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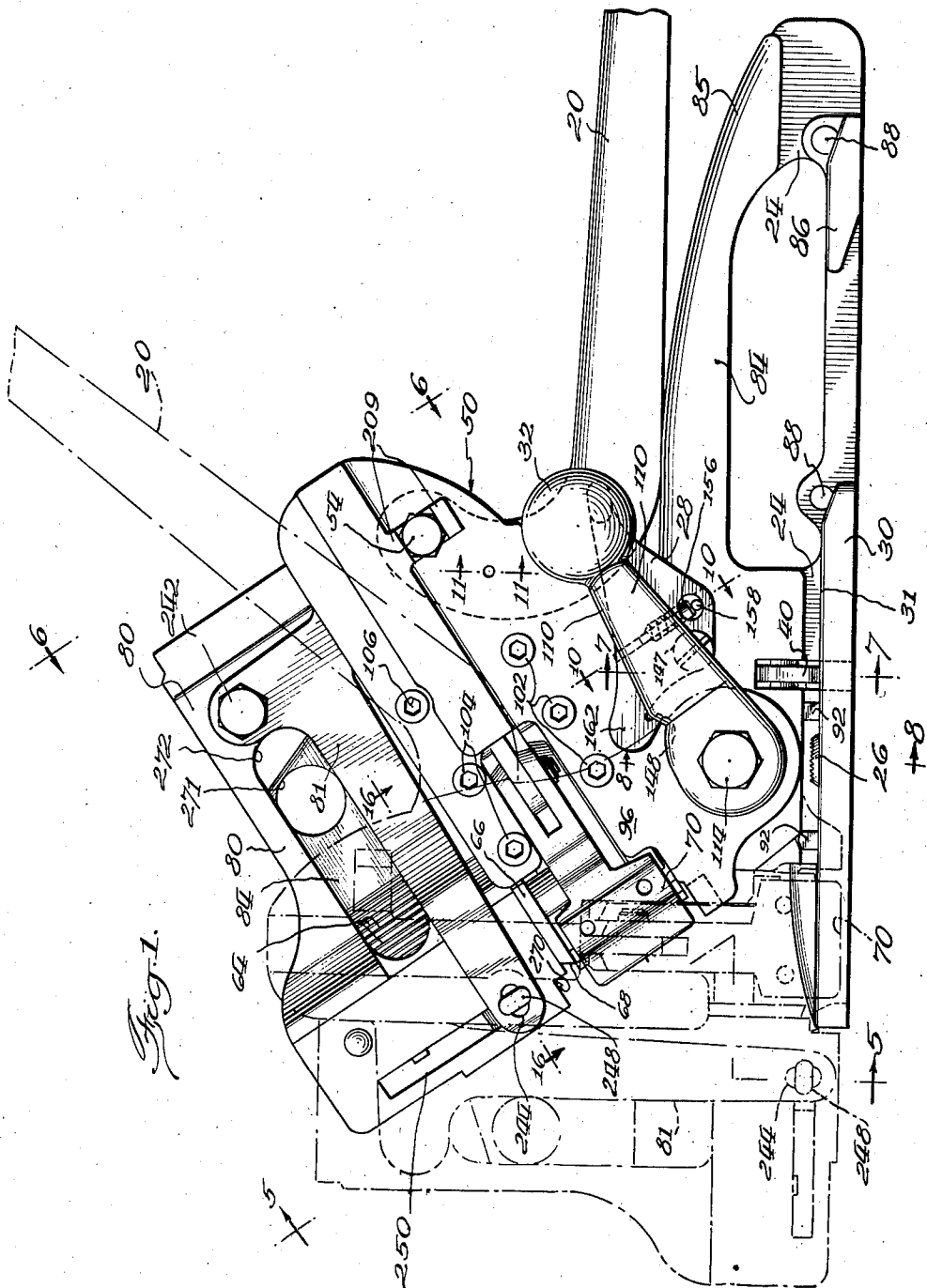
J. H. LESLIE, 2D

2,336,264

PACKAGE BINDING TOOL

Filed June 6, 1941

7 Sheets-Sheet 1



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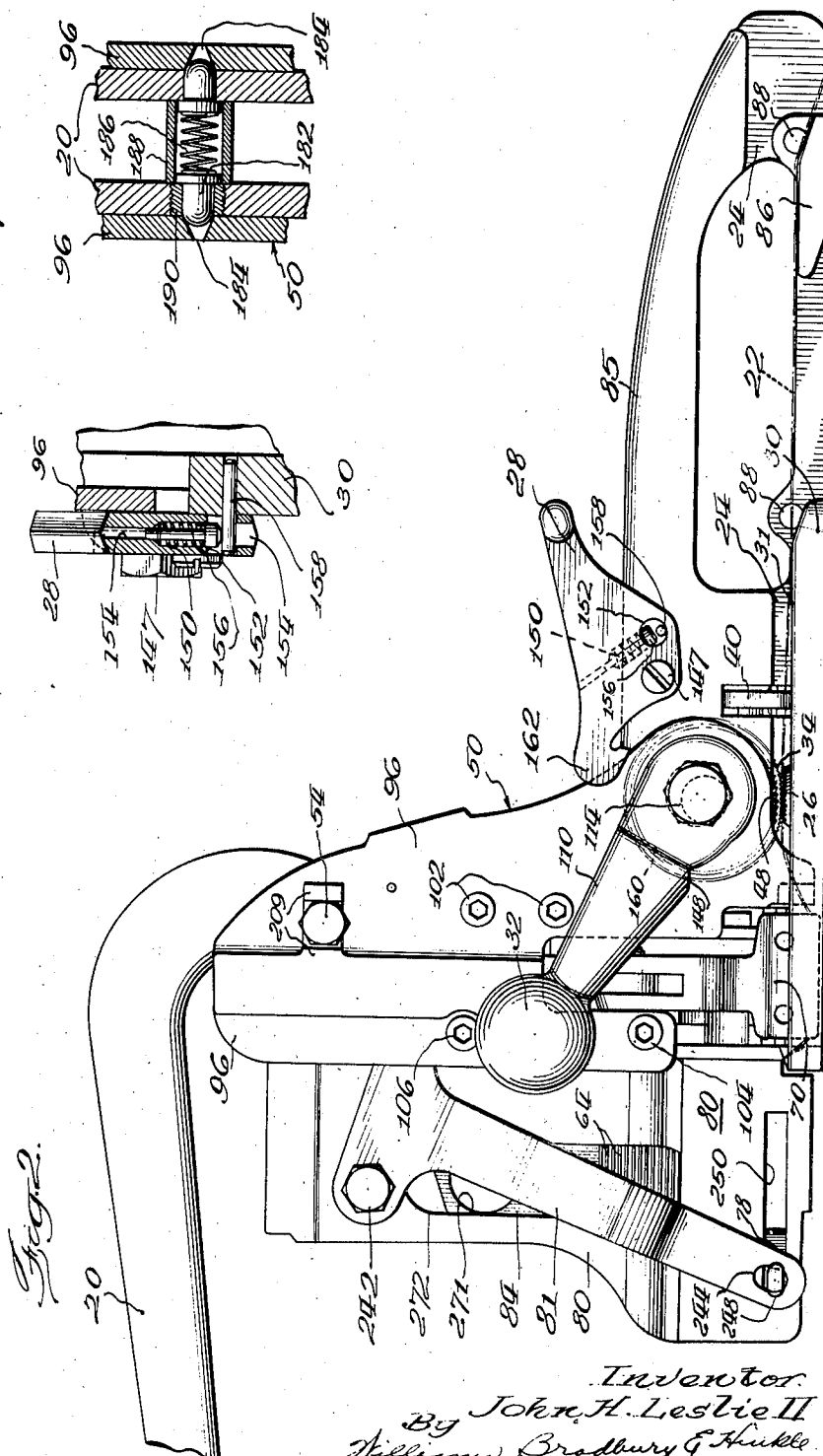
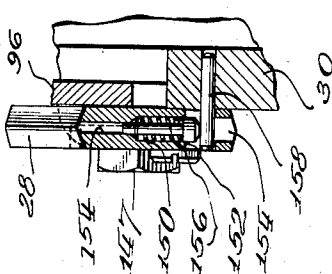
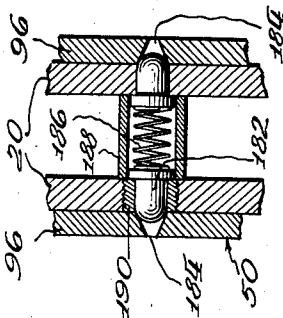
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PACKAGE BINDING TOOL

