July 3, 1962 W. L. ENSIGN ET AL 3,042,335

COILING MANDREL AND STRIPPER MECHANISM

Filed Dec. 6, 1957

4 Sheets-Sheet 1

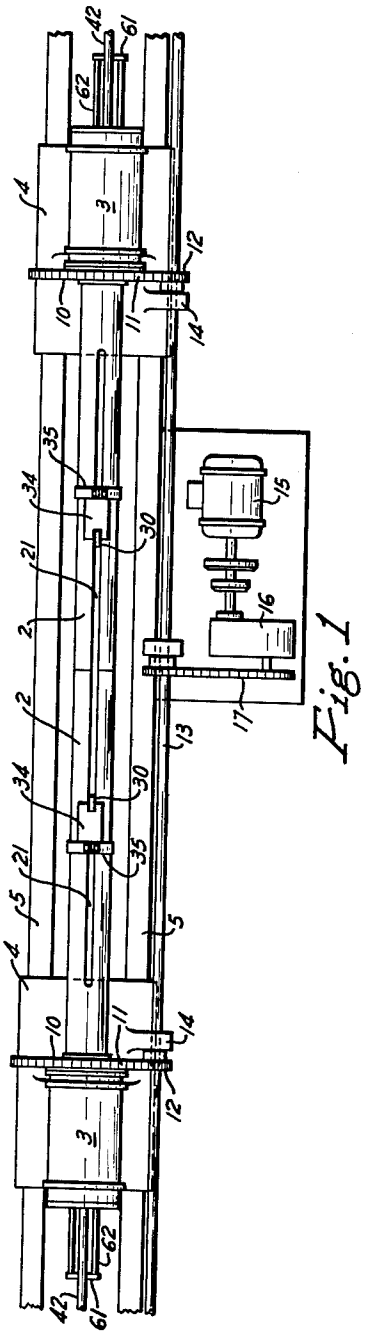


Fig. 1

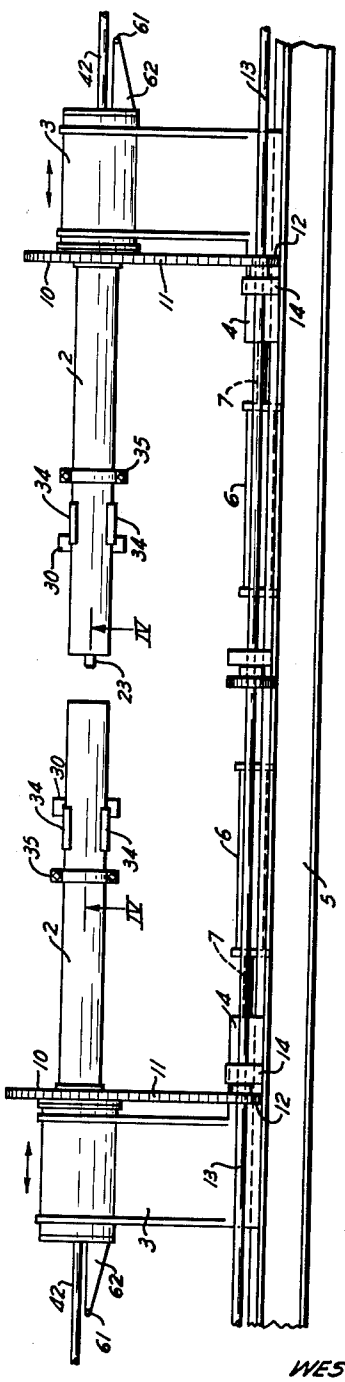


Fig. 2

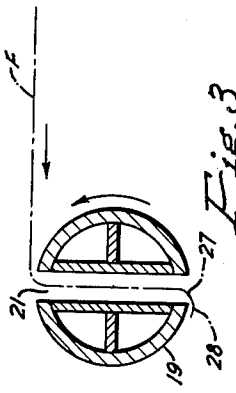


Fig. 3

