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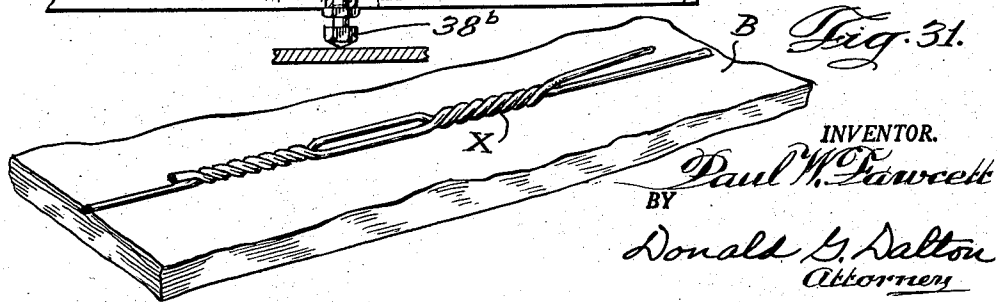
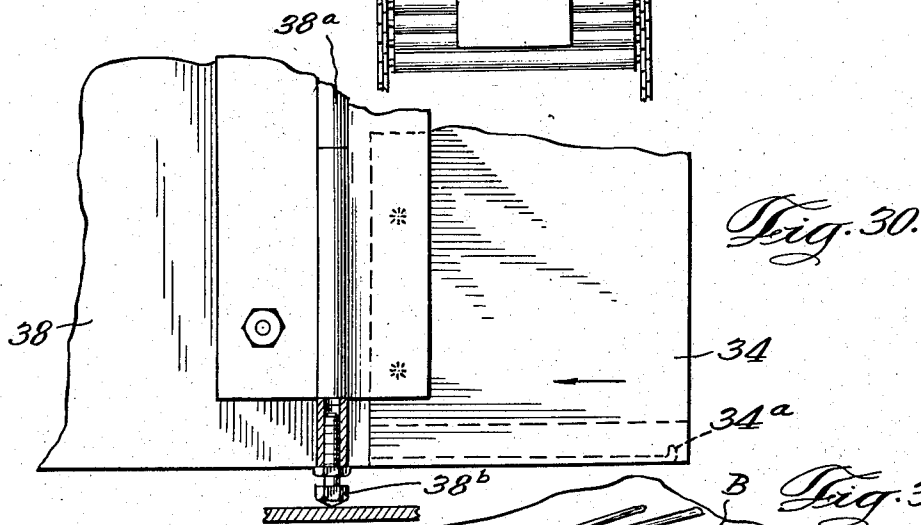
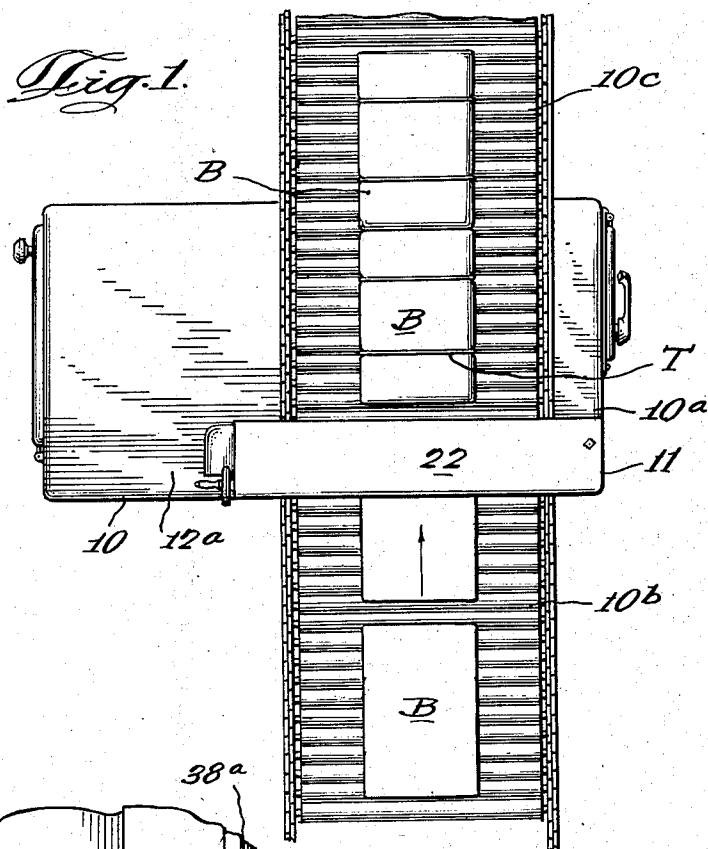
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2,908,215

GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

Filed May 1, 1957

14 Sheets-Sheet 1



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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 2

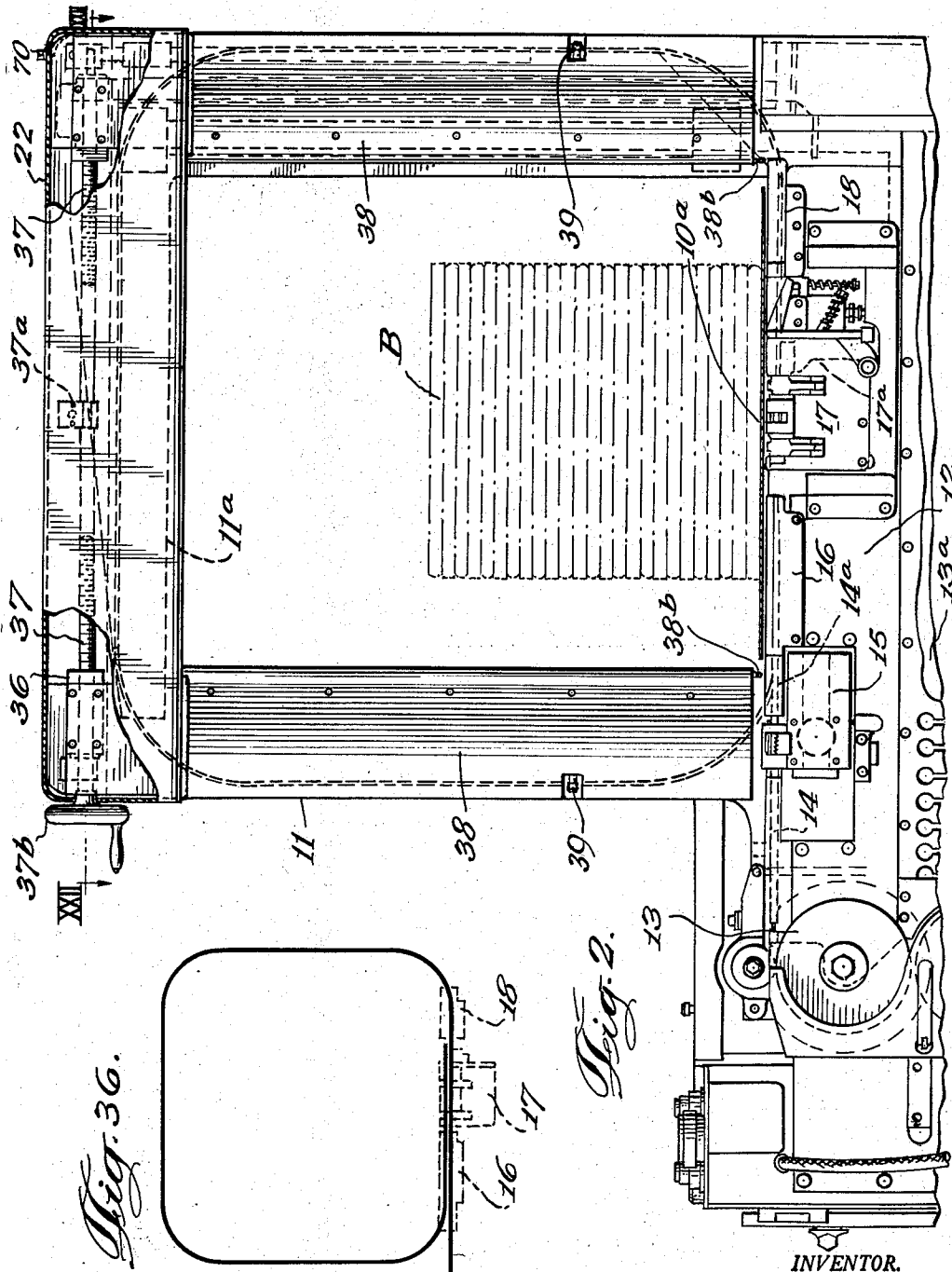


Fig. 36.

Fig. 2.