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7 Sheets-Sheet 2



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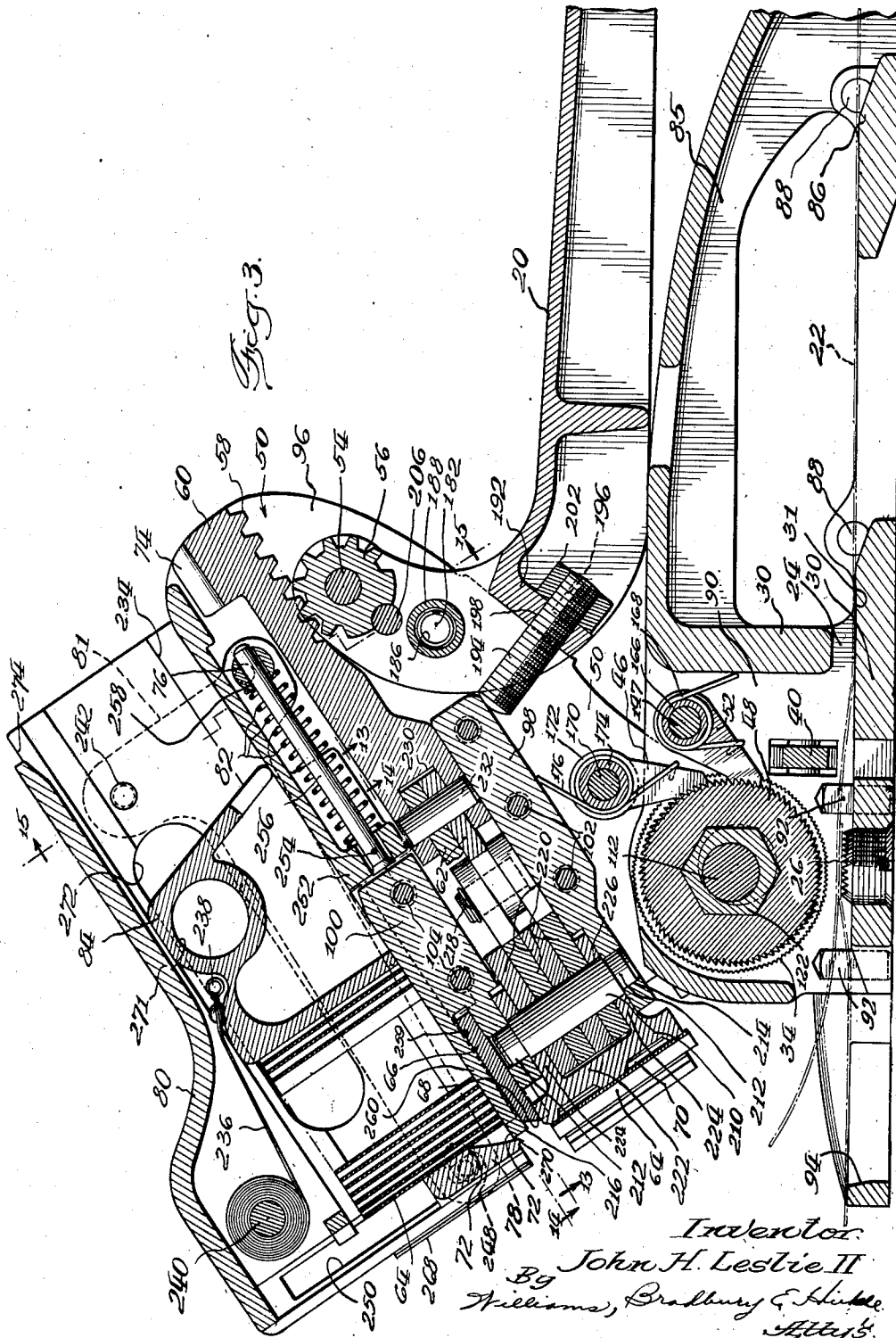
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PACKAGE BINDING TOOL

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7 Sheets-Sheet 3



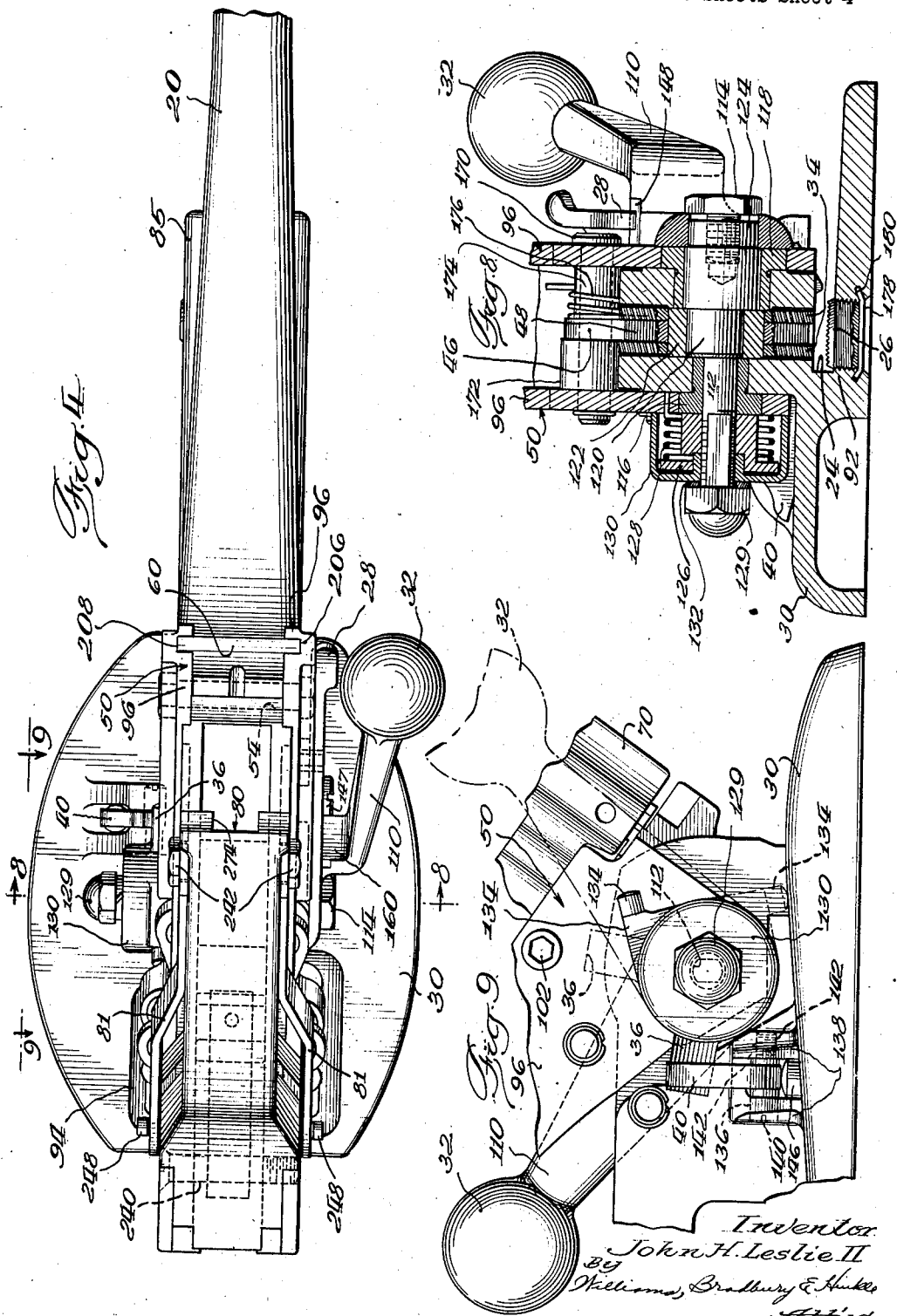
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PACKAGE BINDING TOOL