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4 Sheets-Sheet 2

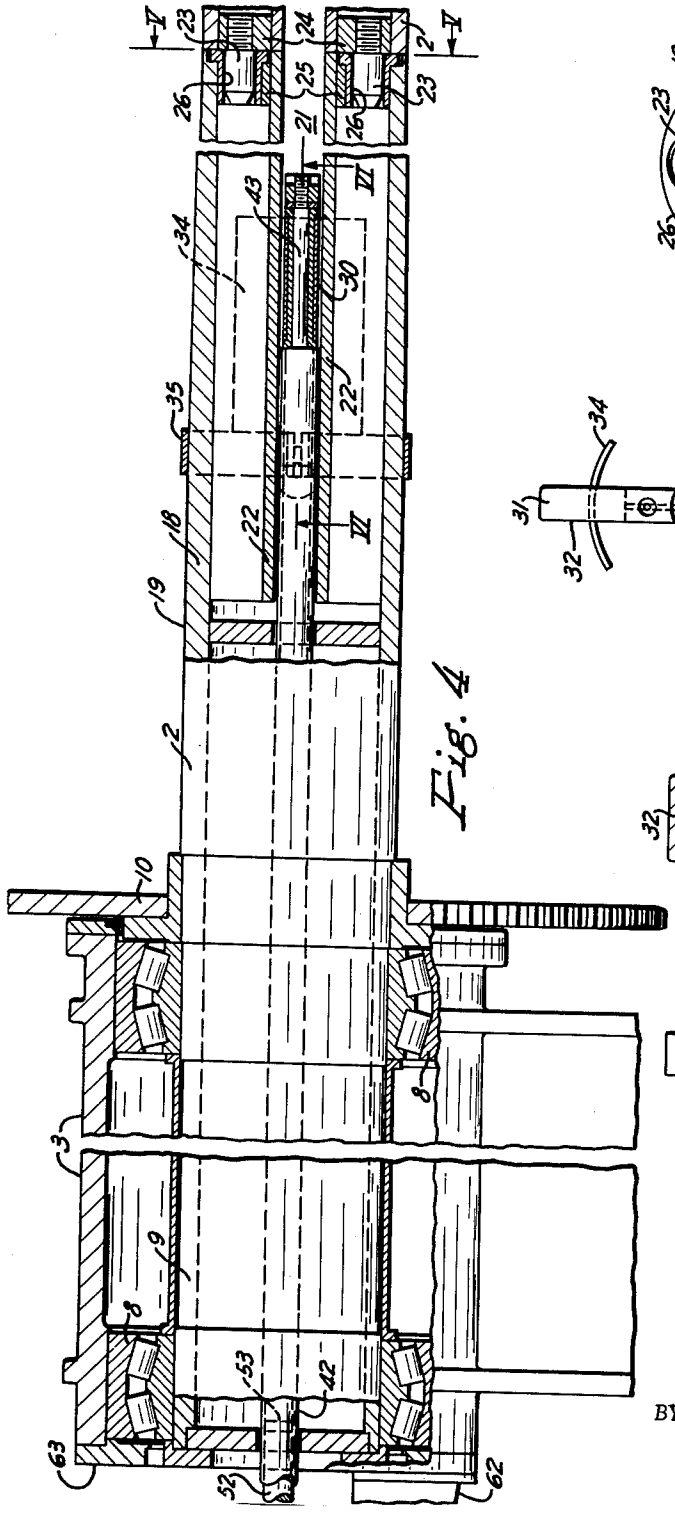


Fig. 4

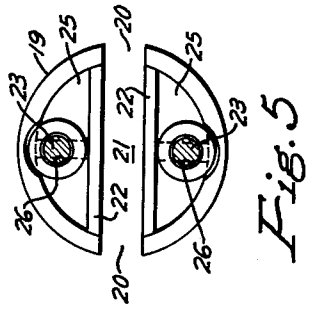


Fig. 5

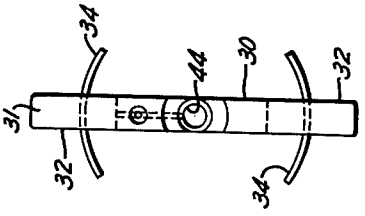


Fig. 7

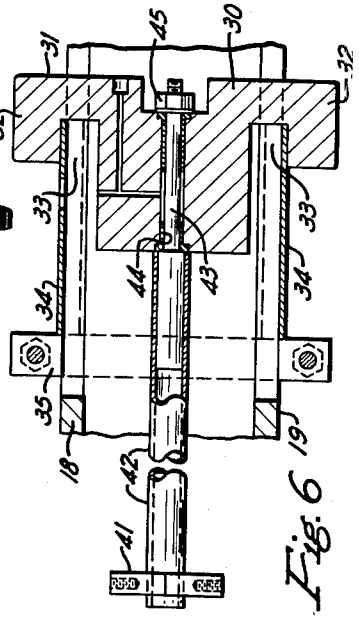


Fig. 6

