurality of equally spaced shouldered pins 38 are curved links 39, which are pivotally connected at their opposite ends to the segmental elements 25 by shouldered screws 40, one link for each element. A cap or guard 41 is fixed to the end of the spindle 10 and serves to cover the ends of the pins 38.

Rotatably secured to the arbor 17 and longitudinally slidable thereon is a collar 44, which has fixed to its inner periphery a key 45 reciprocable in a keyway 46 formed in the outer periphery of the arbor, the key and keyway forming a spline connection. The collar 44 at its outer or left end is provided with a flange having an outer tapered end face 47 with which the wire 20 as it moves onto the periphery of the arbor 17 engages, the flange being provided with an aperture 48 through which the end of the wire 20 to be coiled is threaded at the beginning of the coiling operation. Upon the right end of the collar 44 is fixed an outer flanged end of a tapered collar 49 which is supported at its inner end upon a roller bearing 51 reciprocably mounted upon the periphery of a cylindrical portion of the housing 12.

Formed in the housing or frame 10 below the spindle 10 is a cylinder 52 having a piston 53 therein. A piston rod 54 is fixed to the piston 53 and the outer end of the piston rod is suitably secured to a lug 55 formed upon the hub of the tapered collar 49. A source of motive fluid (not shown); for example, compressed air, for actuating the piston 53 of the cylinder 52 is connected thereto through a supply pipe 58, a four-way control valve 59 and connections 60 and 61 from the valve to opposite ends of the cylinder 52. The exhaust air from either end of the cylinder escapes through one of the connections 60 and 61, through the valve 59 and out a pipe 62, except during one operation of the apparatus shown in Fig. 1, wherein the cylinder 52 exhausts through the connection 61, a port 63 of the valve, a port 64 provided in the movable valve element and finally through a spring controlled blow off valve 65. The connection 60 between the cylinder 52 and the valve 59 is connected to the supply pipe 58 by a connection which includes a pressure regulator 66 of any suitable type. The purpose of the pressure regulator 66 is to reduce the pressure of the air from the supply pipe 58 acting on the piston 53 in one operation of the apparatus, which will be described hereinafter.

It will be understood that by operating a control handle 67 of the valve 59 compressed air can be admitted either at the right or left end of the cylinder 52 to reciprocate the piston 53 and thereby the piston rod 54. In the position of the control handle 67, as shown in Fig. 1, the air enters the cylinder 52 through the pressure regulator 66 and the connection 60 from the supply pipe 58, due to the port 63 of the valve 59, which port is connected to the connection 60, being closed to the supply pipe 58. Another position of the control handle 67 is shown in Fig. 4 wherein the valve 59 has been operated to a position which will permit the full pressure of the air from the supply pipe 58 to enter the valve 59 and pass through the port 63, which is connected to the connection 60 and thereby act upon the piston 53 to move it quickly towards the left and through the connections hereinbefore described the collar 44 is likewise moved. In still another position of the control handle 67, which is shown in Fig. 5, the full pressure of the air enters the valve 59 and passes through a port 72 connected to the connection 61 and acts upon the piston 53 to move it quickly towards the right, causing the collar 44 to be likewise moved in a manner similar to that previously referred to when it is moved toward the left, the exhaust air in each of the two latter positions referred to of the control handle 67 escaping through the pipe 62.

At the beginning of a coiling operation the reciprocable collar 44 is positioned at the forward end of the ring 24 as shown fragmentarily in dotted outline in Fig. 1 and the end of the wire to be coiled is first threaded through the aperture 48 formed in the flange of the collar and turned back at an angle to hold it. Also the collapsible ring 24 will be in its expanded position ready for the coiling operation. Upon the spindle 10 being caused to rotate the wire 20 will be directed to the high

part of the tapered peripheral surfaces 31 of the segmental elements 25 closely adjacent the flanges 32 of the elements and thus be coiled upon the tapered surfaces.

