United States Patent [19]

Sykes et al.

[11] **3,769,859**

[45] **Nov. 6, 1973**

[54] **SEALING MECHANISM**

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[73] Assignee: **Interlake, Inc.**, Chicago, Ill.

[22] Filed: **June 21, 1971**

[21] Appl. No.: **154,736**

[52] **U.S. Cl.** **81/9.1**, 74/17.5, 81/313

[51] **Int. Cl.** **B25b 25/00**

[58] **Field of Search** ..... 81/9.1 R, 9.1 M, 81/313; 140/93.4; 72/17.5

[56] **References Cited**

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Assistant Examiner—Roscoe V. Parker
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[57] **ABSTRACT**

A power sealing mechanism for forming tension resisting joints in overlapping portions of bundle encircling and load retaining tensioned strapping and a seal blank has an air pressure operated cylinder-piston combination with a projecting piston rod connected to drive the joint forming mechanism mounted in a frame which in turn is mounted on the cylinder. The joint forming mechanism includes pairs of strapping and seal blank engaging jaws or bending dies pivotally mounted on the frame and at least one pair of rotatable deforming dies or punches rotatably mounted on the frame adjacent the jaws. The jaws are connected to be pivoted by the piston rod to have relative movement with respect to the deforming dies to cause the jaws to fold the seal blank closely about the overlapping strapping portions and to force the seal blank into engagement with the deforming dies to deform the sandwich of seal blank and the strapping portions into a tensioning resisting joint. The advancing piston rod carries a cam-like abutment to pivot a latch having first and second stops to a position where a spring pressed detent retains the latch at the end of the advancing and joint forming movement of the piston rod. The first stop would be engaged by the abutment upon too early withdrawal of the piston rod and thus prevent retraction of the joint forming dies unless the mechanism had been fully advanced. The second stop is engaged by the abutment near the end of the normal retraction of the piston rod after a complete joint forming operation so as to release the latch from its detent and to condition the mechamism for a subsequent joint forming operation.