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4 Sheets-Sheet 3

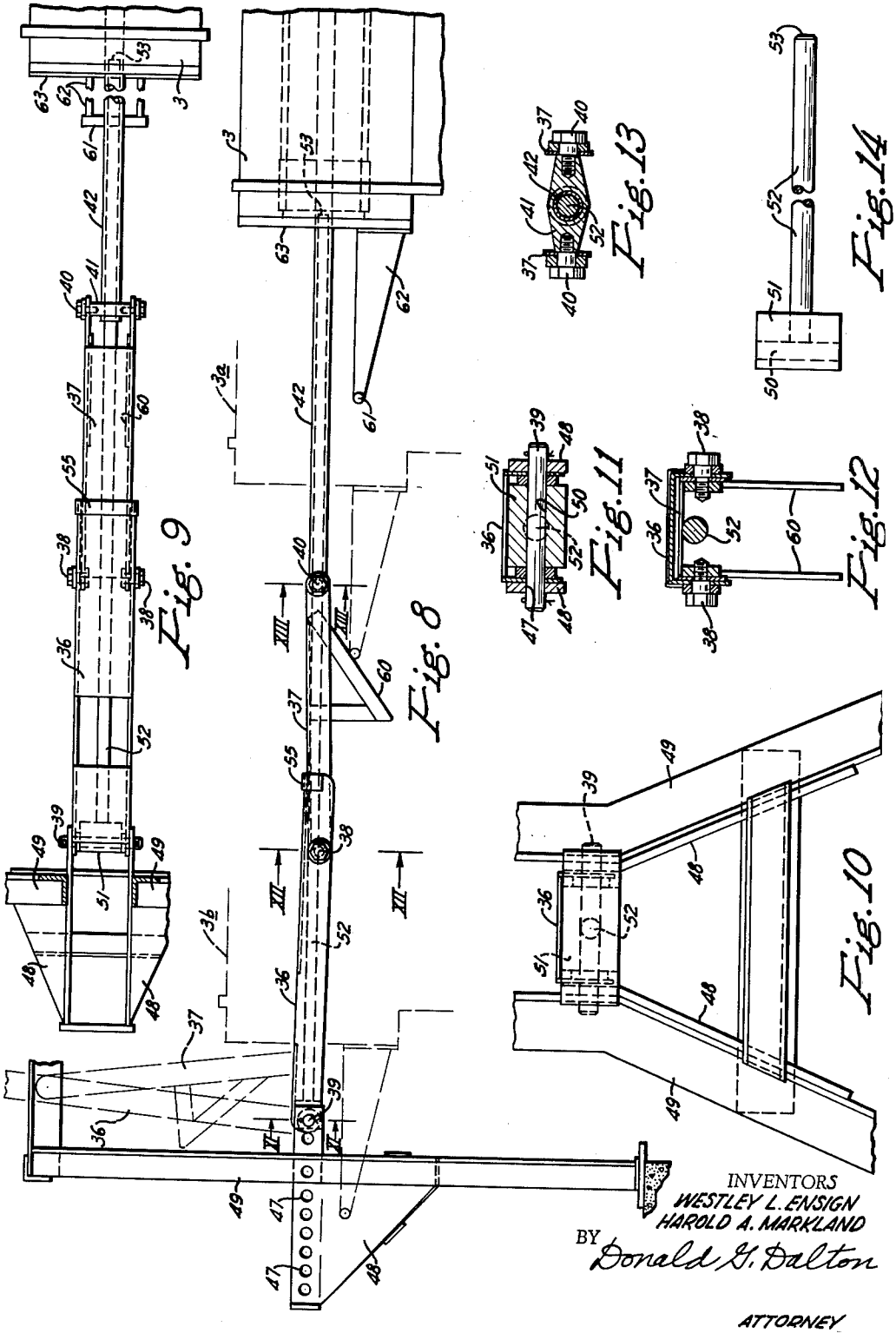


Fig. 9

Fig. 8

Fig. 13

Fig. 14

Fig. 11

Fig. 12

Fig. 10

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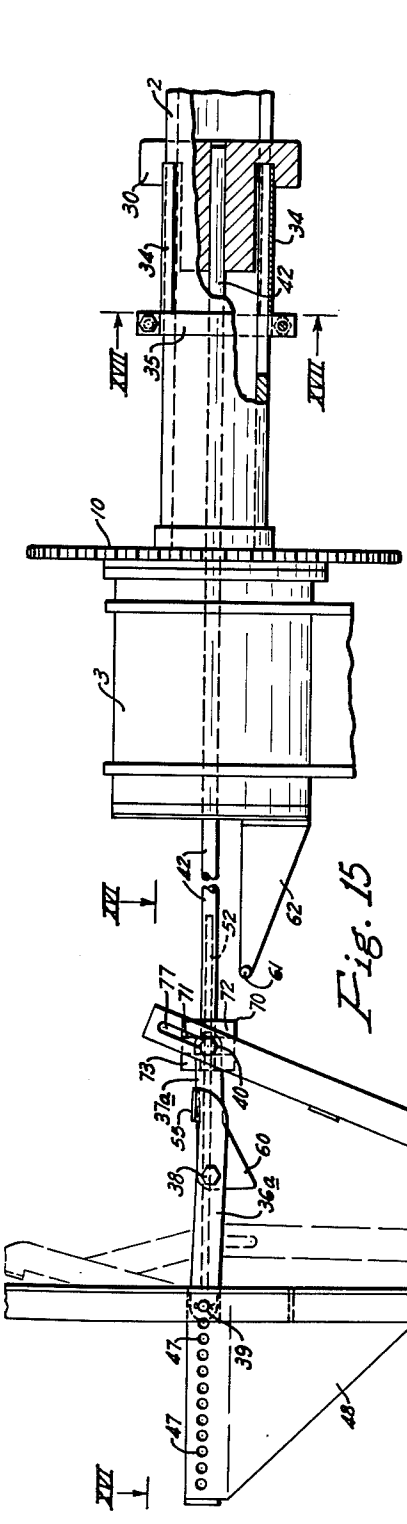