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7 Sheets-Sheet 4



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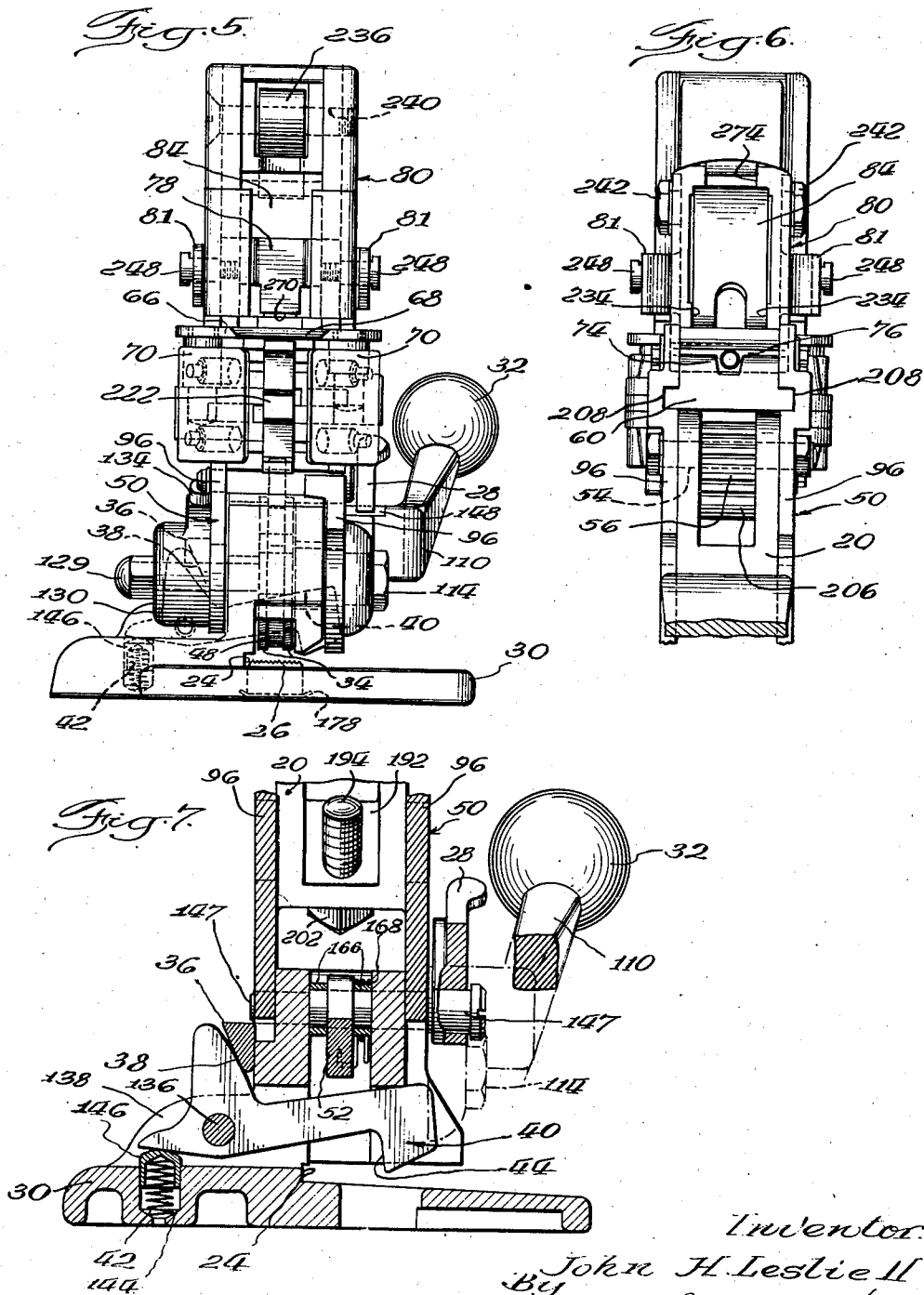
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J. H. LESLIE, 2D
PACKAGE BINDING TOOL

2,336,264

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7 Sheets-Sheet 5



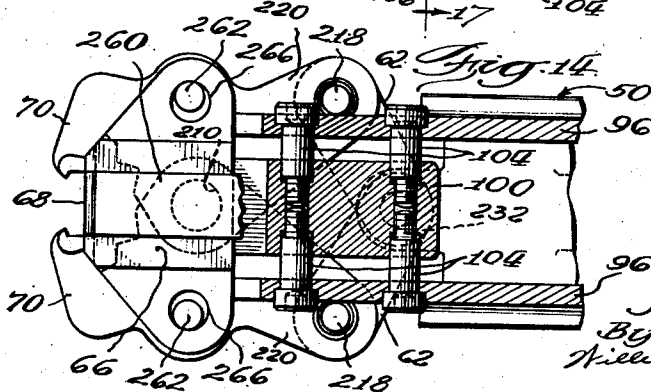
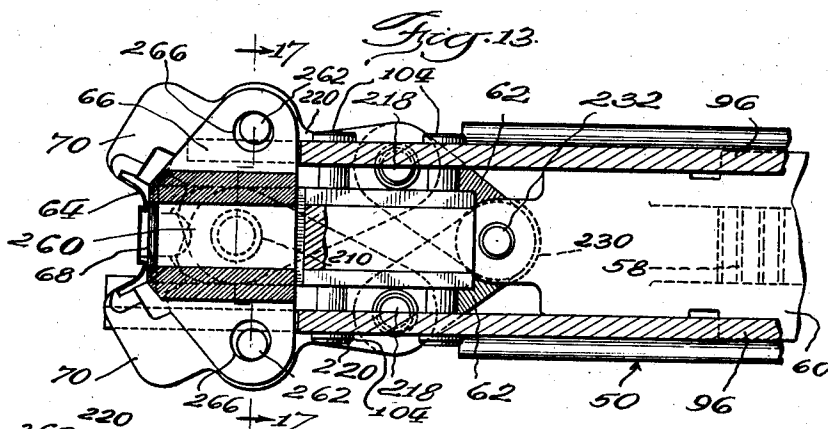
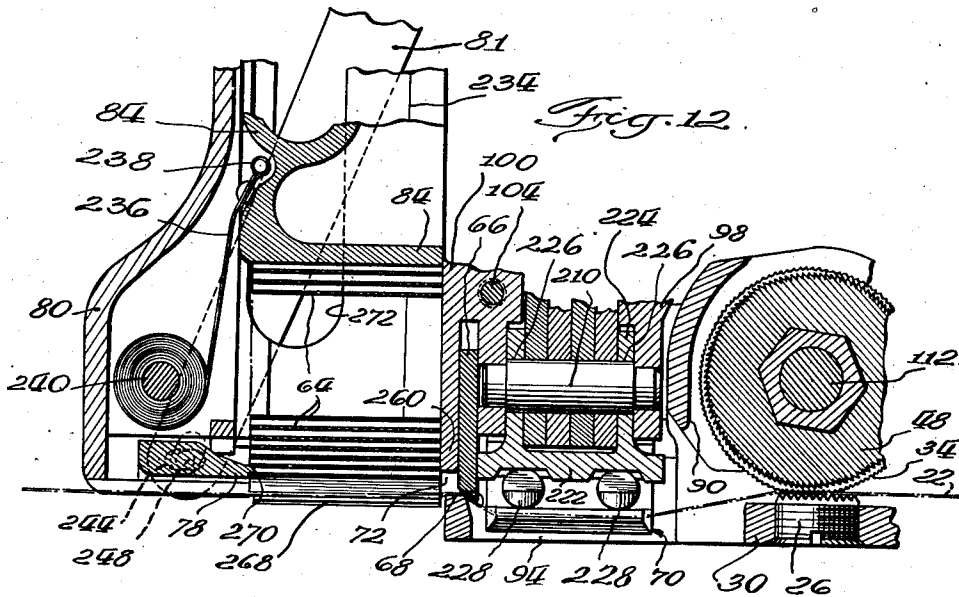
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PACKAGE BINDING TOOL