1 Claim, 8 Drawing Figures

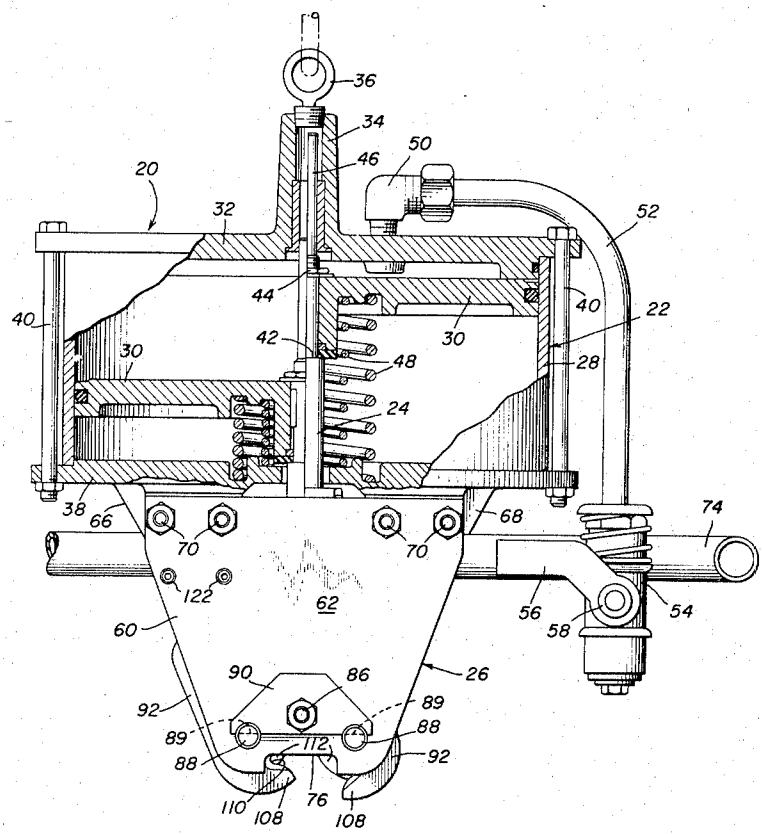

FIG. 2

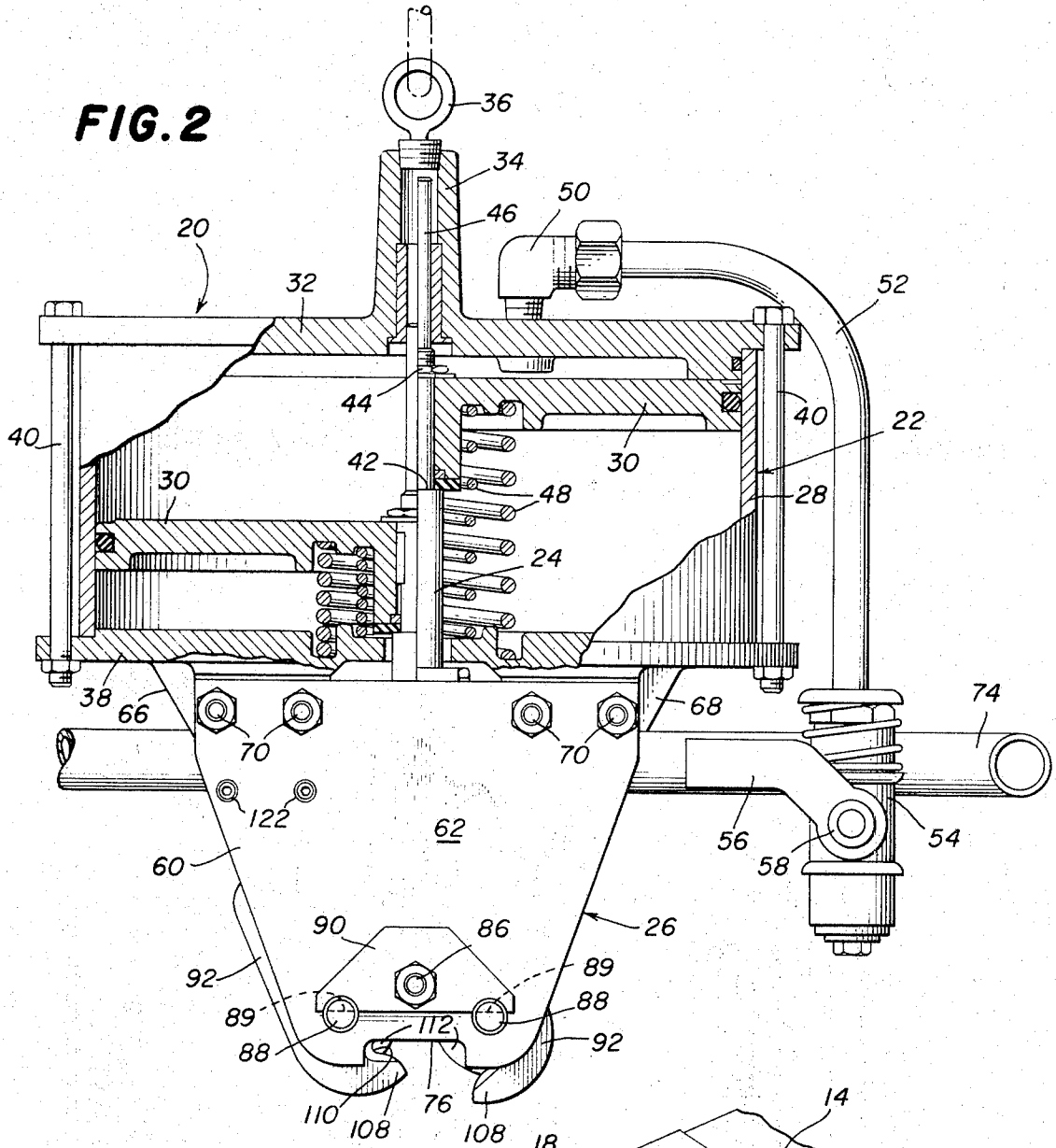

FIG. 1