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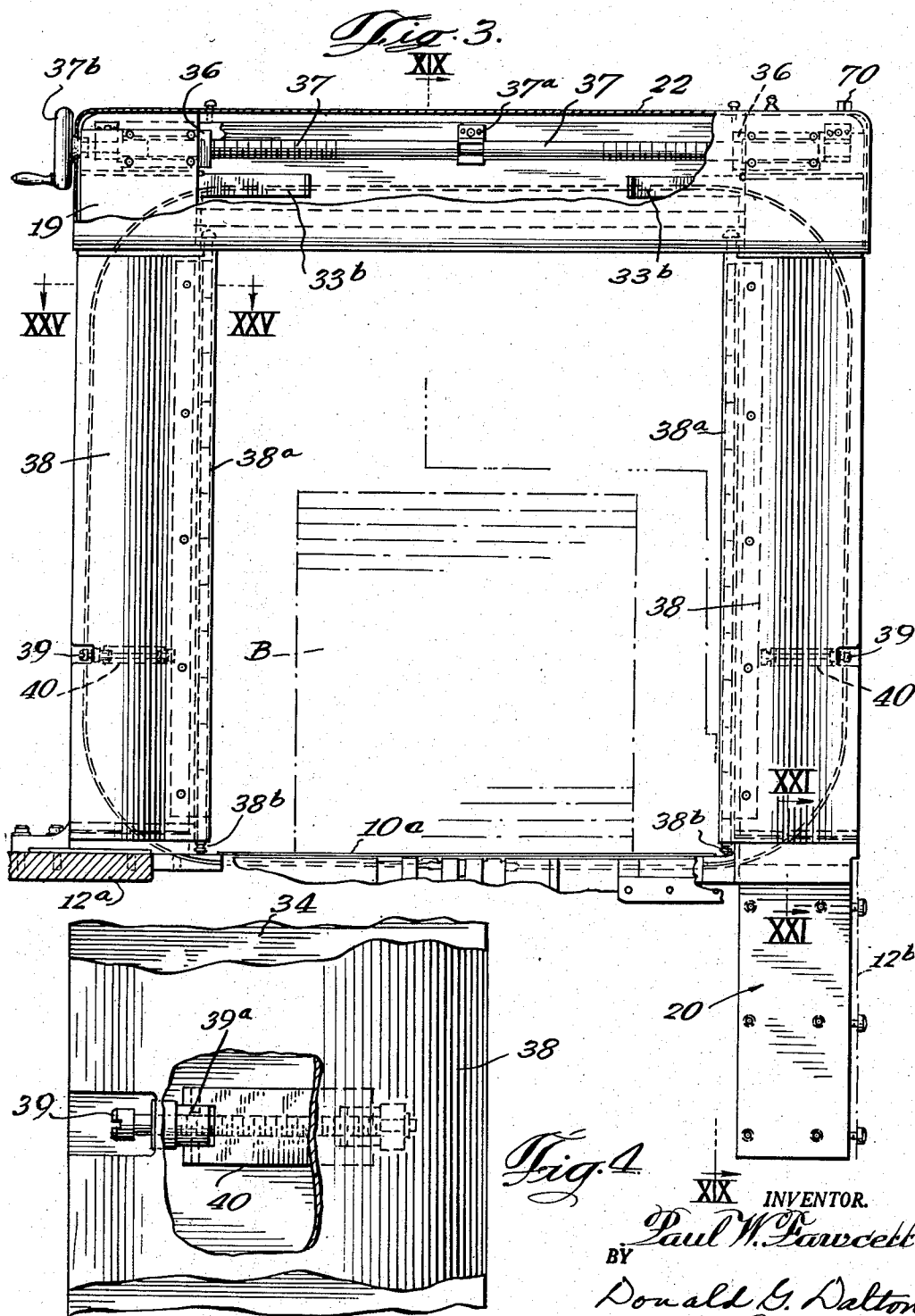
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 3



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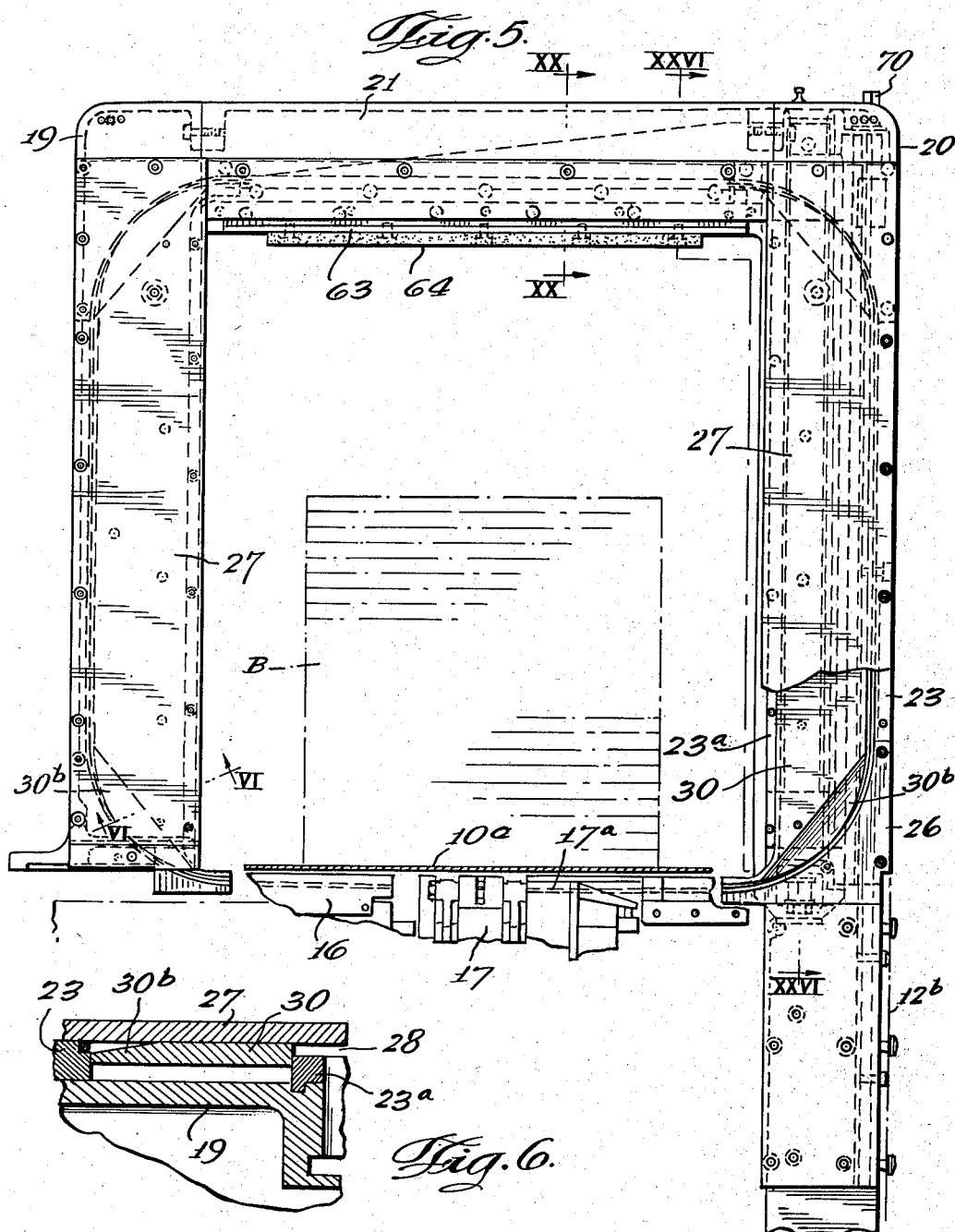
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 4



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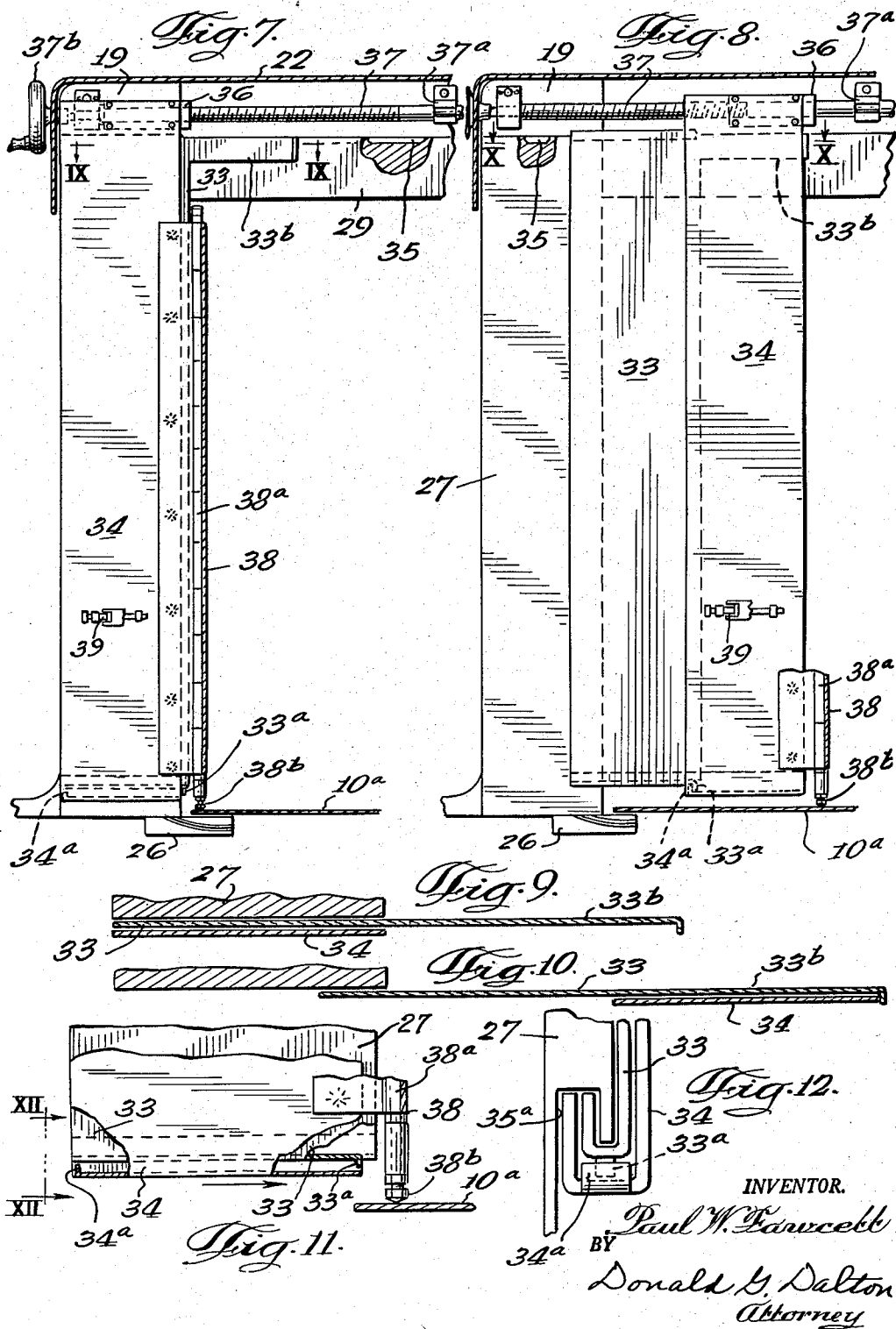
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 5