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7 Sheets-Sheet 6



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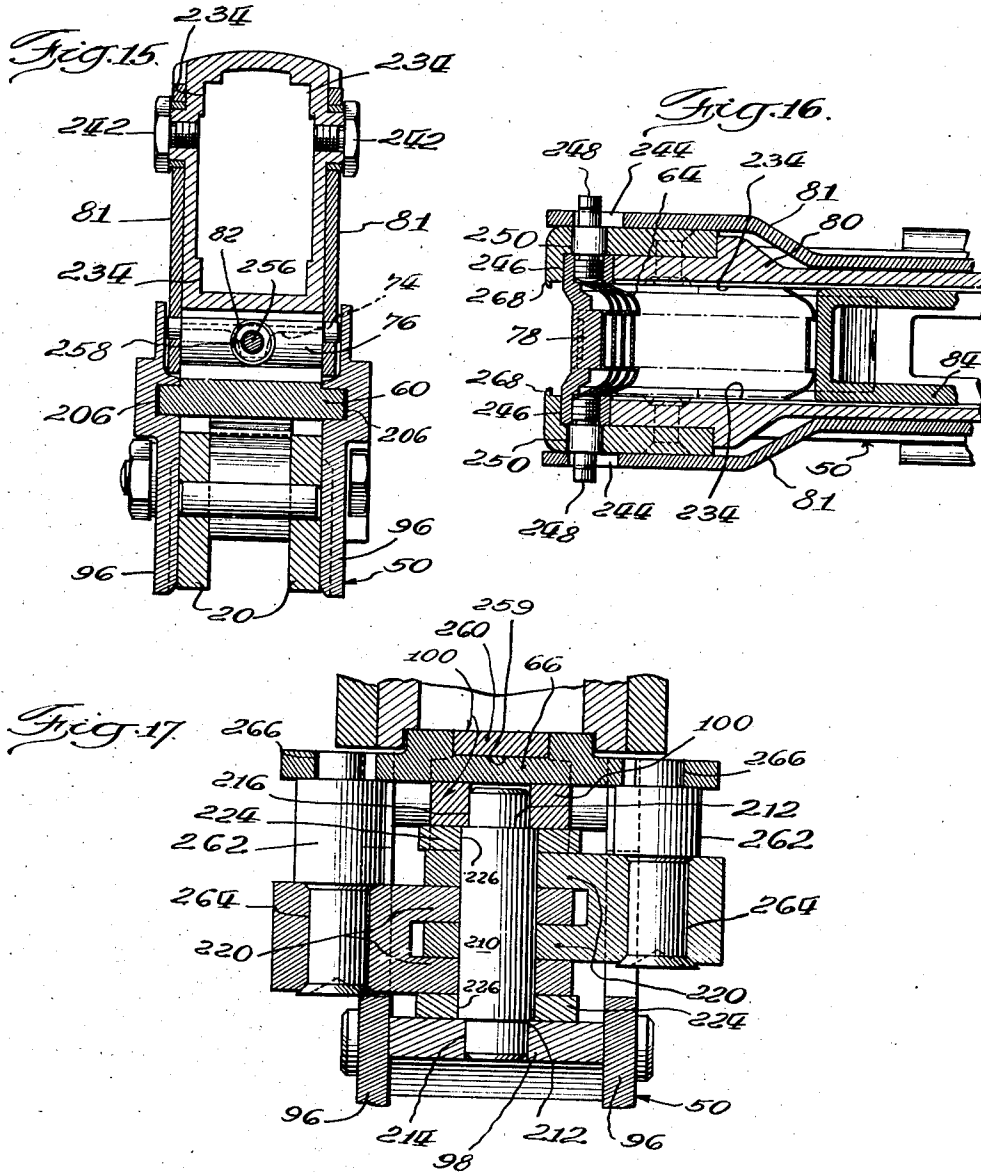
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J. H. LESLIE, 2D
PACKAGE BINDING TOOL

2,336,264

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,336,264

PACKAGE BINDING TOOL

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Application June 6, 1941, Serial No. 396,893

2 Claims. (Cl. 81—9.1)

My invention relates generally to package binding tools and, more particularly, to an improved manually operable package binding tool for tensioning and sealing metal straps encircling packages or groups of packages.

It is an object of my invention to provide an improved manually operable package binding tool, which has improved automatic means for feeding metal sealing sleeves to the tool and which has a single handle for tensioning a metal strap placed around a bundle and operating the tool to apply a sealing sleeve to the overlapping strap ends and to deform the sleeve and strap ends to produce a strong joint that firmly holds the strap ends together.

It is another object of my invention to provide an improved package binding tool of the above mentioned type having a magazine for retaining a plurality of metal sealing sleeves and having a rugged, durable and reliably operating ejector mechanism for automatically feeding a single sleeve to the sealing mechanism incidental to each operation of the tool.

It is another object to provide a manually operable magazine type package binding tool having improved means for facilitating the filling of the magazine with metal sealing sleeves.

A further object is to provide a package binding tool of the above mentioned type with improved means for retaining the metal strap to be joined in the proper position for tensioning and sealing.

Other objects will appear from the following description, reference being had to the following drawings in which:

Fig. 1 is a side view of my improved package binding tool, showing in full lines the various parts thereof when they are in an inoperative position and in broken lines the position of the various moving parts thereof when they are in an intermediate position;

Fig. 2 is a side view similar to Fig. 1 with the working parts in the position assumed in applying the seal and completing the joint;

Fig. 3 is a vertical cross-sectional view of my improved tool taken along the axis thereof;

Fig. 4 is a top view of the tool;

Fig. 5 is a front view of my improved tool;

Fig. 6 is a rear view of the strap sealing mechanism and improved sealing sleeve magazine of my invention;

Fig. 7 is a vertical cross-sectional view of the improved strap retaining mechanism, taken along the plane of the line 7—7 of Fig. 1;

Fig. 8 is a cross-sectional view of the strap ten-

sioning mechanism, taken along the plane of the line 8—8 of Fig. 1;

Fig. 9 is a right side view of the strap tensioning mechanism and strap retaining means of my improved tool;

Fig. 10 is a detail cross-sectional view taken along the plane of the line 10—10 of Fig. 1;

Fig. 11 is a detail cross-sectional view taken along the plane of the line 11—11 of Fig. 1;

Fig. 12 is a partial vertical cross-sectional view showing the seal magazine, sealing jaws, and tensioning wheel in the position assumed after the seal has been applied;

Fig. 13 is a cross-sectional detail view taken along the planes indicated by the broken line 13—13 of Fig. 3;

Fig. 14 is a view similar to Fig. 13 taken along the planes indicated by the broken line 14—14 of Fig. 3;

Fig. 15 is a cross-sectional view taken along the planes indicated by the broken line 15—15 of Fig. 3;

Fig. 16 is a cross-sectional detail view taken along the plane of the line 16—16 of Fig. 1 and showing the construction of the seal magazine of my invention; and

Fig. 17 is a cross-sectional detail view taken along the planes indicated by the broken line 17—17 of Fig. 13.

It is believed that the construction of my improved strapping tool will be more easily understood if its operation is first briefly reviewed.

Brief description of operation

Preliminary to positioning the tool for tensioning and sealing a binder strap encircling a package, the handle 20 of the tool is moved to position the working parts as indicated by the full lines in Fig. 1. The tool is then located so that the flat under surface of the base or main frame 30 rests against the package and the strap 22, shown in Fig. 3 lies in a channel 24 formed in the base 30. When the tool and strap 22 are in their proper relative positions, the underlying free end of the strap is located immediately above a knurled gripper 26 and the overlying portion need not be severed from the main supply of strap. A latch 28 is then tripped to allow a spring to move the handle 32 of the clamping mechanism in a counterclockwise direction.