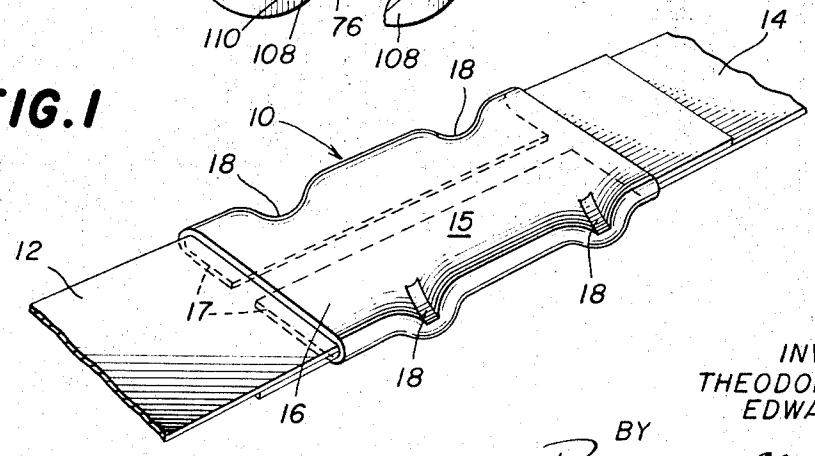

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FIG. 3