Oct. 13, 1959

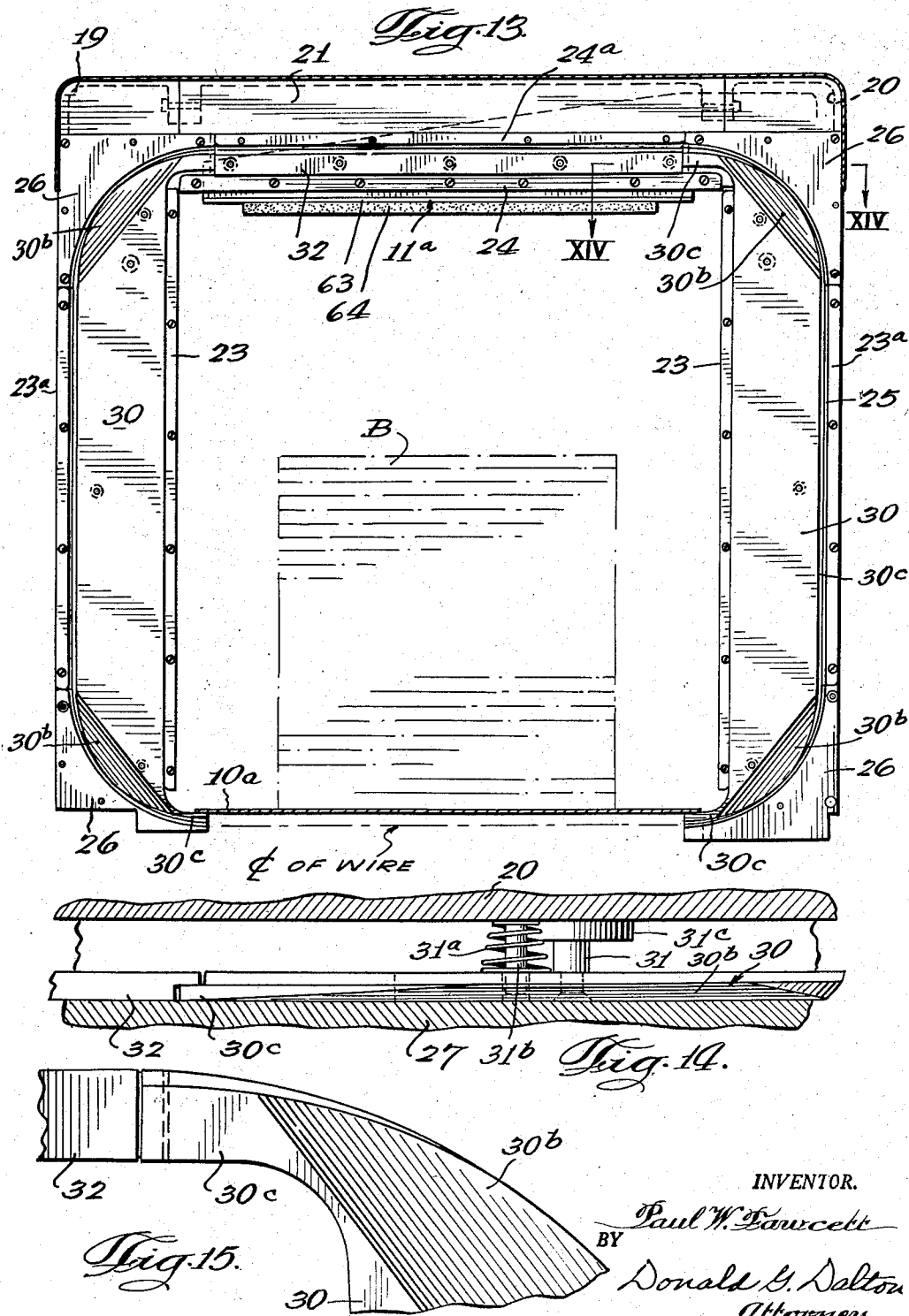
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

Filed May 1, 1957

14 Sheets-Sheet 6



Oct. 13, 1959

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2,908,215

GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 7

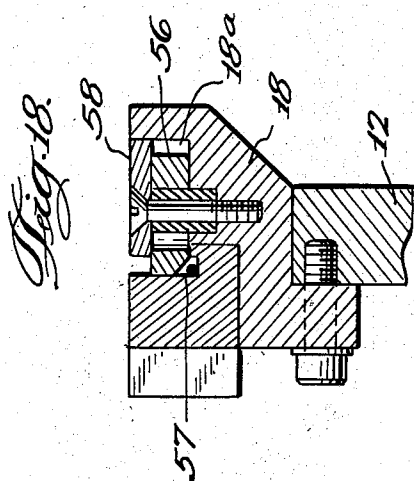
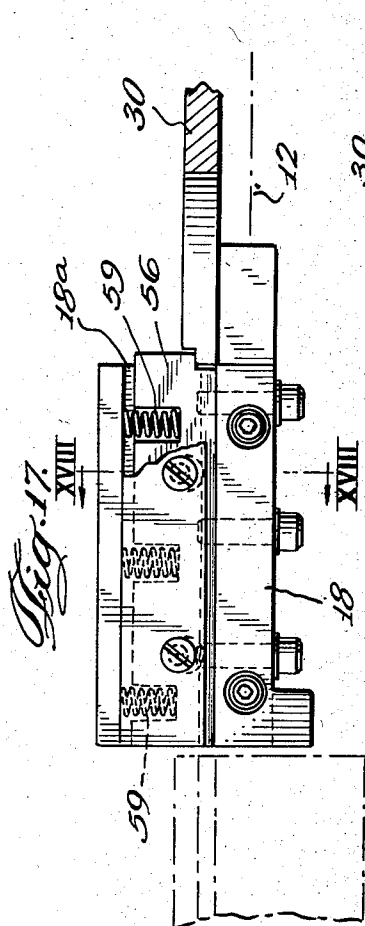
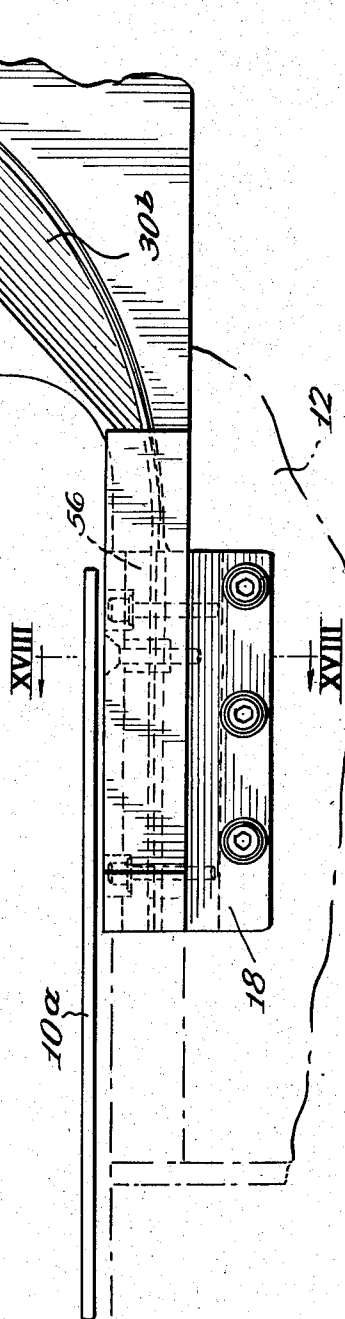


Fig. 16.



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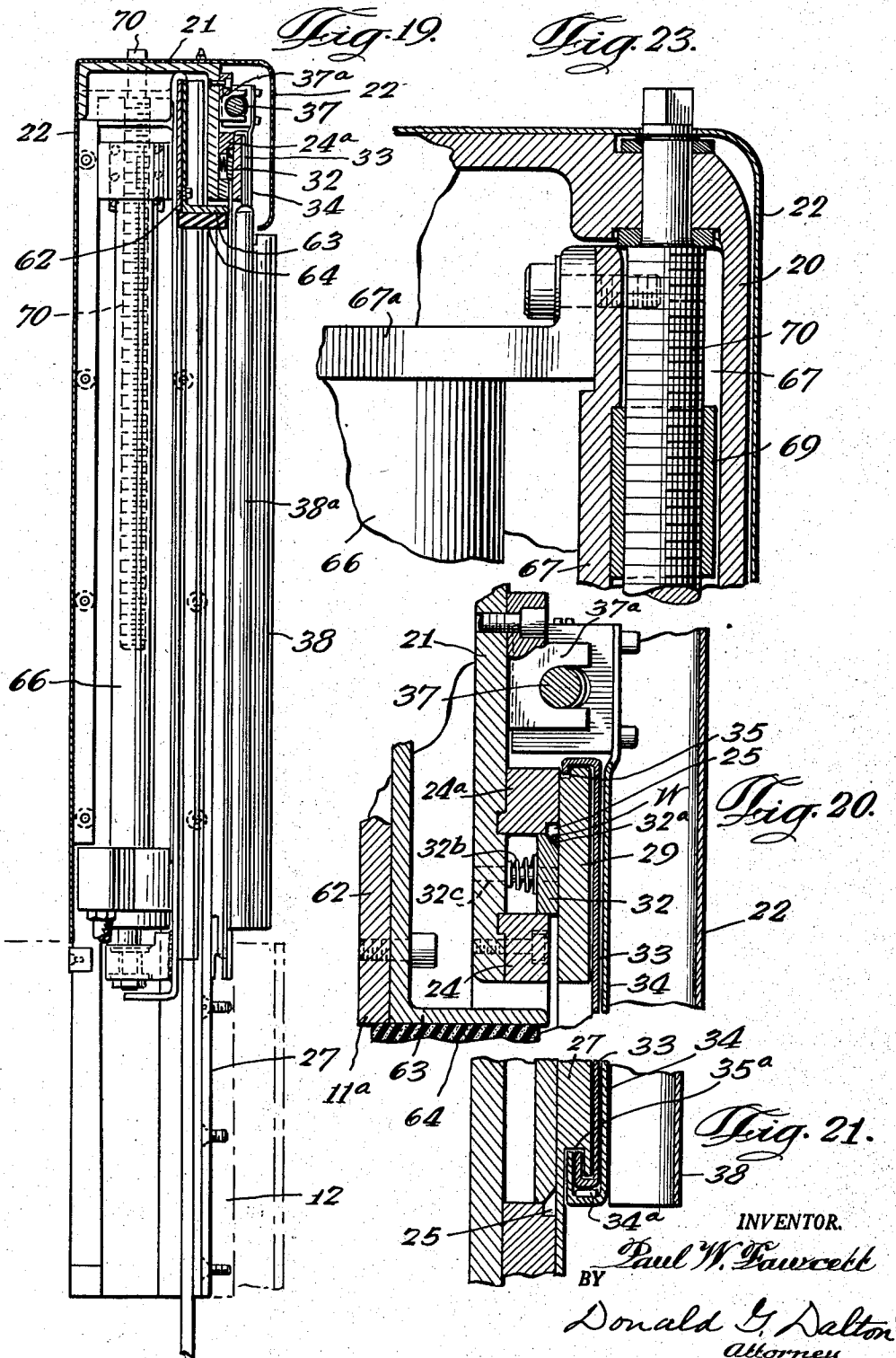
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 8