Incidental to the movement of the handle 32 from the position shown in Fig. 1 to the position shown in Fig. 2, a pair of sharp toothed tensioning wheels 34 are moved downwardly firmly to engage the upper surface of the overlying

strap portion and to press the underlying strap end firmly against the knurled surface of the gripper 26. Simultaneously therewith, a camming lever 36, shown clearly in Fig. 7, moves out of engagement with a cam surface 38 on a strap retaining lever 40 and allows a spring 42 to rotate the lever 40 to move a retractible abutment 44, formed integrally therewith, into a position opposite the overlapping strap portions, retaining the strap in the channel 24 in the base 30.

The band may then be tensioned by moving the operating handle 20 from the position indicated by the full lines in Fig. 1 to the intermediate position indicated by the broken lines in Fig. 1, returning the handle to the position indicated by the full lines, and repeating the operation as many times as is necessary. As the handle 20 is moved from the position indicated by the broken lines to the position indicated by the full lines, an actuating pawl 46, shown in Fig. 3, which is carried by the auxiliary frame 50 of the machine, engages the teeth of a ratchet wheel 48 and causes it to rotate the sharp toothed strap feeding and tensioning wheels 34 to slide the upper portion of the strap over the lower end thereof, thereby tensioning the strap. A holding pawl 52, which is secured to the base 30 of the tool, prevents reversal of the wheels 48, 34 and retains the strap under tension. After the strap has been tensioned, a seal is applied to the overlapping strap portions, and the strap and seal are deformed to produce a strong and rigid joint.

To apply the seal, the handle 20 is moved from the intermediate position indicated by the broken lines in Fig. 1 to the position indicated in Fig. 2. As is shown in Fig. 3, the handle 20 rotates about a shaft 54 affixed to the auxiliary frame 50 of the tool, and as it rotates, causes a pinion 56 to similarly rotate. The pinion 56 engages a rack 58 formed on the operating slide 60 of the machine, causing the operating slide 60 to move downwardly in the auxiliary frame 50 of the tool.

As the operating slide 60 moves downwardly, a pair of links 62 carried by the end thereof moves a pair of sealing jaws 70 toward each other to bend a channel shaped sheet metal sleeve 64 around the overlapping strap portions and, upon further movement, to deform the sleeve and strap to form a rigid joint. A sliding magazine gate 66, having a sharp chisel shaped cutting edge 68 formed on the lower end thereof, is carried by the sealing jaws 70. As the sealing jaws 70 move together to form a joint, the sliding gate 66 moves downwardly past the sleeve ejecting opening 72 in a sleeve magazine frame 80 and forces the cutting edge 68 against the overlying portion of the strap, producing a kerf across the upper surface thereof. When the working parts are returned to the position indicated by the full lines in Fig. 1, the overlying portion of the strap may be bent upwardly and caused to break along the kerf formed by the cutting edge 68.

As the operating slide 60 moves downwardly, an abutment 74 formed thereon engages and carries with it an ejector actuating spacer 76 to rotate a pair of magazine ejector levers 81 secured to opposite ends of the spacer 76, thereby causing a magazine ejector 78 to move out of engagement with the bottom sleeve 64 in the magazine frame 80, and compressing an ejector spring 82. A magazine follower 84 presses against the sleeves 64 in the magazine frame 80 and moves the lower sleeve in the magazine into a position directly opposite the ejector 78. As the operating handle is returned from the joint completion

position shown in Fig. 2 to the intermediate position indicated by the broken lines in Fig. 1, the pinion 56 moves the operating slide 60 upwardly and the abutment 74 moves away from spacer 76. The ejector spring 82 then causes the ejector levers 81 to push the bottom sleeve 64 in the magazine frame 80 against the sliding gate 66. After the sealing jaws 70 have opened to release themselves from the strap 22, further movement of the jaws moves the sliding gate 66 upwardly away from the lower sleeve 64 and the spring 82 operates the ejector 78 to snap the sleeve from the magazine into position between the sealing jaws 70. The gripping mechanism handle 32 is moved from the position in Fig. 2 to the position shown in Fig. 1, which moves the feed wheels 34 away from the strap to release it, and held in that position by the latch 28 so that the tool may be moved away from the strap.

The construction of the base and auxiliary frame

The base or main frame 30 has a flat under-surface adapted for positioning on the package to be bound, and a handle 85 is integrally formed with the base to strengthen it and facilitate the positioning and operation of the tool. A channel 24 is formed longitudinally in the base 30, and is open along the side thereof so that a strap may be inserted laterally therein. A main strap supporting surface 31 engages the under-surface of the strap, and a strap engaging lug 86 is attached to the base and spaced from the surface 31. When the package presents a large, flat surface for supporting the tool, the strap is located above the lug 86 and the lug secures the tool from rotating when force is exerted upon the handle 20 to produce a joint. Otherwise, the strap is passed under the lug. Metal pegs 88, adjacent the proper position of the inner strap edge, locate the strap properly.

The base 30 has a recess 90 formed therein to receive the tensioning mechanism. Metal pegs 92, having flattened sides, which engage and position the strap being tensioned, are held in place in holes in the base 30 located one on either side of the knurled anvil 26.

Referring to Figs. 4 and 12, an opening 94 is formed in the base directly under the sealing jaws 70 when they are in position to seal a strap, thereby permitting free action of the jaws. The portion of the base 30 located immediately below the cutting edge 68 of the sliding gate 66 is preferably constructed of a metal which will withstand the action of the cutting edge without damage.

The auxiliary frame 50 comprises a pair of side plates 96. A metal spacer 98 forms one end of the auxiliary frame 50, and the side plates 96 are retained thereto by safety screws 102. The other end of the auxiliary frame is formed by the magazine frame 80 which is interposed between the side plates 96. A gate guiding spacer 100 is interposed between the sides of the magazine frame, and two pairs of safety screws 104 pass through holes in the side plates 96 and magazine frame 80 into drilled and tapped holes in the gate guide spacer 100 to retain these various parts in position. A pair of safety screws 106 retain the side plates 96 directly to the magazine frame 80.

The strap retaining and tensioning mechanism

Referring to Figs. 7, 8, and 9, the operation of the strap retaining and tensioning mechanism is;

controlled by a handle 32 attached to the end of a lever 110. The lever 110 is secured to one end of a shaft 112 and held in position by a hexagonally headed bolt 114 threaded into a drilled and tapped hole in the end of the shaft 112. One end of the shaft 112 has opposed flat surfaces milled thereon, and these flat surfaces engage corresponding flat surfaces forming sides of a hole formed in the lever 110 so that rotation of the lever 110 rotates the shaft 112.

The side plate 96 of the auxiliary frame 50 are secured to the base 30 by two flanged cylindrical sleeves 116 and 118 which are free to rotate. Integrally formed on the shaft 112 is an eccentric collar 120 eccentric to the axis of the shaft. The sharp toothed tensioning wheels 34 and ratchet wheel 48 are assembled on a hub 122, which rotates on the collar 120, and has flat surfaces on its periphery. These flat surfaces engage corresponding flat surfaces forming sides of the central openings of the tensioning and ratchet wheels 34 and 48 so that rotation of the ratchet wheel 48 causes the hub 122 to rotate, thereby rotating the tensioning wheels 34.

The angular position of the eccentric collar 120 with respect to the axis of the lever 110 is such that when the lever 110 is in the position indicated by the full lines in Fig. 9, the axis of the collar is approximately horizontally opposite the axis of the shaft, and when the lever is in the position indicated by the broken lines the axis of the collar is below the axis of the shaft. Thus, the sharp toothed tensioning wheels may be raised away from or lowered into contact with the strap being sealed by movement of the handle 32.

A concentric collar 124 is formed on the end of the shaft 112 to which the lever 110 is secured. The diameter of the concentric collar 124 is such that its periphery extends past all portions of the periphery of the eccentric collar 120. This construction allows the shaft 112 to be installed by sliding it into place through the bushing 118. The concentric collar 120 rotates in the bushing 118, and the end of the collar abuts against the hub 122 to insure the proper positioning of the shaft 112.