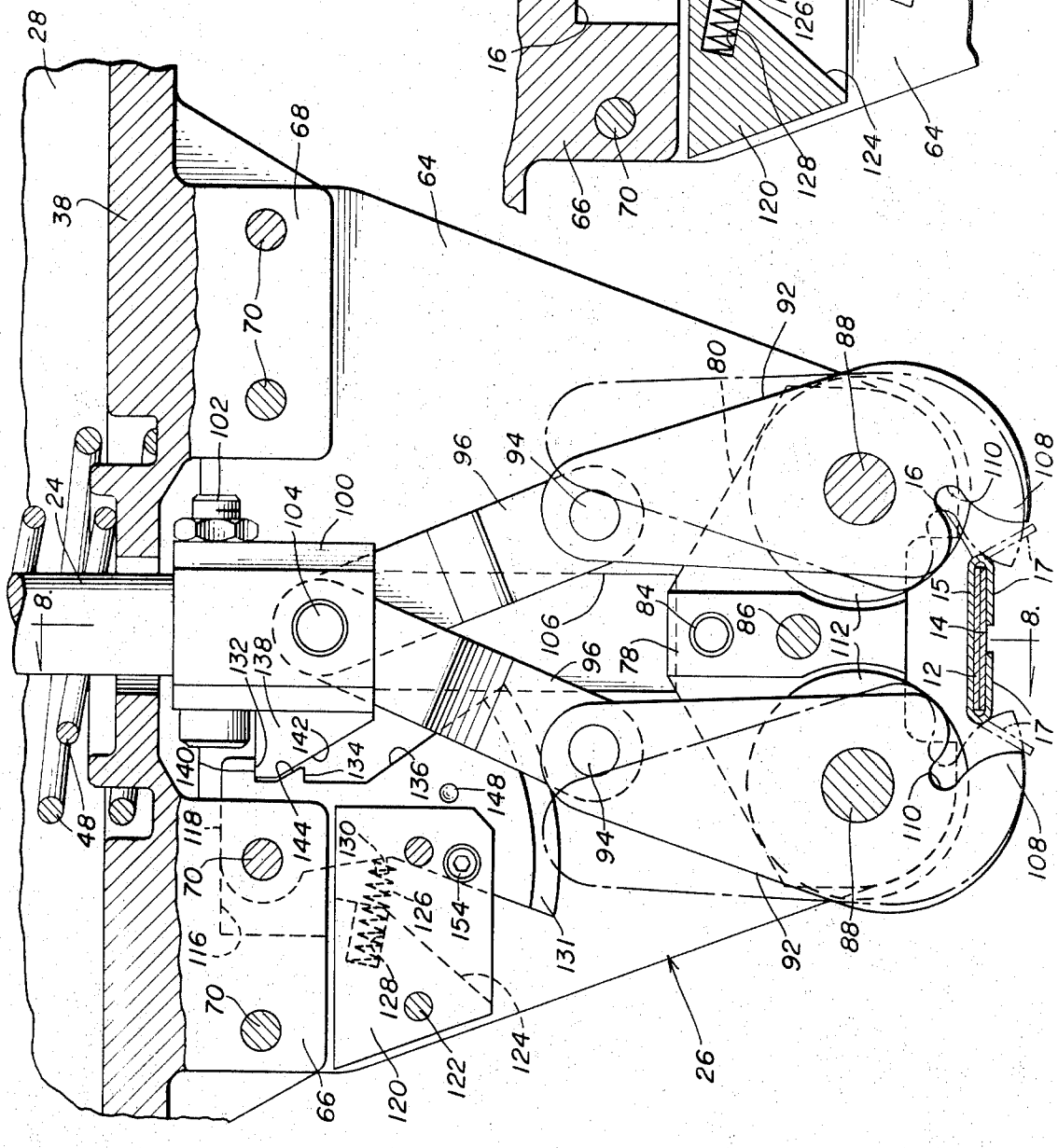

FIG. 4

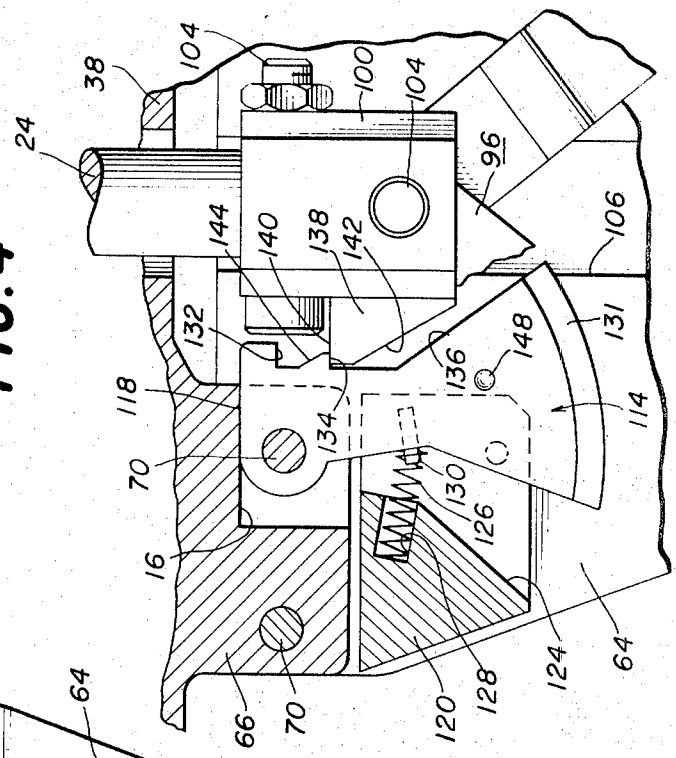

FIG. 5

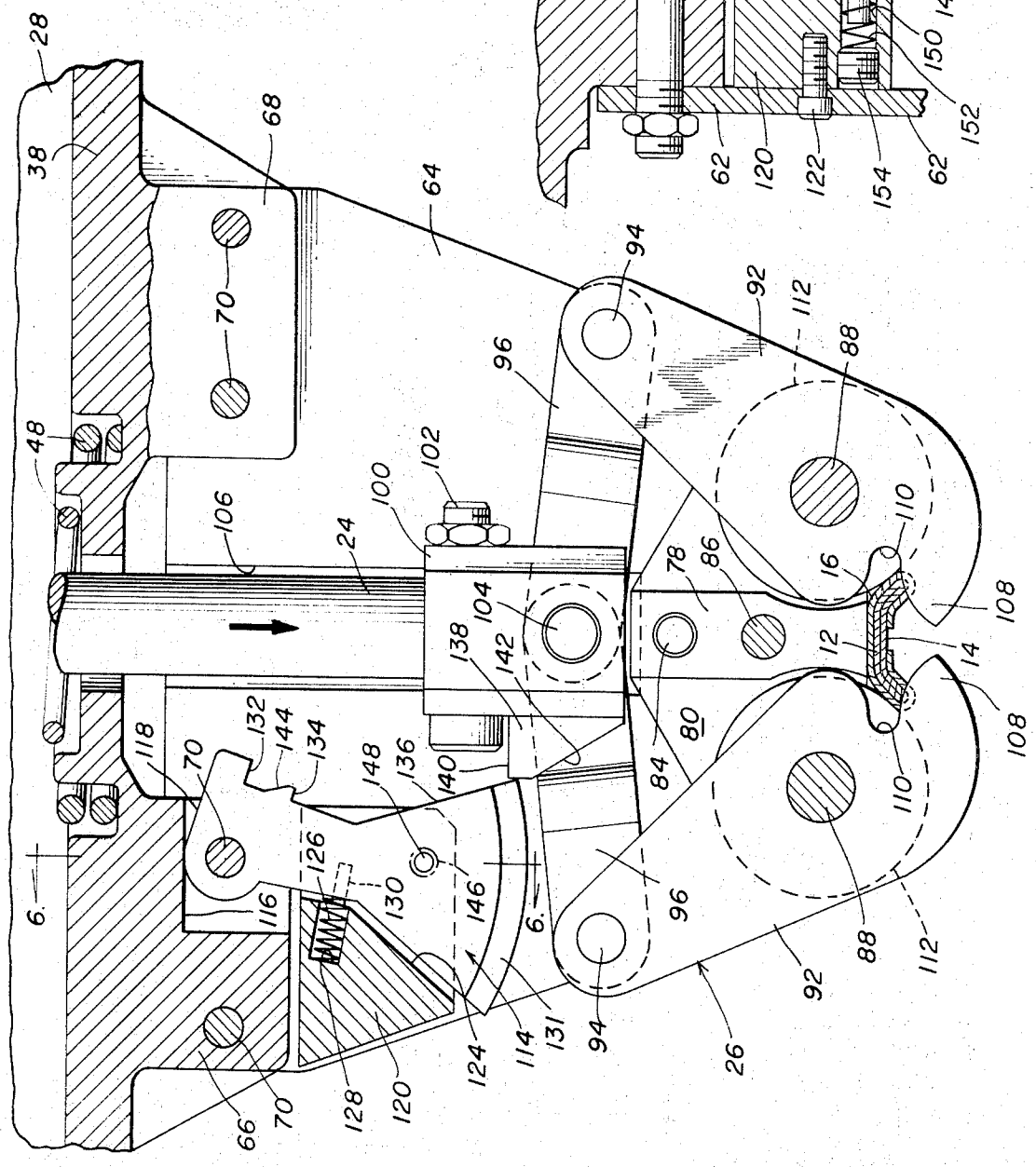