Fig. 15

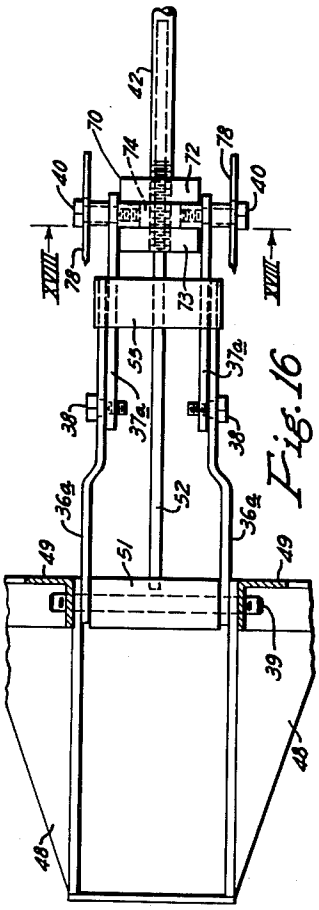


Fig. 16

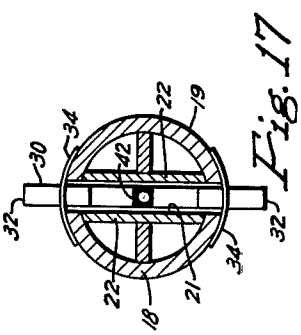


Fig. 17

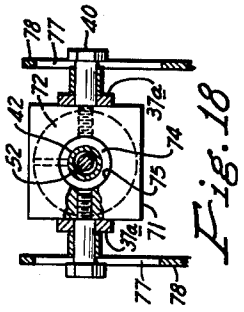


Fig. 18

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COILING MANDREL AND STRIPPER MECHANISM

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Filed Dec. 6, 1957, Ser. No. 701,067
11 Claims. (Cl. 242—81)

This invention relates to apparatus for reeling or coiling electrically welded wire fabric and, as indicated, is directed to a coiling mandrel and stripping mechanism therefor. It relates, more particularly, to an apparatus for stripping a coil of fabric from a winding mandrel having a longitudinally extending slot in which the inner end of the coil is anchored.

Continuous fabricating lines for the production of wire fabric commonly include an electrical welding machine to which wire is fed continuously from pay-off reels through sets of straightener rolls. After the welding operation the wire fabric is delivered through a shear that is operated to cut it into uniform lengths, usually about 150 feet long, and then over a looping pit to a reeling apparatus where it is coiled on a mandrel. Each length of fabric, as it is delivered from the shear, must have its leading end anchored to the winding reel prior to winding and after coiling thereon into a bundle for handling and shipping purposes must be stripped therefrom. These anchoring and stripping operations at the coiling reel are troublesome in conventional apparatus and require considerable time for their performance. As a consequence they reduce the productive capacity of the entire line.

In one common and conventional form of reeling apparatus, the winding mandrel is constructed in two parts that are axially aligned and are supported in bearing housings at their opposite ends. The bearing housings are mounted for retracting movement to withdraw the mandrel parts supported thereby from a coil of fabric that has been wound thereon and thus effect a stripping operation of the coiled fabric with respect to the winding mandrel. For attaching a length of fabric to be wound, each of the mandrel winding parts has a T-slot extending axially inwardly from its outer end in which a key bar is removably received. The key bars have anchoring hooks at spaced intervals along their lengths which engage and anchor the stay wires of the fabric being wound. When the mandrel parts are pulled apart to perform a stripping operation the key bars slide out of the mandrel T-slots and are thus separated from the winding mandrels. They are thereafter removed manually from the interior of the coil to which they are attached by their anchoring hooks. Such key bars weigh about 40 pounds each and the services of two men are required at each reel for assembling them on the winding mandrels prior to each winding operation thereof.

One of the principal objects of this invention is to provide improvements in reeling apparatus of this character that facilitate winding and stripping a coil of wire fabric with respect to a winding mandrel. For this purpose it contemplates a mandrel having a winding slot in which the leading end of a length of wire fabric to be wound is anchored, and a pair of stripper heads that are mounted for relative axial movement in the mandrel slots to strip a wound coil of fabric. In a manner to be described the stripper heads operate to strip the coiled fabric from the winding mandrel when it is moved relative thereto to remove it from coil wound thereon. The invention further contemplates a novel arrangement of over-center toggle linkage for controlling the movement of the stripper heads relative to the slotted mandrels in which they are mounted.

Other objects and advantages of the invention will become apparent from the following description.