The end of the shaft 112 opposite the collar 120 is flattened and threaded. A flanged spool 126 has an axial hole which closely fits over the flattened end. One end of a wire coil spring 128 is secured to the auxiliary frame 50 by inserting it into a hole drilled therein. The spring is coiled around the spool 126 and the other end of the spring is similarly secured in a hole drilled in the spool 126. The spring 128 is positioned and tensioned to exert a resilient force on the spool 126 which tends to cause the handle 32 to move from the position indicated by the full lines in Fig. 9 to the position indicated by the broken lines, thereby causing the sharp-toothed tensioning wheels 34 firmly to engage the upper surface of the strap ends to be joined.

A cap 130, having a hole therein which conforms in outline to the cross section of the flattened end of the shaft 112, is placed over the spool 126 and secured in position by a hexagonal cap nut 129 and lock washer 132. Integrally formed with the cap 130 are the camming lever 36 and a stop peg 124. When the handle 32 is positioned so that the strap retaining and tensioning mechanism is inoperative, the camming lever 36 is rotated to a position where it engages the cam surface 38 on the strap retaining lever 40. The lever 40 rotates through a small arc around a pin 136 which is retained by brackets

138 integrally formed in the base 30 of the tool. The pin 136 is reduced in diameter and threaded at one end and has a screwdriver kerf 140 in the opposite end. The threaded end is screwed into a drilled and tapped hole 142 in one of the brackets 138. A hole 144 is drilled and counterdrilled in the base 30 between the brackets 138 and immediately below an arm of the lever 40. The coil spring 42, carrying a cap 146 which engages an arm of the lever 40, tends to move the retractable abutment 44 into its strap retaining position.

The latch 28, which holds the lever 110 out of strap tensioning position, is pivotally secured to the base 30 by a screw 147. The latch 28 is resiliently retained in position to engage a latching surface 148 on the lever arm 110 by a coil spring 150. As is shown more clearly in Fig. 10, a hole 152 is drilled through the latch 28, and a second hole 154, with its axis at right angles to the hole 152, is drilled and counter-drilled into the latch 28. The spring 150 is then placed in the counter-drilled portion of the hole 154 and a spring follower pin 156, having a shank corresponding in diameter to the drilled portion of the hole 154, and a head corresponding in diameter to the counter-drilled portion of the hole 154, is placed in position with its shank passing through the center of the spring 150 into the drilled portion of the hole 154. A peg 158 is then inserted through the hole 152 into a tightly fitting hole in the base 30. The head of the follower pin 156 rests against the peg 158, holding the spring 150 in compression and retaining the latch 28 in position to engage the latching surface of the lever 110. The peg 158 engages the walls of the hole 152, thereby acting as a stop and preventing excessive movement of the latch 28.

The lever 110 has a camming surface 160 formed thereon and terminating at the latching surface 148. As the handle 32 is moved into the position indicated by the full lines in Fig. 9, the camming surface 160 engages the nose 162 of the latch 28, causing it to rotate against the spring 150. When the camming surface 160 has passed the nose 162 of the latch 28, the spring 150 causes the latch to engage the latching surface 148.

From the above it is seen that as the handle 32 is moved into the position shown by the full lines in Fig. 9, the cam arm 36 engages the cam surface 38 to cause the lever 40 to retract the abutment 44 so that a strap may be slidably inserted into or removed from the channel 24 in the base 30, and the tensioning wheels 34 are not in contact with the strap. As the handle 32 is so moved, the cam surface 160 engages the nose 162 of the latch 28, to cause the latch 28 to trip itself and retain the strap retaining and tensioning mechanism in this position.

When a strap to be tensioned and sealed is placed in the channel 24, the latch 28 may be manually tripped to allow the coil spring 128 to rotate the shaft 112, thereby moving the tensioning wheels 34 into contact with the upper portion of the strap, and moving the cam arm 36 out of engagement with the cam surface 38 to permit the spring 42 to rotate the lever 40 to move the abutment 44 into a position opposite the strap.

The stop pawl 52 is pivotally secured to the base 30 by a stud 147 and is positioned to prevent reversal of the ratchet wheel 48. A pair of spacing washers 166 prevents lateral movement of the pawl 52 and it is retained in engage-

ment with the teeth of the ratchet wheel 48 by a spring 168 coiled around the stud 147 and secured at its opposite ends to the pawl 52 and the base 30, respectively.

The actuating pawl 46 is pivotally secured in place by a pin 170 which passes through holes in both side plates 96 of the auxiliary frame 50. Spacing washers 172, 174 are interposed between the sides of the pawl 46 and the inner sides of the plates 96 which form the auxiliary frame 50. A coil spring 176 holds the pawl 46 in engagement with the teeth of the ratchet wheel 48. The washer 172 is of large enough diameter to engage the base 30 when the auxiliary frame 50 is in the position shown in Fig. 3, thereby acting as a stop to prevent excessive movement of the auxiliary frame 50, while the washer 174 is of smaller diameter to allow space for the spring 176. Thus as the auxiliary frame is oscillated about the shaft 112, the pawl 46 causes the tensioning wheels 34 to rotate in a strap tensioning direction and the pawl 52 prevents its reversal.

The knurled gripper 26 is externally threaded and has three kerfs, 60° apart, formed upon its under surface. It is screwed into a drilled and tapped hole in the bottom of the base 30 directly below the tensioning wheels 34. The ends of a retaining wire 178 are inserted into a pair of holes 180 adjacent the lower end of the drilled and tapped hole in the base 30 and the wire 178 is pressed into one of the kerfs of the anvil 26 to prevent it from being accidentally turned.

The operating handle 20 is channel-shaped in cross section and the end about which it rotates is vertically slotted. When the handle 20 is in the position relative to the auxiliary frame 50, shown in the full and broken lines of Fig. 1, it is retained in this position by a resilient detent. As is most clearly shown in Fig. 11, this resilient detent comprises a pair of round nosed pins 182 carried by the sides of the handle 20 and engageable with a pair of frusto-conical holes 184 formed in the side plates 96 of the auxiliary frame 50 of the tool. A spring 186 is interposed between and held in compression by the heads of the pins 182, and the spring 186 and heads of the pins 182 are enclosed by a sleeve 188 interposed between the sides of the handle 20. A threaded bushing 190, which is threaded into a drilled and tapped hole in one side of the handle 20, provides for the installation of the detent assembly.

As is shown in Fig. 3, a web 192, connecting the two sides of the handle 20, carries an adjustable threaded stop pin 194, the tip of which is engageable with the frame spacer 98. A hexagonal hole 196 is formed in the opposite end of the stop pin 194 so that it may be threaded inwardly or outwardly in a drilled and tapped hole 198 in the web 192. After the pin has been adjusted to engage the spacer 98 when the detent pins 182 engage the holes 184, it may be locked in position by tightening a hexagonal nut 202.

Thus, when it is desired to tension a binding strap, the overlapping strap ends are placed in the channel 24 formed in the base 30, and the latch 28 is manually tripped to cause the sharp-toothed tensioning wheels 34 to firmly press against the upper surface of the strap and the under surface of the lower end of the strap to press firmly against the knurled gripper 26. The handle 20 and auxiliary frame 50 are moved into the intermediate position indicated by the

broken lines in Fig. 1. The handle 20 is then moved into the position indicated by the full lines in Fig. 1, causing the pawl 46 to engage the teeth of the ratchet wheel and rotate the tensioning wheels 34. The sharp teeth of the tensioning wheels 34 press into the upper surface of the strap, causing it to move in the direction of rotation of the wheel, while the knurled end of the gripper 26 presses into the under surface of the lower end of the strap. Thus the rotation of the tensioning wheels causes the upper portion of the strap to slide over the anchored lower portion thereof, tensioning the strap on the package being bound. Considerable force may be exerted upon the handle 20 during this operation, inasmuch as the stop pin 194 firmly engages the spacer 98 when the strap is being tensioned. The handle 20 may then be returned to the position indicated by the broken lines in Fig. 1, and during this movement of the handle the detent pins 182 retain the handle 20 in its proper position with respect to the auxiliary frame 50. While the handle is being returned to the intermediate position and the pawl 46 is inoperative, the pawl 52 affixed to the base 30 engages the teeth of the ratchet wheel 48 to prevent the tensioning wheels 34 from reversing and allowing the strap to loosen.