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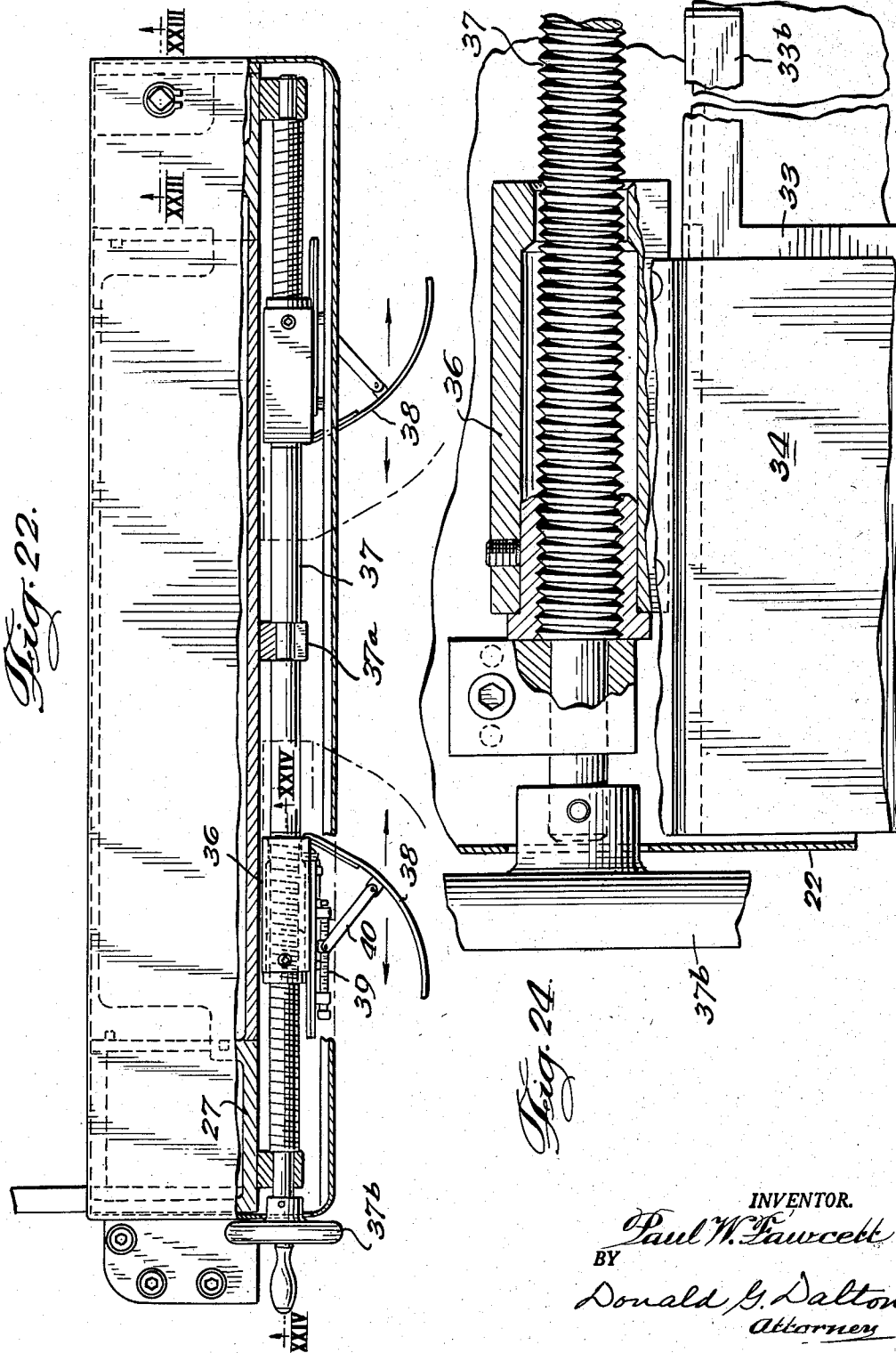
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 9



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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 10



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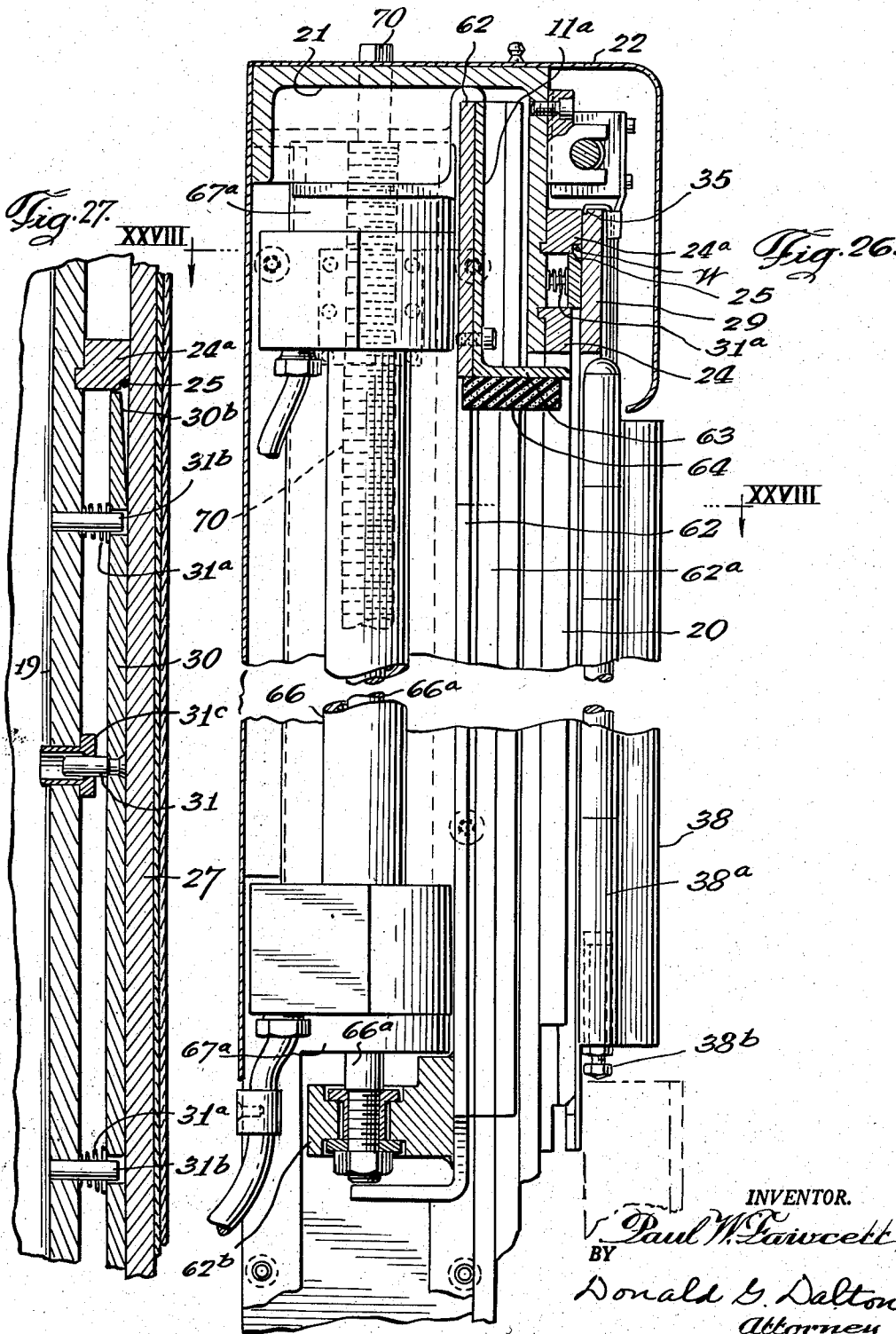
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 11