The apparatus in the drawing is shown in the position it assumes during the forming of a coil of wire 20, the coil being shown partially formed upon the arbor 17. At this point in the operation of the apparatus the wire 20 is directed to the tapered surfaces 31 of the segmental elements 25 from the wire drawing machine and spirals downwardly along the tapered surfaces in a single layer and then onto the periphery of the arbor 17 against the outer tapered end face 47 of the collar 44. The collar 44, it will be apparent, opposes the wire 20 as it is received upon the arbor 17, due to the air under suitable pressure entering the cylinder 52 through the pressure regulator 66 and exhausting through the blow off valve 65, the opposition of the collar being sufficient to cause the wire to bulge outwardly and build up into a coil, the collar slowly moving rearwardly upon the arbor until it reaches the right dotted outline position (Fig. 1). This latter mentioned position of the collar 44, it will be understood, may be varied according to the length of the wire 20 to be coiled by suitable stops (not shown), but the extreme movement of the collar towards the right will be limited by the right end of the mounting for the roller bearing 51 engaging an angular surface 73 of the housing 12.

After completing the coil of wire 20 the rotating spindle 10 is stopped and the inner end thereof which was threaded through the aperture 48 of the collar 44 at the beginning of the coiling operation and turned at an angle is turned back again to permit a free removal thereof, and the hand wheel 33 is rotated clockwise, as viewed in Fig. 2, to cause the collapse of the ring 24, in the manner previously described, to position the flanges 32 of the segmental elements 25 slightly within the periphery of the arbor 17. Thereafter, the control handle 67 is moved to the position shown in Fig. 4, whereupon, as hereinbefore described, the collar 44 will be moved quickly towards the left and cause the completed coil to be forced or stripped from the arbor 17 and onto the supporting and guiding surfaces provided by the end surfaces of the central portions 30 of the stationary blocks 29, hereinbefore described. This movement of the collar 44 towards the left is sufficient to move the coil completely off the portions 30, whereupon the coil will drop onto a skid or truck positioned thereunder or onto the floor. At the end of this last described movement of the collar 44 the left end of the mounting for the roller bearing 51, which slides upon the housing 12, will engage the inner surface of the vertical wall 18 of the arbor 17, thereby limiting its outward movement.

The end of the wire 20 to be coiled in the next coiling operation is secured in the aperture 48 of the collar 44 as previously described and thereafter the control handle 67 is moved to the position shown in Fig. 5. This, it will be apparent, will cause the collar 44, through the previously described connections, to move quickly towards the right, the comparatively short distance necessary to position it as shown in dotted outline in Fig. 1 at the left end of the apparatus; the control handle 67 is then moved to the position shown in Fig. 1, ready for the coiling operation. The hand wheel 33 is then rotated counterclockwise to expand the segmental segments 25 to their operative position and immediately thereafter the spindle 10 is caused to rotate and the wire 20 is formed into a coil and thereafter stripped from the arbor 17 in the manner as described hereinbefore.

Although the invention is herein described as particularly applicable to the coiling of wire as delivered from a wire drawing machine, it should be understood that the novel features thereof are capable of other applications and modifications without departing from the spirit and scope thereof as defined in the appended claims.

What is claimed is:

1. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a rotary collapsible member adjacent one end face of the element and having a tapered peripheral face for receiving and then feeding the strand onto the element, movable means for opposing the strand as it is fed onto the element and thereafter being used to remove the completed coil from the element upon the member being collapsed, and means for causing a collapse of the member.

2. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a collapsible member driven by the element and adjacent one end face of the element and having a flanged and tapered peripheral face for receiving, retaining and then feeding the strand onto the element, movable means for opposing the strand as it is fed onto the element and thereafter being used to remove the completed coil from the element upon the member being collapsed, and means for causing a collapse of the member.

3. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a rotary collapsible means comprising a plurality of segmental shaped elements, each abutting one end face of the element and having a tapered peripheral face serving as a unit to receive and thereafter feed the strand onto the driving element, movable means for opposing the strand as it is fed thereon and thereafter being used to remove the completed

coil from the driving element upon the segmental means being collapsed, means for causing a collapse of the segmental means, and means for predeterminedly guiding the segmental elements during their movement.

4. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a rotary collapsible means comprising a plurality of segmental shaped elements, each abutting one end face of the element and having a tapered peripheral face serving as a unit to receive and thereafter feed the strand onto the driving element, movable means for opposing the strand as it is fed thereon and thereafter being used to remove the completed coil from the driving element upon the segmental means being collapsed, and means comprising a rotary hand wheel connected to each of the segmental elements by individual links for simultaneously operating the elements to cause a collapse of the collapsible means.

5. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a rotary collapsible means comprising a plurality of segmental shaped elements, each abutting one end face of the element and having a tapered peripheral face serving as a unit to receive and thereafter feed the strand onto the driving element, movable means for opposing the strand as it is fed thereon and thereafter being used to remove the completed coil from the driving element upon the segmental means being collapsed, means rotatably mounted upon the element and operatively connected to each of the segmental elements by individual links for operating the elements to cause a collapse of the collapsible means, and cooperating keyways and keys formed in and fixed upon the segments and driving element respectively for predeterminedly guiding the elements during their movement.

6. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a rotary collapsible member abutting one end face of the element and having a tapered peripheral face for receiving and then feeding the strand onto the element, means axially aligned and rotating with the driving element but slidable longitudinally thereof for opposing the strand as it is fed onto the element and thereafter being used to remove the completed coil from the element upon the member being collapsed, and means for causing a collapse of the member.

7. In a strand handling apparatus, a rotary driving arbor for supporting a coiled strand, a rotary collapsible ring abutting one end face of the arbor and having a tapered peripheral face for receiving and then feeding the strand onto the arbor, a collar rotatably secured to and slidable longitudinally upon the arbor by means of a spline and provided with a tapered end face for opposing the strand as it is fed onto the arbor and thereafter being used to remove the completed coil from the arbor upon the ring being collapsed, and means for causing a collapse of the ring.

8. In a strand handling apparatus, a rotary driving arbor for supporting a coiled strand, a rotary collapsible ring abutting one end face of the arbor and having a tapered peripheral face for receiving and then feeding the strand onto the arbor, a movable collar surrounding the arbor for opposing the strand as it is fed onto the arbor and thereafter being used to remove the completed coil from the arbor upon the ring being collapsed, means for causing a collapse of the ring, and motive fluid means including a piston operatively connected to the collar for causing the collar to yieldably oppose the strand and for subsequently moving the collar along the arbor to remove the coil therefrom, and means for controlling the motive fluid means.

9. In a wire coiling apparatus, a horizontal rotary driving arbor for supporting upon its periphery a coiled wire, a rotary collapsible means comprising a plurality of segmental shaped elements, each adjacent one end face of the arbor and having a flanged and tapered peripheral face serving as a unit to retain, receive and thereafter feed the wire onto the arbor, a collar rotatably secured to and slidable longitudinally upon the arbor by means of a spline connection and provided with a tapered end face for opposing the wire as it is fed onto the arbor and thereafter being used to remove the completed coil from the arbor upon the segmental means being collapsed, means for causing a collapse of the collapsible means, and motive fluid means including a piston operatively connected to the collar for causing the collar to yieldably oppose the wire and subsequently for moving the collar upon the arbor to remove the coil therefrom, and means for controlling the motive fluid means.

10. In a strand handling apparatus, a rotary driving element for supporting coiled strand, a rotary collapsible means comprising a plurality of spaced elements, each adjacent one end face of the driving element and having a tapered peripheral face serving as a unit to receive and thereafter feed the strand onto the driving element, movable means for opposing the strand as it is fed onto the driving element and thereafter being used to remove the completed coil from the driving element and past the outer end of the collapsible means upon the latter means being collapsed, a rotary member between each of the spaced elements abutting the end face of the driving element and in line with the periphery thereof for supporting and

guiding the completed coil as it is removed from the driving element after the collapse of the collapsible means, and means for causing a collapse of the collapsible means.

In witness whereof, I hereunto subscribe my name this 30th day of September, A. D. 1929.

EINER WILLIAM LARSEN.