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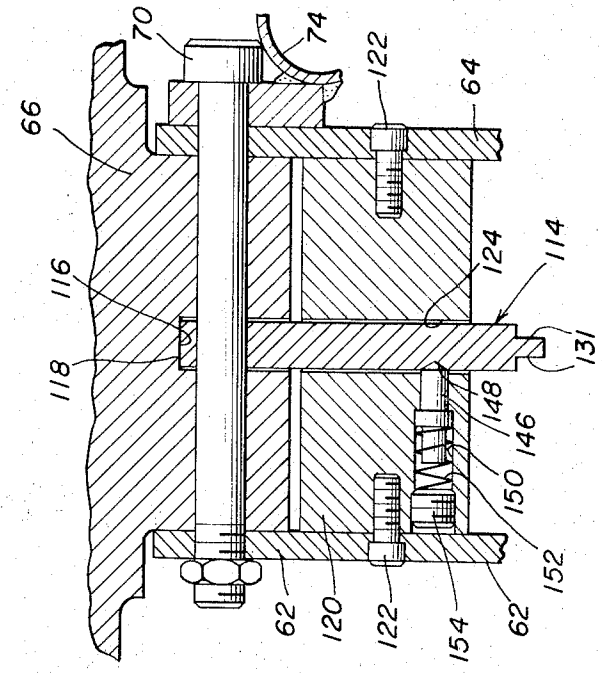
FIG. 6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