The sealing mechanism

Referring to Fig. 3, the handle 20 is pivotally secured to the side plates 96 of the auxiliary frame 50 by a bolt 54 which passes through a pair of holes in the side plates 96 of the auxiliary frame 50 and through corresponding holes in the end of the lever 20. The bolt 54, which acts as a shaft, has a hexagonal head which is placed between two locking lugs 209, integrally formed on one side of the auxiliary frame 50, to prevent it from rotating as the tool is operated. A pinion 56 is located between the sides of the handle 20 and is free to rotate upon the bolt 54. The pinion 56 is positively caused to rotate with the handle 20 by a pin 206, retained by holes in the sides of the handle 20, which engages a deformation in the periphery of the pinion 56.

As is shown in Fig. 6, the operating slide 60 reciprocates vertically between the side plates 96 of the auxiliary frame 50 and is guided in opposed channels 208 formed therein. As is shown clearly in Fig. 3, a rack 58 is formed on the slide 60 and the pinion 56 engages this rack to reciprocate the slide 60 in the auxiliary frame 50.

Referring now to Figs. 3, 12, 13, 14, and 17, the sealing jaws 70 rotate about a jaw pin 210. The ends of the pin 210 are sharply reduced in diameter to form shoulders 212 and are retained in holes 214 and 216, drilled in the spacer 98 and the magazine gate guiding spacer 100, respectively, with the shoulders engaging the opposed surfaces of the spacers 98 and 100, respectively, to prevent the pin 210 from sliding from position. The sealing jaws 70 are each formed integrally with a pair of plate shaped levers 220 which are shaped and disposed so that the levers 220 of the two jaws interlock on the pin 210. Holes are formed in each lever 220 to accommodate a pin 210 and pivotally secure the jaws 70 in place. The end of each lever opposite the corresponding sealing jaw 70 has a hole formed therein to receive a pin 213 which attaches each lever 220 to a jaw actuating link 62. Each link 62 is placed between the levers 220 attached to the jaw which it actuates. A clamping anvil 222 is located between the sealing jaws 70 to hold the

seal 64 in position and prevent it from buckling when the joint is being formed. Brackets 224 are integrally formed with the anvil to retain it in position. A hole 226 is formed in each bracket 224 to accommodate the jaw pin 210, and the brackets 224 span the sealing jaw levers 220. As is shown in Fig. 13, the faces of the sealing jaws 70 are in general of a channel shaped cross section. Two strap deforming lugs 228, shown in Fig. 12, are positioned on the face of each jaw 70 to deform the binding strap and sealing sleeve after the sealing sleeve has been applied to the strap, thereby producing a strong and rigid joint.

The lower end of the actuating slide 60 has a slot 230 formed therein to receive the two links 62 which operably connect the slide 60 with the sealing jaws 70. These links are pivotally secured in the slot 230 by a pin 232 which passes through coaxial holes formed in the slide 60 and the links 62. Each link connects the slide with the pair of levers 220 attached to one of the jaws 70 and is retained to the levers by a pin 218. Each of the pins 218 has a head which fits into a counter-bored hole in the outer face of one of the levers 220 and is retained in position by a split ring.

Referring now to Figs. 13 and 14, it may be seen that as the slide 60 moves downwardly from the position shown in Fig. 13 to the position shown in Fig. 14, the links 62 cause the two pairs of levers 220 to separate, thereby moving the faces of the sealing jaws 70 toward each other. As is seen in Fig. 14, the links 62 exert a sort of toggle action on the levers 220 as the jaws 70 close, thereby increasing the force exerted upon the levers 220. Thus, a relatively small movement of the slide causes the jaws 70 to bend the seal around the strap, and as the slide moves farther and the strap deforming lugs 228 come in contact with the sides of the strap, the force exerted by the sealing jaws 70 increases greatly to deform the strap.

After the strap has been deformed to produce the joint, the handle 20 may be rotated in a clockwise direction. This causes the pinion 56 to move the slide upwardly sufficiently to separate the jaws so that they may be removed from the newly formed joint. Before the jaws have separated enough to allow them to withdraw from the strap, the detent pins 182 engage the side plates 96 of the auxiliary frame 50, causing the handle to carry the auxiliary frame with it as it is rotated farther. The auxiliary frame 50 rotates away from the strap until the stop washer 172 comes into contact with the base 30. Further rotation of the handle 20 then causes the seal feeding mechanism to feed a seal to the jaws, as is hereinafter described in detail.

The seal feeding mechanism

As is shown in Fig. 3, the seal magazine frame 80 encloses a plurality of channel shaped sheet metal sleeves 64 superimposed upon each other. As is shown in Fig. 15, the seals are guided by tracks 234 formed in the corners of the magazine frame 80. The follower 84 slides within the magazine frame and retains the sleeves in the bottom portion thereof. One end of a flat metal tape 236 is fastened to the follower 84 by a pin 238, and the other end of the tape 236 is coiled around a spool 240. The spool 240 is attached to a suitable coil spring which tends to cause the spool to rotate to wind the tape 236 around it, thereby holding the tape in tension, retaining the magazine follower 84 against the sleeves 64 in

the magazine and thereby feeding the sleeves 64 toward the bottom thereof.

One of a pair of ejector levers 81 is secured to each side of the magazine frame 80 by one of a pair of pivot bolts 242. The lower end of each ejector lever 81 has a generally elliptical hole 244 formed therein. As is shown in Fig. 16, an ejector 78 slides across the bottom of the magazine in a pair of tracks 246. A pair of ejector actuating lugs 248, similar in cross section to the holes 244, extend through slots 250, one in each side of the magazine frame 80 and parallel to the tracks 246. The ends of the lugs 248 extend through the holes 244 in the ejector levers 81, and the portion of each lug which engages the sides of the corresponding hole 244 is of generally cylindrical cross section. The elliptical cross section of the lugs 248 prevents them from rotating in the slots 250 and permits the assembly of the ejector 78 and levers 81 by placing each lever 81 with the hole 244 registering with the end of the corresponding lug 248, moving the lever until the hole 244 is opposite the cylindrical portion of the lug, and then rotating the levers to their proper position and securing them by the bolts 242. The elliptical ends of the lugs 248 then extend across the holes 244 to retain the levers 81 to the ejector 78.

The frame 80 of the magazine has a shelf 252 integrally formed therewith to engage the ejector spring 82. A pin 254 secures the end of a guide rod 256 in a hole in the shelf 252 of slightly greater diameter than the rod 256, so that the rod 256 is free to tilt with respect to the magazine frame 80. The rod 256 passes through the center of the ejector spring 82 to retain it in its proper position.

The ejector actuating spacer 76 is interposed between and pivotally secured to the ejector levers 81. A hole 258 in the spacer 76 receives the guide rod 256. The ejector spring 82 is held in compression between the shelf 252 and the spacer 76 and is of sufficient strength to cause the ejector levers 81 to move the ejector 78 toward the sealing jaws 70 with a guide snapping action. As the operating slide 60 moves downwardly in the auxiliary frame 50, the abutment 74 carried thereby engages the spacer 76 to slide it downwardly on the rod 256, thereby compressing the spring 82 and moving the ejector 78 to a position beneath the spool 240 and out of engagement with the bottom seal in the magazine.