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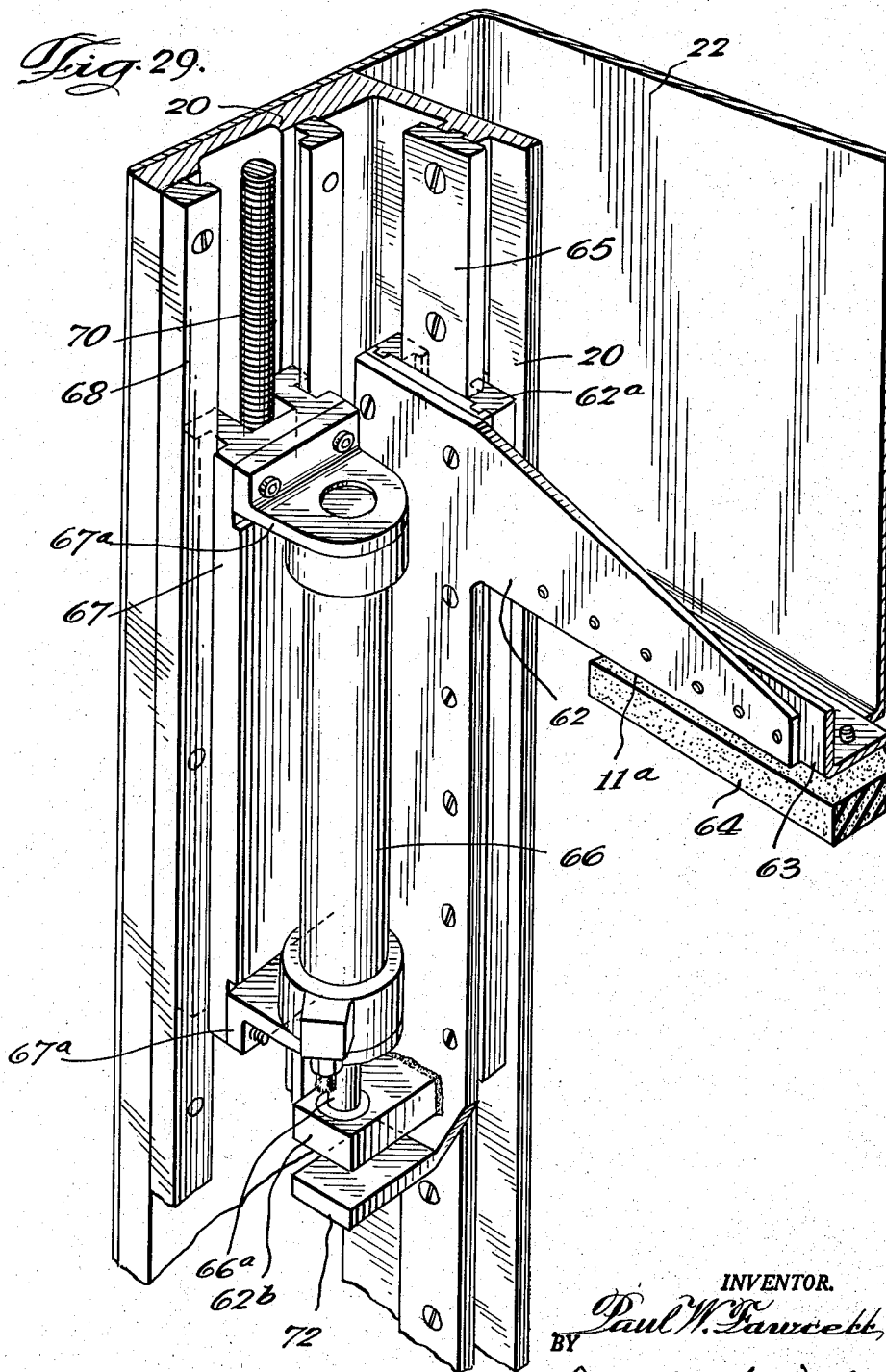
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 12



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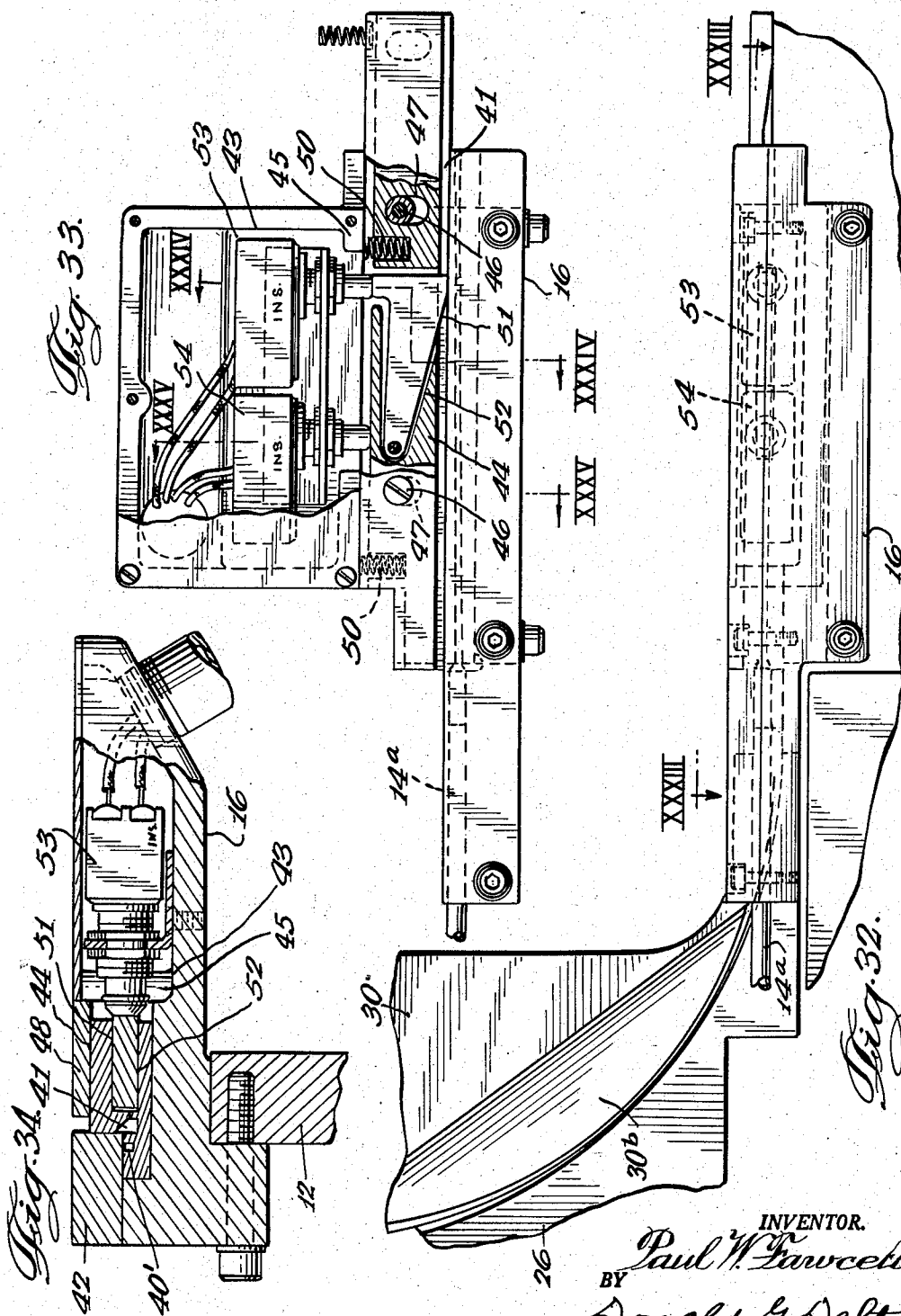
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 13



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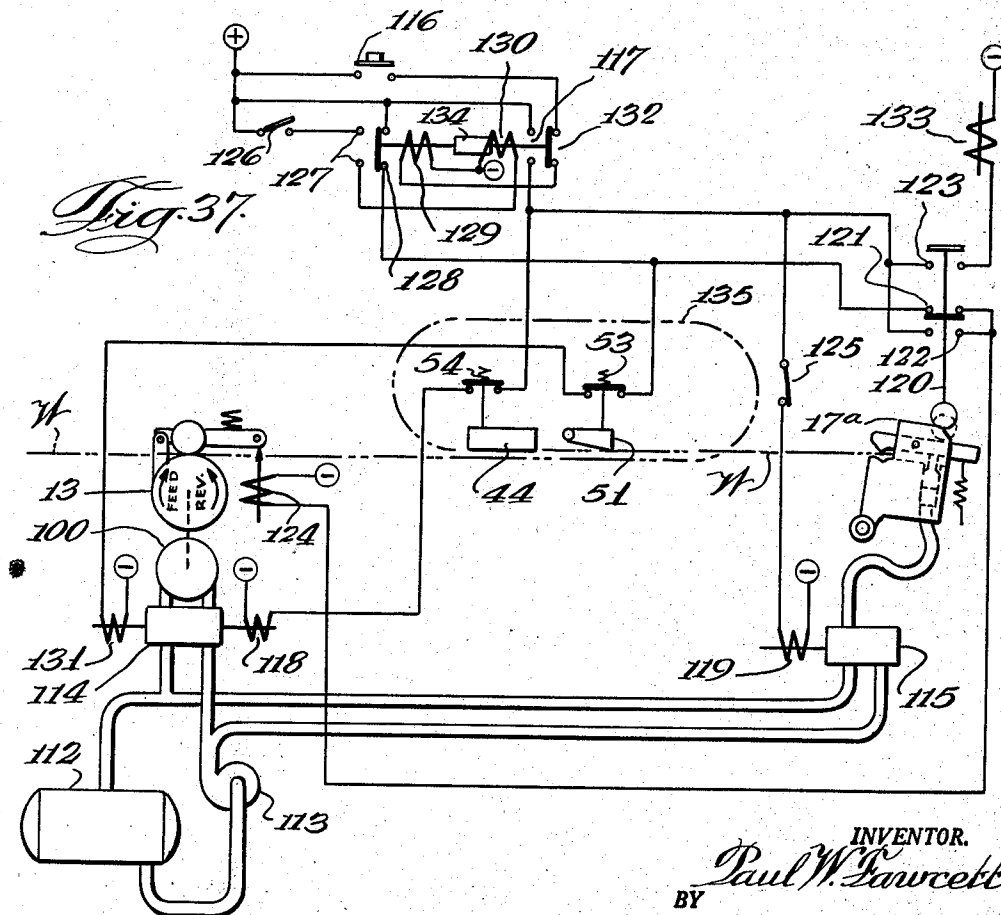
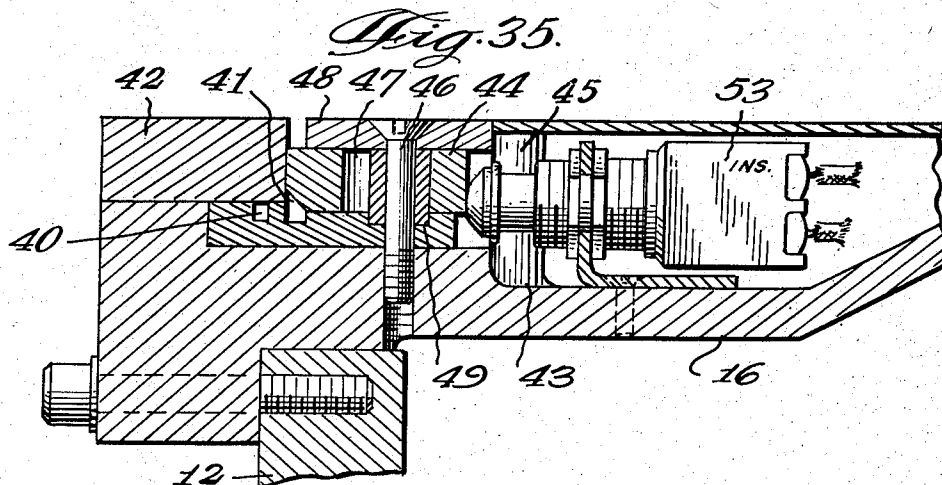
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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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14 Sheets-Sheet 14



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GUIDE TRACK AND COMPRESSOR FOR AUTOMATIC WIRE-TYING MACHINE

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Application May 1, 1957, Serial No. 656,282

16 Claims. (Cl. 100—26)

This invention relates to automatic machines for applying a tie wire to a bundle, tightening it therearound and securing the lapped ends of the wire by a twist or "knot." In particular, the invention concerns a rectangular guide track into which the bundle or package to be tied is inserted preparatory to application of a tie wire thereto, around which the tie wire is fed as the last step in a tying cycle, before automatic operation is suspended, in order to be ready instantly for initiation of a succeeding cycle.