In the drawings, there is shown a preferred embodiment of the invention. In this showing:

FIGURE 1 is a plan view of a wire fabric or cloth reeling apparatus that is provided with a slotted winding mandrel and stripper mechanism constructed in accordance with the principles of this invention;

FIGURE 2 is an elevational view in which the winding mandrel is shown in a partially open or retracted position;

FIGURE 3 is a sectional view taken transversely of the winding mandrel which illustrates diagrammatically the manner in which an end of a length of wire fabric is attached thereto for a winding operation;

FIGURE 4 is an enlarged view showing one of the mandrel bearing supports in vertical section and a fragmentary central portion of the mandrel supported thereby in section along the line IV—IV of FIGURE 2;

FIGURES 5 and 6 are sectional views taken respecitvely along the lines V—V and VI—VI of FIGURE 4;

FIGURE 7 is an end elevational view of one of the stripper heads used in conjunction with the mandrel shown in the previous figures, which is taken in a direction looking from the right of FIGURE 6;

FIGURE 8 is a fragmentary view showing in side elevation a preferred form of toggle linkage for controlling the operation of the mandrel stripper heads;

FIGURE 9 is a plan view of the apparatus shown in FIGURE 8;

FIGURE 10 is an enlarged fragmentary end elevational view looking from the left of FIGURE 8;

FIGURES 11, 12, and 13 are enlarged sectional views taken, respectively, along the lines XI—XI, XII—XII and XIII—XIII of FIGURE 8;

FIGURE 14 shows a guide rod that constitutes one of the links in the linkage shown in FIGURES 8 and 9;

FIGURE 15 is a view in side elevation of a modified form of stripper head toggle linkage;

FIGURE 16 is an enlarged view in plan looking in the direction of the line XVI—XVI of FIGURE 15;

FIGURE 17 is a sectional view taken along the line XVII—XVII of FIGURE 15; and

FIGURE 18 is an enlarged sectional view taken along the line XVIII—XVIII of FIGURE 16.

FIGURES 1 and 2 of the drawings show somewhat diagrammatically a conventional arrangement of drive and mounting for a winding mandrel and stripper mechanism that are constructed in accordance with the principles of this invention, and in which the winding mandrel is adapted to have wire fabric reeled thereon as it is received from a continuous fabricating line of the type, for example, which includes a welding machine for continuously forming mesh or fabric from wire. In this showing, the winding mandrel is formed of a pair of complementary halves or mandrels **2** which are mounted in axially aligned positions for movement between operating and retracted positions relative to each other. Each mandrel **2** has an identical mounting and operating mechanism which includes a conventional arrangement of rotary drive and retractable bearing support. Such arrangement comprises, for each mandrel **2**, a bearing housing **3** that has at its base a slide carriage **4** mounted on a pair of parallel tracks **5** for guided rectilinear movement between retracted and operating positions. Movement of the housings **3** between these positions is effected by fluid pressure motors **6** that are connected by piston rods **7** with the carriages **4**. Bearings **8** provide a rotational support for the outer ends **9** of the mandrels **2** in the housings **3**. A chain and sprocket drive for rotating the mandrels comprises a sprocket wheel **10** mounted on each mandrel adjacent its bearing housing **3** as shown in FIGURE 4, and sprocket chains **11** trained over sprocket pinions **12**, that have splined connections (not shown) on a

drive shaft 13 for movement axially with respect thereto. The sprocket pinions 12 are rotatably supported on arms 14 projecting outwardly from the carriages 4 for movement therewith. As shown in FIGURE 1, the drive shaft 13 is driven by an electric motor 15 through a gear reducing unit 16 and a chain and sprocket drive 17. The mounting and drive for each mandrel 2, which is provided by the elements 3—17, as explained above, is conventional and forms no part per se of this invention.

Each of the mandrels 2 is fabricated by welding and includes a part 18 of tubular construction that provides a cylindrical outer surface 19 on which wire fabric is wound. The surfaces 19 have tapers that decrease in an axial direction toward their outer ends, as shown in FIGURE 4, to facilitate withdrawal of the mandrels 2 from a coil of fabric by axial movement to retracted positions in a manner to be described. Each of the tubes 18 has a pair of diametrically opposed openings 20 (FIGURE 5) that extend axially inwardly from their outer ends and which cooperate to provide a winding slot 21 (FIGURE 1) arranged diametrally and axially in each mandrel part 2. The sides of the winding slot 21 are defined by parallel plates 22 which are welded to the tube 18 along the edges of the openings 20 therein.

To insure movement of the mandrels 2 to positions in which the ends of the slot 21 are aligned with each other, as shown in FIGURES 1 and 4, a pair of guide pins 23 are secured in positions extending axially from closure plates 24 in the end of one of the mandrels 2. Closure plates 25 in the end of the other mandrel are provided with guide openings 26 in which the guide pins 23 are received when the mandrels 2 are moved to their operative winding positions in which their ends have abutting engagement with each other as shown in FIGURE 1. Movement of the pins 23 into the guide openings 26 in this manner operates to align the positions of the mandrels 2 to provide a single and axially extending winding slot 21.

The manner in which the slot 21 serves as an anchoring connection for the end of a length of wire fabric to be wound will be best understood by referring to FIGURE 3. In this showing, the fabric is designated diagrammatically by the letter F and is delivered to the mandrel in the direction indicated by the arrow. Prior to starting the winding operation the leading end 27 of a length of fabric F is inserted in the slot 21 and, if desired, a terminal portion 28 thereof may be crimped to provide a lip extending over the mandrel surface 19 as shown in FIGURE 3, Thereafter, and upon rotation of the mandrel in counterclockwise direction as viewed in FIGURE 3, the end 27 will be anchored in the slot 21 with a snubbing action. With the end 27 anchored in this manner, continued rotation of the mandrel will operate to wind the fabric F thereon as it is received from the fabricating line.