Referring to Figs. 3, 12, 13, 14, and 17, the magazine gate guiding spacer 190 is interposed between the sides of the magazine frame 80. This spacer has a slot 259 formed therein to receive the magazine gate 66 and to provide a tongue 260 for guiding the gate 66. The gate 66 has a channel formed in one side thereof, and this channel receives the tongue 260 of the spacer 190. The magazine gate slides upwardly and downwardly to control the ejection of sleeves from the magazine opening 72. The sealing jaws 70 carry a pair of pins 262 which are inserted in holes 264 formed in the jaw frames, and the ends thereof extend through the jaw frames and are peened to hold the pins 262 in place. The central portion of each of these pins 262 is enlarged in diameter to form two shoulders which rest against each sealing jaw frame and against the magazine gate 66, respectively. The tip of each pin 262 is of a reduced diameter and extends into one of a pair of holes 266 formed in the gate 66. Inasmuch as the movement of the pins is arcuate while the

movement of the gate is rectilinear, the holes 264 must be of a larger diameter than the tips of the pins 262 to accommodate the movement of the pins 262 inwardly and outwardly with respect to the axis of the gate 66. The difference in size between the holes 264 and the tips of the pins 262 causes lost motion so that the gate 66 will not be withdrawn from the magazine opening 72 sufficiently to allow a seal to be ejected from the magazine until the sealing jaws 70 are in a position to receive the seal.

The lower end 68 of the slide 66 is beveled and sharpened to act as a chisel. When the jaws have closed sufficiently to deform the strap, the pins 262 move the sliding gate firmly into contact with the upper surface of the strap being joined, and the pressure exerted on the gate 66 by the handle 20 is sufficient to cut a kerf across the surface of the overlying portion of the strap. When the auxiliary frame 50 has been moved away from the strap, the overlying strap end may be bent upwardly and caused to break along this kerf.

When the ejector 78 has been moved out of engagement with the lower seal in the magazine, the tape 236 draws the magazine follower 84 downwardly to cause the edges of the lower seal to press against a pair of lips 268 formed in the bottom of the magazine frame 60 and shown in Fig. 16. When the gate 66 covers the magazine opening 72, and the ejector actuating abutment 74 has been withdrawn from contact with the spacer 76, a notch 270 formed in the nose of the ejector 78 engages the top of the lowest sleeve and holds it firmly against the sides of the channel formed on the surface of the gate 66. The ejector 78 is prevented from moving to the right to eject the sleeve by the stiffness of the sleeve itself. When the handle 20 is moved in a clockwise direction, the detent pins 182 come into contact with the sides of the auxiliary frame 50, and exert a force which tends to rotate the frame 50 away from the strap which has been joined. After the handle 20 has been rotated sufficiently to release the jaws from the strap and one side of the auxiliary frame 50 has come into contact with the stop washer 172 on the pawl pin 170, further movement of the handle causes it to rotate about the bolt 54, opening the jaws sufficiently to withdraw the sliding gate 66 from the magazine opening 72 sufficiently to allow the ejector spring 82 to rotate the ejector levers 81 and cause the ejector 78 to snap a sealing sleeve 64 into the position between the sealing jaws 70 as is shown in Fig. 13.

The front end of the ejector 78 is beveled upward from the tip thereof. As the ejector 78 moves across the bottom of the seal magazine, this beveled surface engages the seal immediately above the seal being ejected to raise all the seals in the magazine against the action of the follower 84.

As is shown in Fig. 1, the magazine follower 84 has a finger hole 271 formed therein, and this hole is easily accessible through slots 272 formed in both sides of the ejector frame 80. Thus the operator may insert his fingers through the slots 272 into the hole 271 to withdraw the follower 84 so that the magazine may be refilled. As is shown in Fig. 3, the upper end of the end wall of the magazine has a notch 274 formed therein, and the follower 84 may be conveniently retained against the outside of the end wall of the maga-

zine with the metal tape 236 extending through this slot while the magazine is being loaded.

Briefly summarized, the normal operation of the tool is as follows:

5 The operator loops the binder strap about the package to be bound and with the ends of the loop overlapping, rests the tool upon the pack-
age with the actuating handle and auxiliary
frame with its magazine and sealing mechanism
10 in the position shown by the full lines of Fig. 1. The feed wheel control handle 32 is in the position shown in Fig. 1 so that the feed wheels are separated from the gripper 26 to full open position and with the strap retaining dog 40 open—
15 the control lever, feed wheels and retaining dog being held in this position against the tension of their biasing springs by the latch 28. The operator may now insert the overlapping ends of the binder strap loop laterally into the tool.
20 When the strap ends are in place, the operator depresses the latch 28 which releases the feed wheels to enable them to engage the top strap and releases the retaining dog 40 to overlie the strap ends. Now the operator tensions the
25 strap loop about the package by reciprocating handle 20 through a range whose limits are represented by the full and the dot-dash lines of Fig. 1. When the desired tension is attained in the package encircling binder loop, the operator
30 moves the actuating handle 20 from the dot-dash line position of Fig. 1, where the auxiliary frame is in proper joint forming position, to the full line position of Fig. 2. In this range of movement of the actuating handle 20, which then pivots about shaft 54, instead of shaft 112, the seal-
35 ing jaws are caused to move together to deform the seal and overlapping strap ends into a tension resisting joint and the ejector is moved back ready to feed the next or bottom seal from the
40 magazine into the jaws. After the joint is completed, the handle is moved back to the position shown by full lines in Fig. 1. This movement opens the jaws ready to take the next seal but the ejector remains inactive, although biased
45 forwardly by its spring 82, until the jaws are fully opened and the gate 66 is withdrawn, whereupon the next seal is snapped into place between the jaws ready to be carried to the work when the actuating handle is again swung to the dot-
50 dash position shown in Fig. 1. The feed wheel control lever 32 is now moved from the full line position in Fig. 2 to the full line position of Fig. 1 and held there by the retaining latch 28. This movement of the control lever 32 separates the
55 feed wheel from the strap and withdraws the holding dog 40 so that the tool may be removed laterally from the tightly tensioned package encircling loop of binder strap. Finally the run of strap to the supply thereof is sharply bent where the gate 66 scored it so as to completely sever the package loop from the source of strap supply. The tool is now in condition to be applied to another package for a repetition of the operations just described.

65 While I have disclosed my invention in connection with a particular embodiment thereof, it will be readily apparent to those skilled in the art, that numerous departures may be made from the construction disclosed without departing from the underlying principles of my inven-
70 tion.

It is therefore my wish to include within the scope of the following claims all such constructions by which substantially the results of my

invention may be obtained by substantially the same or equivalent means.

I claim:

1. A package-binding tool of the type wherein a main frame for resting on a package to be bound carries a strap tensioning mechanism and a pivoted auxiliary frame carrying a pair of pivoted sealing jaws and a seal magazine, and wherein a single actuating handle pivoted to the auxiliary frame actuates the tensioning mechanism when operated through one range of movement and when operated through another range of movement swings the sealing jaws with a seal therebetween into sealing position relative to the tensioned binder strap and then deforms the seal and strap to form a joint connecting them, characterized by a slide movably mounted in the auxiliary frame and connected to the sealing jaws to open and close the same, a rack and pinion connection between the slide and the actuating handle whereby the handle can advance the slide to close the jaws to form a joint and retract the slide to open the jaws, a sliding ejector carried by the auxiliary frame to project seals one at a time from the magazine to a position between the open jaws, a spring for biasing the ejector to project a seal from the magazine, means on the slide for tensioning the ejector actuating spring when the handle is moved to sealing position, and a gate operatively connected to one

of the jaws so as to be moved into the path of seals projected from the magazine as the jaws close and to be withdrawn from that path when the jaws are fully opened.

2. A package-binding tool of the type wherein a main frame for resting on a package to be bound carries a strap tensioning mechanism and a pivoted auxiliary frame carrying a pair of pivoted sealing jaws and a seal magazine, and wherein a single actuating handle pivoted to the auxiliary frame actuates the tensioning mechanism when operated through one range of movement and when operated through another range of movement swings the sealing jaws with a seal therebetween into sealing position relative to the tensioned binder strap and then deforms the seal and strap to form a joint connecting them, characterized by a sliding gate which is interposed in the path of seal movement from the magazine when the sealing jaws are closed and is withdrawn from that path when the jaws are fully opened, an operative connection between one of the jaws and the gate, a seal ejector for projecting seals from the magazine, a spring for biasing the ejector to project the seals from the magazine, and operative connections between the actuating handle and the jaws and ejector biasing spring.

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