Automatic wire-tying machines of the guide-track type are known generally and include, in addition to the guide track itself, wire-feeding and retracting means, final-tensioning means, a twister or knoter mechanism and shear means for cutting the completed tie from a coil of tie wire. One example of such machines is shown in Vining et al. Patent No. 2,416,859. As stated, my invention is principally concerned with the guide track. The novel features thereof, as herein described and claimed, may be employed in any known machine of the same general type. Details of parts other than the guide track and associated elements are not, therefore, included herein.

One object of the invention is to provide a guide track having spring-pressed plates normally cooperating with the track frame to define a passage for the tie wire, said plates providing guide means for the tie wire until it is completely drawn taut around the package and thus kept in alignment with the track, said plates being displaceable by the tie wire when it is retracted to pull it taut around the bundle.

A further object is to provide the track with package guides made up of extensible panels for adjusting the width of the opening through the track to the size of the package being tied.

A further object is to provide movable means effective to guide the leading end of the tie wire properly into the track on its first approach and into an adjacent path on its second approach, after it has made a complete circuit of the track.

A further object is to provide hinged centering wings on the package guides to insure proper positioning of a package advancing along a conveyor or being manually put through the track for tying.

A still further object is to provide a bundle compressor actuated by a fluid-pressure cylinder and means for adjusting the cylinder vertically so that the retracted or "up" position of the compressor will be only slightly above the top of the uncompressed bundle.

Further objects and advantages of the invention will be made clear during the following detailed description which refers to the accompanying drawings illustrating a present preferred embodiment. In the drawings:

Figure 1 is a plan view of a tying machine having the invention incorporated therein, with feed-in and carry-away conveyors on opposite sides thereof, respectively; Figure 2 is an elevation, partly broken away and with

2

parts in section, showing the general arrangement of the principal operative units of the machine and their relation to the guide track;

Figure 3 is a view similar to Figure 2 with parts removed or broken away;

Figure 4 is a portion of Figure 3 enlarged showing a detail;

Figure 5 is an elevation of the main frame of the guide track with the package guides removed and parts broken away;

Figure 6 is a partial section taken along the plane of line VI—VI of Figure 5;

Figure 7 is a partial elevation, with parts in section or broken away, showing the package guides fully retracted;

Figure 8 is a view similar to Figure 7 showing the package guides partially advanced;

Figures 9 and 10 are partial sections taken along the planes of lines IX—IX and X—X, respectively, of Figures 7 and 8;

Figure 11 is a partial elevation partly broken away to show the package guides in vertical section;

Figure 12 is a partial elevation showing how the package guides are mounted and interlocked, as projected along the plane of line XII—XII of Figure 11;

Figure 13 is an elevation of the back portions of the guide track with the overlying parts removed, showing the spring-pressed, yieldable wire-confining plates;

Figure 14 is a partial section along the plane of line XIV—XIV of Figure 13;

Figure 15 is a partial elevation of the yieldable plates corresponding to Figure 14;

Figure 16 is a partial elevation of the right-hand guide block;

Figure 17 is a plan view of the right-hand guide block; Figure 18 is a section taken along the plane of line XVIII—XVIII of Figures 16 and 17;

Figure 19 is a partial section taken along the plane of line XIX—XIX of Figure 3;

Figure 20 is a partial section to enlarged scale taken along the plane of line XX—XX of Figure 5;

Figure 21 is a partial section taken along the plane of line XXI—XXI of Figure 3;

Figure 22 is a view, partly in plan, and partly with parts broken away and shown in section along line XXII—XXII of Figure 2;

Figure 23 is a partial vertical section taken along the plane of line XXIII—XXIII of Figure 22;

Figure 24 is a partial vertical section to enlarged scale taken along the plane of line XXIV—XXIV of Figure 22;

Figure 25 is a section taken along the plane of line XXV—XXV of Figure 3;

Figure 26 is a section along the plane of line XXVI—XXVI of Figure 5 with parts in elevation;

Figure 27 is a partial section with parts removed along the plane of line XXVII—XXVII of Figure 25;

Figure 28 is a section taken along the plane XXVIII—XXVIII of Figure 26;

Figure 29 is a partial perspective showing the compressor and its fluid-pressure cylinder;

Figure 30 is a partial elevation, partly in section, showing the vertically adjustable bearing for the package guides and centering wings;

Figure 31 is a partial perspective showing the completed tie on the bottom of the package;

Figure 32 is an elevational view of the left-hand guide block;

Figure 33 is a plan view with parts broken away taken along the plane of line XXXIII—XXXIII of Figure 32;

Figure 34 is a sectional view taken along the plane of line XXXIV—XXXIV of Figure 33;

Figure 35 is a sectional view taken along the plane of line XXXV—XXXV of Figure 33;

Figure 36 is a diagrammatic illustration showing the course of travel of the tie wire through the track guide and associated elements; and

Figure 37 is a diagrammatic illustration of the control circuits involved in operation of the guide track.

Referring now in detail to the drawings and, more particularly to Figures 1-3 for the present, the invention is shown incorporated in an automatic tying machine 10 having a table 10a with a feed-in conveyor 10b and a carry-away conveyor 10c cooperate. Specifically, the invention resides in the guide track and compressor, indicated generally at 11, which is in the form of an arch or gate bridging the common center line of the conveyors, through which pass the bundles B moving along the latter, each bundle being stopped one or more times while under the arch for the application of a tie T, the formation of a "knot" or twist X on the bottom side of the bundle as it rests on table 10a, and the cutting of the tie from a coil of wire. The compressor 11a is forcibly brought down on the bundle to compact it during tying. The principal elements of machine 10 are mounted on a vertically disposed plate 12 which is secured to the main frame of the machine. These elements include a sheave-and-pinch roll feeding mechanism 13 for feeding into the track tie wire W from a supply coil (not shown), a pocket or escapement 13a to receive temporarily the surplus length of wire when the tie is pulled back and tightened, a guide tube 14, final-tensioning means 15, a second guide tube 14a, left-hand guide 16, knotter and shear 17 with a tiltable gripper 17a, and right-hand guide 18. The knotter includes the usual slotted twister pinion. Other details of the tying machine 10 and of the feeding mechanism 13 and tensioning means 15 are not part of the invention claimed herein.

Track 11 comprises a frame composed of left and right side posts 19 and 20 of channel and angle section, respectively, (Figures 25 and 28) and a beam 21 of the channel section (Figures 13, 19 and 26) extending between the top of the posts and carried by them. Post 19 is secured to the machine frame member 12a (Figure 3) and post 20 is affixed with its one flange attached to plate 12 and its other flange attached to the right end 12b of the machine frame (Figures 3 and 5). A removable sheet-metal cover 22 fits over the beam and extends downwardly around the tops of the posts. Spaced marginal ribs 23 and 23a are secured to the co-planar faces of posts 19 and 20 (Figures 13, 25 and 28), and similar ribs 24 and 24a are secured to beam 21 (Figures 13 and 26). The inner arrises or corners of the ribs 23a and 24a are rabbeted to form a wire track or groove 25. Corner plates 26 (Figure 13) extend between ribs 23a and rib 24a and between ribs 23a and guides 16 and 18, and are similarly rabbeted on a quadrant of a circle to complete the track with smooth curves at the corners. Thus a wire end fed in by feeding mechanism 13 will be directed through guide tube 14a, guide 16, the knotter 17, guide 18 and around the track 25, then through guide 16 and through the knotter a second time.

Vertical plates 27 secured by corner plates 26 extend upwardly from table 10a spaced in front of posts 19 and 20 (Figures 25 and 28). The outer edges of these plates abut ribs 23a. Their inner edges, however, are spaced from ribs 23 because the ribs 23a have a greater thickness than ribs 23, leaving a gap 28 through which the tie wire W may be pulled from its track 25 to draw it tight around a bundle. Similarly a horizontal plate 29 (Figure 20) is secured to beam 21, with its upper edge abutting rib 24a and its lower edge spaced from rib 24. Plates 30 are contained between ribs 23 and 23a by means of a mounting pin 31 and guide pins 31b (Figures 13, 15 and 25, 27 and 28) and yieldingly urged

against plates 27 by springs 31a. Mounting pins 31 are supported in bushings 31c in posts 19 and 20. The outer edges of the plates 30 are beveled as at 30a. Their ends are curved and the curved portions are beveled as at 30b (Figures 13 and 28). Projections 30c extend from the curved end portions of the plates 30 providing smooth transition to the horizontal portions of the track. A plate 32 is contained between ribs 24 and 24a (Figure 20). Plate 32 rests on rib 24 and is spring-urged against bar 29 by means of springs 32b which are mounted on guide pins 32c. The upper edge of plate 32 is beveled as at 32a.