According to this invention the winding slot 21 has a pair of stripper heads 30 mounted in opposite ends thereof in positions that are adjustably located and spaced relative to each other a distance corresponding to the width of the fabric to be wound, which is fabricated in conventional wire fabric machines in widths varying, for example from about 5 feet to about 12 feet. The heads 30 have facing surfaces 31 (FIGURE 6) that define the effective ends of the slot 21 and facilitate stripping fabric from the mandrel when its parts are moved by the housings 3 to retracted positions in which they are withdrawn from a coil of fabric wound thereon.

As best shown in FIGURES 6 and 7, each stripper head 30 is a T-shaped plate that has a thickness slightly less than the spacing of the plates 22 at opposite sides of the slot 21, and opposite end portions 32 projecting through the openings 20 and beyond the external surface 19 of the mandrel. The end portions 32 have undercut recesses 33 extending radially inwardly with respect to the external surface 19 of the mandrel to provide for the connection thereto of arcuate-shaped flanges 34, which are secured

to the heads 30 by welding and have a lose fit and sliding engagement with the surface 19 to guide the axial movement of the stripper head 30 in the slot 21. Split clamping rings 35 have clamping engagement about the mandrel surface 19 for a purpose to be described.

Each of the stripper heads 30 has its movement in the slot 21 controlled by an over-center collapsible toggle linkage that operates to hold it against movement during initial movement of the bearing housings 3 toward their retracted positions for withdrawing the mandrels 2 from a coil of fabric wound thereon. The toggle linkage for this purpose, as best shown in FIGURES 8 and 9, comprises a pair of toggle links 36 and 37 which have their adjacent ends pivotally connected together at 38 by a horizontal common center pivot, a stationary horizontal pivot 39 at the opposite end of the link 36, and a movable pivot 40 connecting the opposite end of the link 37 to a yoke 41 (see FIGURE 9) at one end of a hollow shaft 42. The hollow shaft 42 is a control shaft that, as will be apparent from FIGURES 8 and 4, extends through the bearing housing 3 and has a stub shaft 43 projecting from its opposite end. The stub shaft 43 projects through and is rotatable in an axially extending opening 44 (see FIGURE 7) arranged centrally of the stripper head 30 and a nut 45 on the end of the shaft 43 holds the stripper head 30 against axial movement relative to the shaft 42, which in a manner to be described controls the axial position of the stripper head 30 in the slot 21. The stub shaft 43, its rotational support in the opening 44, and the nut 45 form a rotatable coupling that provides for rotational movement of the stripper head 30 about the shaft 42 with the mandrel 2 in which it is located. As indicated, the yoke 41 at the other end of the shaft 42 has a pivotal connection with the toggle link 37 and, for this purpose, has threaded openings in which the pivots 40 in the form of pivot bolts are received.

The stationary pivot 39 at the other end of the toggle linkage is in the form of a pivot pin that has its ends supported in aligned pairs of openings 47 in laterally spaced brackets 48 which are secured to vertically extending angles 49 that form part of a supporting frame. The pin 39 extends through an opening 50 in a crosshead 51 (see FIGURE 14) at one end of a guide rod 52, which is telescopically received in the hollow shaft 42. In the operating or unretracted position of the bearing housing 3 shown in FIGURES 8 and 9, the other end 53 of the guide rod 52 is located adjacent one end of the housing 3 so that the length of the rod 52 telescoped in the hollow shaft 42 is sufficient to furnish an adequate support and guide therefor.

The toggle links 36 and 37, as will be apparent from FIGURES 8, 9, 11 and 12, are channel sections that have vertically depending side flanges with respect to which the axes of the pivots 38, 39 and 40 extend transversely and horizontally. The inner end of the link 36 extends beyond the common center pivot 38 and has a cross strap 55 that engages the link 37 and thus limits downward movement of the center pivot 38 beyond the position shown in FIGURES 8 and 12 of the drawings. In this position, the axis of the pivot 38 is located below the axis of the guide rod 52 and below the axes of the toggle end pivots 39 and 40, and the toggle links 36 and 37 are thus effective to hold and prevent axial movement of the shaft 42, and thereby the stripper head 30, during initial retracting movement of the bearing housing 3 to the left as viewed in FIGURES 8 and 9. In this manner, the stripper heads 30 are effective to prevent axial movement of coiled fabric on the winding mandrels 2 during their withdrawal or stripping movement to a retracted position.

Upon movement of the bearing housing 3 to the partially retracted position designated by the broken lines 3a in FIGURE 8, a downwardly inclined camming member 60 secured to the toggle link 37 is engaged by a cam

bar 61 which is mounted by a bracket 62 on the housing 3 for movement therewith. Continued movement of the housing 3 to the left, as viewed in FIGURE 8, is effective through the camming parts 61 and 60 to rotate the toggle link 37 in a clockwise direction about its pivot 40 and to thus raise the common center pivot 38 to a position above the axis of the guide rod 52. When the pivot 38 moves to a position above the axis of the guide rod 52 in this manner, the link 36 and 37 are rendered ineffective to hold the control shaft 42 against axial movement. Shortly after this action takes place, the end 63 of the housing 3 will engage the yoke 41 on the end of the shaft 42 so that continued movement of the housing 3 to the fully retracted position designated 3*b* in dotted lines will operate to move the toggle links 36 and 37 to their collapsed position as shown in broken lines in FIGURE 8 of the drawings.

It will be recalled that the stripper heads 30 define the effective ends of the winding slot 21 during the fabric winding operation. The stripper heads 30 are in their operating positions for this purpose when the toggle links to which they are connected occupy the extended position down in FIGURE 8 of the drawings. The operating position of each stripper head 30 in the winding slot 21 is of course dependent upon the length of the shaft 42 and the location of the stationary pivot 39. It will thus be apparent that adjustment of the position of the stationary pivot pin 39 in the bracket openings 47 will effect a similar adjustment of the location of a stripper head 30 in the slot 21. Further adjustment may be effected by using shafts 42 of different lengths to vary the distance between the movable pivot 40 and the stripper head 30. By adjustments of this character, the stripper heads 30 may be properly located for the winding of fabric having widths varying, for example, from about 5 feet to about 12 feet.

A typical winding operation by the apparatus described above is effected by first operating the fluid pressure motors 6 to pull the bearing housings 3 inwardly toward each other to an operating position in which adjacent ends of the mandrels 2 have abutting engagement with each other. In this position, the guide pins 23 are received in the openings 26 (see FIGURE 4) so that both portions of the slots 21 in the mandrels 2 are axially aligned with each other. During the final portion of this movement, the clamping rings 35 on the mandrels 2 engage the outer ends of the guide flanges 34 to move the stripper heads 30 toward each other to their final operating positions. This in turn pulls the shafts 42 inwardly toward each other and moves the toggle links 36 and 37 into the extended position shown in FIGURE 8. The end of a length of fabric F is then threaded in the slot 21 as described above with reference to the showing of FIGURE 3 and a winding operation initiated by operating the drive 15—17 to rotate the mandrels 2. When the winding operation has been completed, the fluid pressure motors 6 are operated to move the bearing housings 3 and the mandrels 2 supported thereby in an outward direction to their retracted positions, in which the mandrels 2 are withdrawn from the coil of cloth that has been wound thereon. During the initial portion of this retracting movement, the toggle linkages hold the stripper heads 30 against movement and thus render them effective to strip the coiled fabric from the mandrels 2. As the mandrels 2 are retracted to positions in which the stripper heads 30 therein are positioned adjacent their inner ends, the cam bar 61 carried by each bearing housing 3 engages the camming member 60 so that the toggle links 36 and 37 are pivoted to their collapsed position as explained above. Subsequent operation of the fluid pressure motors 6 to return the bearing housings 3 and mandrels 2 to the position shown in FIGURE 1 then conditions the apparatus for another winding operation.

FIGURES 15–18 show a modified form of linkage and, in this showing, the same numerals have been used to

designate parts that are similar to those in the preferred form of toggle linkage described above. With reference to FIGURE 15, it will be noted that the shaft 42 is rigidly connected as by welding to the stripper head 30 and thus rotates therewith. The other end of the shaft 42 is connected to a rotatable coupling 70 that is rotatably supported in a bearing block 71. As best shown in FIGURES 16 and 18, the coupling 70 is comprised of two collars 72 and 73 that are threaded on the end of the shaft 42. The collar 72 has a journal 74 projecting therefrom and spacing it with respect to the collar 73. The journal 74 is received in an opening 75 in block 71 which thus provides a bearing support for the coupling 70 which is rotated by the shaft 42. Pivot bolts 40 are threaded in the block 71 and are arranged with their outer ends projecting through slots 77 at the upper ends of supporting links 78, which have angle shaped lower ends 79 pivoted at 80 to a support 81. The parts 77 to 80 operate as a support for the pivots 40 and the toggle linkage connected with the shaft 42.

The pivot bolts 38 in this modification provide a common center pivot between toggle links 36*a* and 37*a* which correspond to and function in the manner of the toggle links 36 and 37, as explained above. The links 37*a* have their outer ends pivoted on the pivot bolts 40 and the links 36*a* have their outer ends pivoted on a stationary pivot pin 39, which is supported in the brackets 48, as explained above. The pivot pin 39 further furnishes a support for the head 51 at the inner end of the guide rod 52 which is telescoped in the shaft 42 as in the preferred embodiment. The extended ends of the links 36*a* are connected by a strap 55 which engages the guide rod 52 and acts as a stop to limit downward movement of the common center pivot 38 between the links 36*a* and 37*a* below its over-center holding position as shown in FIGURE 15. The toggle linkage shown in these figures operates in essentially the same manner as described above in connection with the preferred form shown in FIGURES 8 and 9, and adjustment of the operating positions of the stripper heads 30 is similarly effected by changing the location of the pivot pin 39 in the bracket openings 47 or by using shafts 42 of different lengths.