By virtue of the construction just described, the tie wire W is closely confined in its track as its leading end is pushed therearound so that it follows the track easily without jamming. When the tie wire W has been fed completely around the track, however, and the leading end thereof has been gripped by the gripper 17a, which is a part of the knotter 17, the tie wire may be easily pulled out of the track and around the bundle by reversing feeding mechanism 13 or otherwise retracting the coil or tail end of the wire. The bevel of portions 30b of plates 30 is greater than the bevel 30a so, on retraction of the coil of the tie wire, the wire rides up on beveled portions 30b, first pressing plates 30 backward against the force of springs 31a. The projections 30c at the upper ends of plates 30 lap the ends of plate 32 (Figures 13-15). Thus, the initial entry of the tie wire between the portions 30b of plates 30 not only wedges them slightly away from plates 27 but also forces plate 32 away from bar 29. Thereafter, the side and top portions of the tie enter easily between plates 27 and 30 and between bar 29 and plate 32, because of the beveled edges 30a and the action of the extended portions 30c on plate 32.

Panels 33 and 34 of the package guide are slidable inwardly of plates 27 (Figures 7 and 8). Panels 33 have their upper ends bent around bar 29 and plates 27 and fitted into a groove 35 which extends through the bar 29 and plates 27. The lower ends of the panels 33 are fitted into a groove 35a in the plates 27 (Figures 12, 20 and 21). Panels 34 are secured at their upper ends to riders 36 threaded on a horizontal screw shaft 37. The reduced ends of shaft 37 are journaled in bearings carried by posts 19 and 20 (Figure 22) and a central bearing 37a (Figure 20). A handwheel 37b is mounted on the left end of the shaft. The lower ends of panels 34 are bent around those of panels 33 (Figures 12, 20 and 21). An upturned tongue 34a (Figures 11, 12 and 21) on panel 34 engages a downturned tongue 33a on panel 33 (as shown in Figure 8) when panel 34 has been moved inwardly its full width, after which panel 33 is pulled along with panel 34. At the upper end of panel 33, a finger 33b (Figures 7-10 and 24) has an out-turned tongue simultaneously engaged by the inner edge of panel 34 so that equal movement of both upper and lower ends of panel 33 is assured.

Panels 34 have centering wings 38 hinged to their inner edges (Figures 22, 25 and 28). At the lower end of each of the hinges shown at 38a is an adjustable bearing foot 38b (Figures 2, 3, 11 and 26) adapted to be screwed down to rest on table 10a when panels 33 and 34 have been adjusted as desired. Each panel 34 has a manually adjustable screw 39 journaled horizontally thereon (Figures 3, 4, 22, 25 and 28). A nut 39a travels along each screw on rotation thereof to adjust the angular position of the wings by links 40 pivoted to the nuts and the wings. The wings, when adjusted to the proper angle, define a converging throat which effectively centers and straightens bundles approaching the guide track 11 on conveyor 10b.

Left-hand guide block 16 is provided with two spaced grooves 40 and 41 in the upper surface thereof for accommodating the tie wire as it is fed into the guide track the first time and as it passes through the guide block the second time, respectively.

5

A cover piece or retainer 42 is removably affixed to the top of the block 16 overlying the groove 40' and extending to the edge of the groove 41. A recess 43 is formed in the top surface of the block 16 spaced from the groove 41. A slidable wire-cover plate 44 is disposed between the cover piece 42 and a flange 45 which projects upwardly from the bottom of the recess 43. Wire-cover plate 44 is provided with transversely extending elongated slots 47 and is slidably retained on block 16 by a cap plate 48. Cap plate 48 is removably affixed to block 16 by means of screws 46 which pass through the slots 47 in the wire-cover plate 44 and are threaded into block 16. A spacer sleeve 49, which is slightly thicker than wire-cover plate 44, is disposed around the portion of each screw 46 which passes through the plate 44 so as to prevent binding of the latter by the cap plate 48.

Slidable wire-cover plate 44 is constantly urged laterally into overlying position relative to groove 41 by springs 50. The forward edge of the wire-cover plate may be beveled so as to facilitate stripping of tie wire W from the groove 41 during the tying operation as will be apparent hereinafter.

The wire-cover plate 44 is partially cut away on its bottom side to accommodate a switch lever 51 which is pivotally mounted in a recess 52 adjacent to and level with the bottom of groove 41. The side of groove 41 is cut away adjacent the forward side edge of lever 51 so that this portion of the switch lever is normally positioned in groove 41 in the path of the wire traveling therealong. Switch lever 51 is adapted to actuate a spring loaded switch 53 which is disposed in recess 43. The lever 51 is constantly urged into groove 41 by the switch 53.

Another spring loaded switch 54 is disposed in recess 43 adjacent to and spaced from switch 53. Stripping of wire W from groove 41 displaces wire-cover plate 44 laterally against the pressure of springs 50 and when thus displaced, plate 44 actuates switch 54.

At the start of a normal operating cycle of the tying machine, the tie wire W has been threaded through the machine and extends along groove 40' of block 16, around track 25, and along groove 41 of block 16. At this point the leading end of the wire W is disposed in the gripper 17a but is not gripped thereby. To start the tying cycle, a switch 116 (shown diagrammatically in Figure 37) is manually or otherwise closed. In order to explain the operation of the left-hand guide block 16, reference is made to Figure 37 for the time being without an attempt to describe in detail the circuits involved in the several operations of the tying cycle of the machine which will be described hereinafter. Closing of switch 116 causes the jaw of the gripper to close on the leading end of the wire W. Closing of switch 116 also causes a motor 100 (shown diagrammatically in Figure 37), which drives the feeding mechanism, to rotate in the reverse direction so that the wire W is retracted from the guide track into the escapement 13a.

As it is being retracted, wire W is stripped from track 25 and from groove 41 in block 16 and is drawn around the bundle. As the wire is stripped from groove 41 it displaces wire-cover plate 44 so that the plate opens switch 54. Opening the switch 54 stops the operation of motor 100. Although motor 100 is disconnected from its power source, the sheave and pinch roll of feeding mechanism 13 continue to rotate under their own momentum. This causes the wire W to continue to retract a sufficient amount to pull gripper 17a counterclockwise until it releases a switch 120 (shown diagrammatically in Figure 37). Release of switch 120 causes disengagement of the sheave and pinch roll of feeding mechanism 13 to abruptly stop retraction of the wire W. Release of switch 120 also starts tensioning means 15 (not described in detail or claimed herein) which functions to exert final tension on the wire W to draw it tightly around the bundle. The knoter 17 is then actuated by other

6

means (not shown) to complete the tie and cut the wire W.

Operation of the knoter 17 causes the jaw of the gripper 17a to open at a predetermined point in the cycle, to release the end of the wire W. The machine is now ready to be "reloaded," so it will be prepared to repeat the tying cycle for the next succeeding bundle. This is initiated by the knoter 17, through means to be described hereinafter, which causes engagement of the sheave and pinch roll of the feeding mechanism 13 and forward rotation of motor 100 so that wire is fed into the guide track through block 16, around track 25 and through block 16 a second time.

When the tying wire W passes through guide block 16 the second time, it travels along groove 41 and in so doing pivots lever 51 so that normally closed switch 53 is opened. This cuts off the flow of pressure fluid to motor 100. After the fluid supply to motor 100 has been cut off, the sheave and pinch roll of feed mechanism 13 continue to rotate for a short time under their own momentum, causing the leading end of the wire W to coast beyond guide block 16 and contact the gripper 17a. The momentum of the coasting wire W causes the gripper 17a to be tilted back. When tilted back, gripper 17a trips the switch 120 which causes the pinch roll and sheave of feeding mechanism 13 to disengage. This abruptly stops further advance of the wire W. The apparatus is then ready for another cycle starting with retraction of tie wire W as described above.

Right-hand guide block 18, as shown in Figures 16-18 has a channel 18a in its top face to accommodate a horizontally displaceable bar 56 which is normally urged to a position over the track-portion 57 at the forward side of the channel. Bar 56 is confined in its channel by a cover piece 58 and is urged forwardly by springs 59. The lower front corner of bar 56 is beveled but the tie wire cannot escape from track portion 57 until the wire has been drawn taut around the package in the tying operation. As the tie wire is being drawn taut around the package it displaces the extended portion 30c of right hand plate 30 laterally which causes portion 30c to move bar 56 against the pressure of springs 59 to provide clearance for escape of the wire at one end. The wire then completes displacement of bar 56 as it is drawn taut around the package.

The details of the compressor are best shown in Figures 2, 19, 23, 26 and 29. A plate 62 of inverted L-shape carries on its horizontal portion a compressor bar or foot 63 having a layer of cushioning material 64 on its lower face. Plate 62 is slidably mounted by gibs 62a on a vertical rail 65 which is secured to the rear face of the inwardly extending flange of post 20. A lug 62b projecting rearwardly from plate 62 has secured thereto the piston rod 66a of a double-acting fluid-pressure cylinder 66. This cylinder is mounted vertically on a block 67 by brackets 67a and the block is slidable in gibs 68 which are secured to the inner face of the other flange of post 20. Block 67 has a nut 69 (Figures 23 and 28) secured thereto by screws 69a. The nut is threaded on a vertical screw shaft 70 journaled in a bearing at the upper end of post 20, with a squared end projecting upwardly through cover 22 whereby the shaft may be turned manually by applying a crank.

Cylinder 66, when fluid pressure is applied to its upper end, tends to force plate 62 downwardly. The retracted or starting position of the plate, of course, is at the upper end of the cylinder. By turning shaft 70, the cylinder 66 and plate 62 may be raised or lowered together in relation to table 10a to accommodate various size packages or bundles. I can thus reduce to a minimum the idle travel of the compressor between starting position and the point where it just clears the top of the uncompressed bundle. By providing the arrangement whereby the cylinder 66 and plate 62 are

moved together to adjust for various size bundles, the hydraulic cushioning effect of the fluid in the cylinder is utilized to cushion the upward stroke of the piston rod.

An integral impact plate 72 may be provided projecting normal to the bottom of plate 62. Plate 72 functions to cushion the impact of the compressor on the table of the tying machine in the event the compressor is actuated while there is no bundle or package in position under the compressor. In such event the plate 72 strikes a resilient pad (not shown) on the tying machine on the downward stroke of cylinder 66.