While a preferred embodiment of our invention and a modification thereof have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. In a reel for winding wire fabric, the combination with a bearing support mounted for guided movement in opposite directions over a rectilinear path between operating and retracted positions, of a mandrel rotatably mounted on and projecting axially outwardly from said support in a direction parallel to said path, said mandrel having a diametral winding slot extending axially inwardly from its outer end, a stripper head mounted in said slot for relative movement in an axial direction with respect thereto, said stripper head having end portions projecting beyond diametrically opposite edges of said slot, a control shaft extending axially through said bearing support and connected with said stripper head, and means for holding said shaft and thereby said stripper head against movement during initial retracting movement of said bearing support and for moving said shaft and stripper head with said bearing support during final retracting movement thereof.

2. A reeling apparatus as defined in claim 1 characterized by said holding means comprising an over-center toggle linkage connected with said shaft and movable between an extended holding position and a collapsed position.

3. A reeling apparatus as defined in claim 2 characterized by means associated with said bearing support for actuating said toggle linkage to its collapsed position in response to final retracting movement of said support.

4. A reeling apparatus as defined in claim 1 characterized by said control shaft being a tube and by a stationary rod having telescopic engagement therein to provide a guide and support thereof.

5. In a reel for winding wire fabric, the combination with a bearing support mounted for guided movement in opposite directions over a rectilinear path between operating and retracted positions, of a mandrel rotatably mounted on and projecting axially outwardly from said support in a direction parallel to said path, said mandrel having a diametral winding slot extending axially inwardly from its outer end, a stripper head mounted in said slot for relative movement in an axial direction with respect thereto, said stripper head having end portions projecting beyond diametrically opposite edges of said slot, a control shaft extending axially through said bearing support and connected with said stripper head, and a toggle linkage controlling the movement of said shaft comprising a pair of toggle links, a common pivot connecting adjacent ends of said links, a movable pivot connecting the other end of one of said links with said shaft and a stationary pivot support for the other end of the other of said links, and means limiting relative pivotal movement of said links beyond a holding position in which they are substantially aligned with said shaft and in which said common pivot is spaced below a line extending between said movable and stationary pivots.

6. A reeling apparatus as defined in claim 5 characterized by said shaft having a rotary connection with said stripper head.

7. A reeling apparatus as defined in claim 5 characterized by said shaft having a rotatable coupling at its point of connection to said movable pivot.

8. A reeling apparatus as defined in claim 5 characterized by the provision of camming means operated by movement of said bearing support toward its said retracted position for pivoting said toggle links out of said holding position and for initiating their movement to a collapsed position.

9. A reeling apparatus as defined in claim 8 characterized by said cam means comprising a cam bar connected to said bearing support for movement therewith, and a camming member connected to said one link and having a camming surface diverging angularly outwardly with respect to the axis of said control shaft when said links are in said holding position, said camming surface being arranged in the path of movement of said cam bar so that it is operated upon movement of said bearing support from its operating position a predetermined distance toward its retracted position.

10. In a reel for winding wire fabric, the combination with a bearing support mounted for guided movement in opposite directions over a rectilinear path between operating and retracted positions, of a mandrel rotatably mounted on and projecting axially outwardly from said support in a direction parallel to said path, said mandrel having a diametral winding slot extending axially inwardly from its outer end, a stripper head mounted in said slot for relative movement in an axial direction with respect thereto, said stripper head having end portions projecting beyond diametrically opposite edges of said slot, a control shaft extending axially through said bearing support and connected with said stripper head, and an operating mechanism connected with said shaft comprising an over-center toggle linkage movable between an extended position and a collapsed position, said linkage being operative when its extended position to hold said shaft against movement during initial retracting movement of said support, means responsive to final retracting movement of said support for moving said toggle linkage to its said collapsed position to thereby move said shaft and stripper head with said support during final retracting movement thereof, and means on said mandrel for engaging the said projecting end portions of said stripper head to move said stripper head and shaft with said support in response to return movement thereof from its said retracted position to its said operating position and to thereby return said toggle linkage from its collapsed position to its extended holding position.

11. In a reel for winding wire fabric, the combination with a bearing support mounted for guided movement in opposite directions over a rectilinear path between operating and retracted positions, of a mandrel rotatably mounted on and projecting axially outwardly from said support in a direction parallel to said path, said mandrel having a diametral winding slot extending axially inwardly from its outer end, a stripper head mounted in said slot for relative movement in an axial direction with respect thereto, said stripper head having end portions projecting beyond diametrically opposite edges of said slot, a control shaft extending axially through said bearing support and connected with said stripper head, a rotatable coupling on said control shaft providing for rotation of said stripper head with said mandrel, and means for holding said control shaft and thereby said stripper head stationary during initial movement of said bearing support out of its said operating position in a direction toward its said retracted position to render said stripper head end portions operative to strip coil of fabric from said mandrel.

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