Figure 37 illustrates the circuits in the several operations of the tying cycle wherein the guide track of the invention is involved. These circuits will now be described for the purpose of showing how the tying wire is fed around the guide track and retracted therefrom in the tying operation.

Pressure fluid for operating motor 100 and gripper 17a is delivered from a reservoir 112 by a pump 113 under the control of solenoid operated valves 114 and 115, respectively. The valve 114 is operated automatically to either of its extreme positions by alternate energization of solenoids 118 and 131. It is of the spring-return type which returns to a neutral or off position when both solenoids 118 and 131 are deenergized. This valve controls the supply of pressure fluid to the motor to drive it in the forward or reverse directions. Valve 115 which controls the operation of gripper 17a is also of the spring-returned type but is operated in one direction only by solenoid 119. Its function is to cause the gripper 17a to grip the wire by controlling the flow of pressure fluid to a pressure cylinder which actuates the jaw of the gripper.

The electrical control circuit includes a two-position relay 134. This relay has two coils 129 and 130 in operation, respectively, to move the contacts from one extreme position to the other. After operation, the relay contacts remain in the position to which actuated by one coil until the next energization of the opposite coil.

Assuming normal starting conditions where the wire W has been fed into the guide track of the machine and is ready to be retracted. The first operation is to close the switch 116, either manually or otherwise. This energizes the coil 129 of the relay 134 closing contacts 117 and 127 and opening contacts 128 and 132. Closing of contacts 117 energizes coil 118 of valve 114 through normally closed switch 54, reversing motor 100 to retract wire out of the track. The closing of contacts 117 also energizes valve solenoid 119 through normally closed switch 125, causing gripping of wire W by means of the pressure cylinder in the gripper 17a. Opening of contacts 128 causes de-energization of solenoid 124 and re-engagement of the sheave and pinch roll of the feeding mechanism 13.

As the wire is retracted it is stripped from the groove 41 in block 16 at which time it moves the spring biased wire-cover 44 to open switch 54 which in turn causes the deenergizing of solenoid 118 permitting valve 114 to return to neutral or off position. The feeding mechanism 13 continues to rotate in the reverse direction under its own momentum after valve 114 has been returned to off position. This causes continued retraction of the wire W and counterclockwise tilting of the gripper 17a. Such tilting of the gripper releases switch 120 opening contacts 121 and closing 122 and 123. The closing of contacts 122 energizes solenoid 124 causing disengagement of the sheave and pinch roll of the feeding mechanism 13 to abruptly stop the retraction of wire W. Closing of contacts 123 causes actuation of tensioning means 15 by energizing valve solenoid 133. Tensioning means 15 includes a gripper jaw (not shown) which maintains the tension initially applied after the feeding mechanism 13 has been disengaged. The gripper jaw in the tensioning

means 15 is of a type constructed to permit the wire to be drawn through it during initial tensioning. Further description of the tensioning means 15 is not necessary to an understanding of the guide track of the invention.

At this point in the cycle knoter 17 is actuated by other means (not shown) to form the knot and eject the completed tie. The knoter 17, during its operation, causes the opening of switch 125 and the deenergizing of valve solenoid 119. Valve 115 thereupon returns to its closed position and the pivoted jaw of gripper 17a is opened by its spring to release the wire. At the end of its operation, the knoter 17 closes switch 126 and, with contacts 127 being closed, the coil 130 of the relay 134 is energized, opening contacts 127 and 117 and reclosing contacts 128 and 132. The opening of contacts 117 disconnects the circuits of valve solenoids 118 and 119 from their current source.

The closing of contacts 128 energizes coil 131 of valve 114 through switch 53, which reclosed on ejection of the tying wire, starting motor 100 so that wire is fed through the track represented by loop 135. After the wire has been fed around the track it passes through left-hand guide block a second time and strikes and displaces lever 51 to open switch 53. This causes the deenergizing of solenoid 131 permitting valve 114 to move to off position. After the wire is further driven by the feed mechanism, which continues to operate under its own momentum, it strikes the gripper 17a displacing it clockwise which causes the gripper to trip switch 120. Tripping of switch 120 closes contacts 121 and causes energizing of solenoid 124 which causes disengagement of the pinch roll and sheave of the feed mechanism 13. This is the last phase of the feeding cycle. The next closing of switch 116 will start motor 100 in the reverse direction so that the wire W is retracted and drawn around the next bundle as described above.

It will be evident that the guide track and compressor herein disclosed have several advantages. Accurate and easy guiding of the leading end of a tie wire entering the track is assured at all points along the track. At the same time, the spring-loaded tie-confining plates are easily displaced when the tie is retracted for tightening around the bundle. The only portions of the track where the bevel of the edges of the confining plates is sufficient to permit the tie wire to escape inwardly are the curved portions where the sole tendency of the advancing tie wire is to press outwardly while being pushed around the track.

The hinges on which the centering wings are pivoted serve as guides for the tie loop as it contracts about the bundle on being pulled tight. The wings guide the bundles to their properly centered position for tying. The panels of the package guide prevent extraneous objects from being inserted within the guide track and engaged by the contracting tie. They also function as safety guards by deflecting and confining the leading end of the tie wire if it should for any reason escape from the track guide. The compressor cylinder is adjustable for bundles of different thicknesses, to limit the idle travel thereof on retraction.

The guide track of the invention may be constructed to any size to accommodate various sizes of packages or bundles by merely changing the dimensions of its component parts.

Although I have disclosed herein the preferred embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

I claim:

1. In a wire-tying machine, an upstanding guide track adapted to receive and hold a loop of wire pushed therearound, means for pushing wire around said track to form a loop, said means including a cooperating sheave and pinch roll and a reversible motor driving said sheave, electro-magnetic means for causing disengagement of the

pinch roll from the sheave, a tiltable gripper positioned to receive and be tilted by the wire end after completion of the loop, and a switch actuated by tilting of said gripper effective to control said electro-magnetic means.

2. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, a marginal rib on each of said posts and said beam, said ribs having their inner edges grooved to form a wire track, and plates displaceably mounted overlying said posts and beam with their outer edges abutting said ribs, said outer edges being beveled, the ends of the plates overlying the posts being curved to form quadrants, said curved ends of said plates being beveled at a greater angle than the intermediate portions thereof.

3. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, a marginal rib on each of said posts and said beam, said ribs having their inner edges grooved to form a wire track, curved corner plates on said posts at the tops and bottoms of the posts, said corner plates having their inner edges grooved to afford smooth transition between the horizontal and vertical portions of the track, and plates displaceably mounted overlying said posts and beam with their outer edges abutting said ribs, said outer edges being beveled, the ends of the plates overlying the posts being curved to form quadrants.

4. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, a marginal rib adjacent both the inner and outer edges of each of said posts and said beam, the outer ribs each having their inner edges grooved to form a wire track, plates displaceably mounted overlying said posts and beam with their outer edges abutting said outer ribs, said last named outer edges being beveled, the outer ribs being higher than the inner ribs affording a gap at the inner ribs through which the tie may be pulled after being fed around the track.

5. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, means on said posts and beam defining a wire track, a plurality of panels adjacent each post, means actuating the panels adjacent one post toward and from the panels adjacent the other post, and means whereby one panel is actuated by another after predetermined movement of the latter.

6. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, means on said posts and beam defining a wire track, sliding panels overlying said posts, and means actuating said panels toward and from each other, said actuating means being a screw shaft carried by said posts having nuts thereon, said panel being suspended by said nuts.

7. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, means on said posts and beam defining a wire track, sliding panels overlying said posts, means actuating said panels toward and from each other, and bundle-centering wings pivoted, respectively, to the panels adjacent their inner edges.

8. Apparatus as defined by claim 7, characterized by means for adjusting the angular position of each of said wings relative to said panels.

9. Apparatus as defined by claim 8, characterized by said adjusting means including a screw shaft journaled

on each panel, a nut on said shaft, and a link pivoted to the nut and the wing.

10. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, a compressor including an arm extending parallel to said beam and an arm extending downwardly along one of said posts, means slidably mounting said compressor on said one of said posts, a fluid-pressure cylinder mounted parallel to said one of said posts having a piston rod connected with said compressor, a block slidable along said one of said posts, said cylinder being mounted on said block, a screw shaft journaled parallel to said one of said posts, and a nut threaded on said shaft and secured to said block.

11. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, a marginal rib on each of said posts and said beam, said ribs having their inner edges grooved to form a wire track, fixed plates mounted on said ribs and overlying said posts and beam in spaced parallel relation thereto, displaceable plates between said posts and the fixed plates adjacent thereto and between said beam and the fixed plate adjacent thereto with their outer edges abutting said ribs, said outer edges being beveled, the ends of said displaceable plates being curved to form quadrants, the curved upper end of the displaceable plates overlying the posts having projections thereon lapping the ends of the displaceable plate overlying the beam.

12. In a wire-tying machine, a guide track comprising spaced posts and a beam connecting the upper ends thereof, a marginal rib on each of said posts and said beam, said ribs having their inner edges grooved to form a wire track, fixed plates mounted on said ribs and overlying said posts and beam in spaced parallel relation thereto, and displaceable plates between said posts and the fixed plates adjacent thereto and between said beam and the fixed plate adjacent thereto with their outer edges abutting said ribs, said last named edges being beveled.

13. Apparatus as defined by claim 12 characterized by spring means urging each of said displaceable plates away from its respective post and beam and toward the fixed plate overlying the same.

14. Apparatus as defined by claim 12, characterized by said displaceable plates being loosely pinned to said posts and beam.

15. Apparatus as defined by claim 12, characterized by the ends of the displaceable plates overlying the posts being curved to form quadrants.

16. In a wire-tying machine, an upstanding guide track adapted to receive and hold a loop of wire pushed therearound, means for pushing wire around said track to form a loop, said means including a cooperating sheave and pinch roll and a reversible motor driving said sheave, and a switch effective to de-energize said motor, said switch being located adjacent said track and including means actuated by the stripping of the wire from the track on retraction thereof by reverse operation of the motor.

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