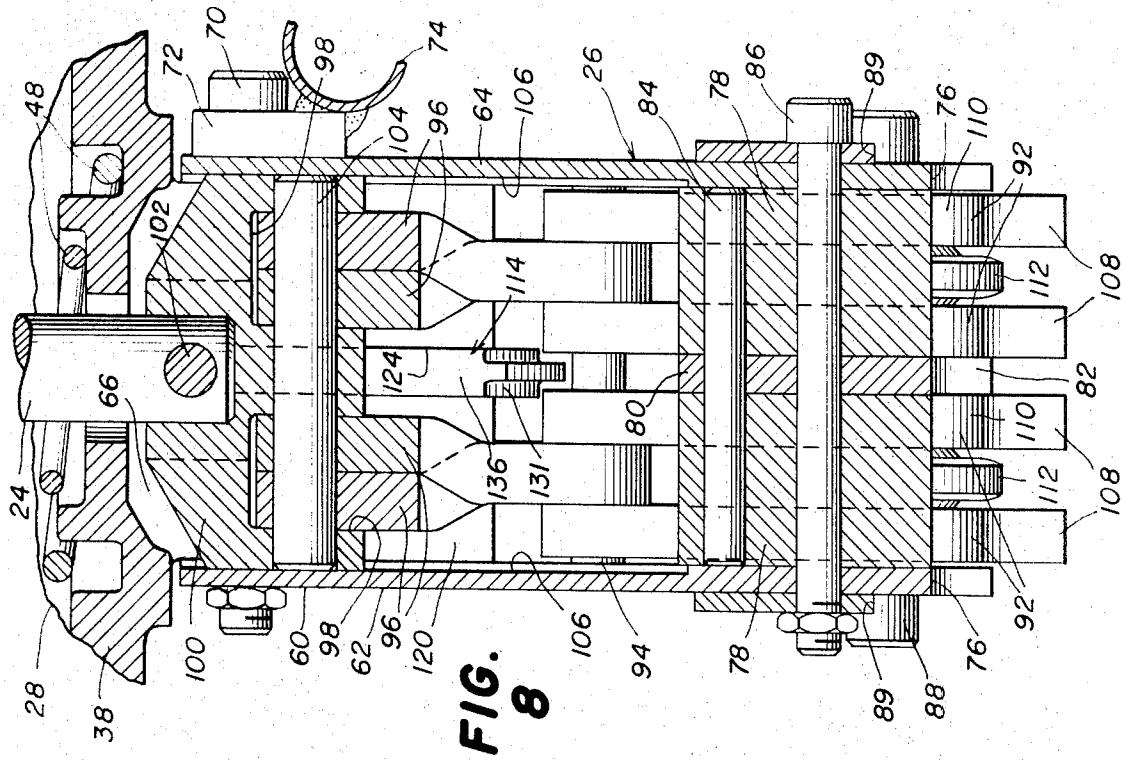
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FIG. 8

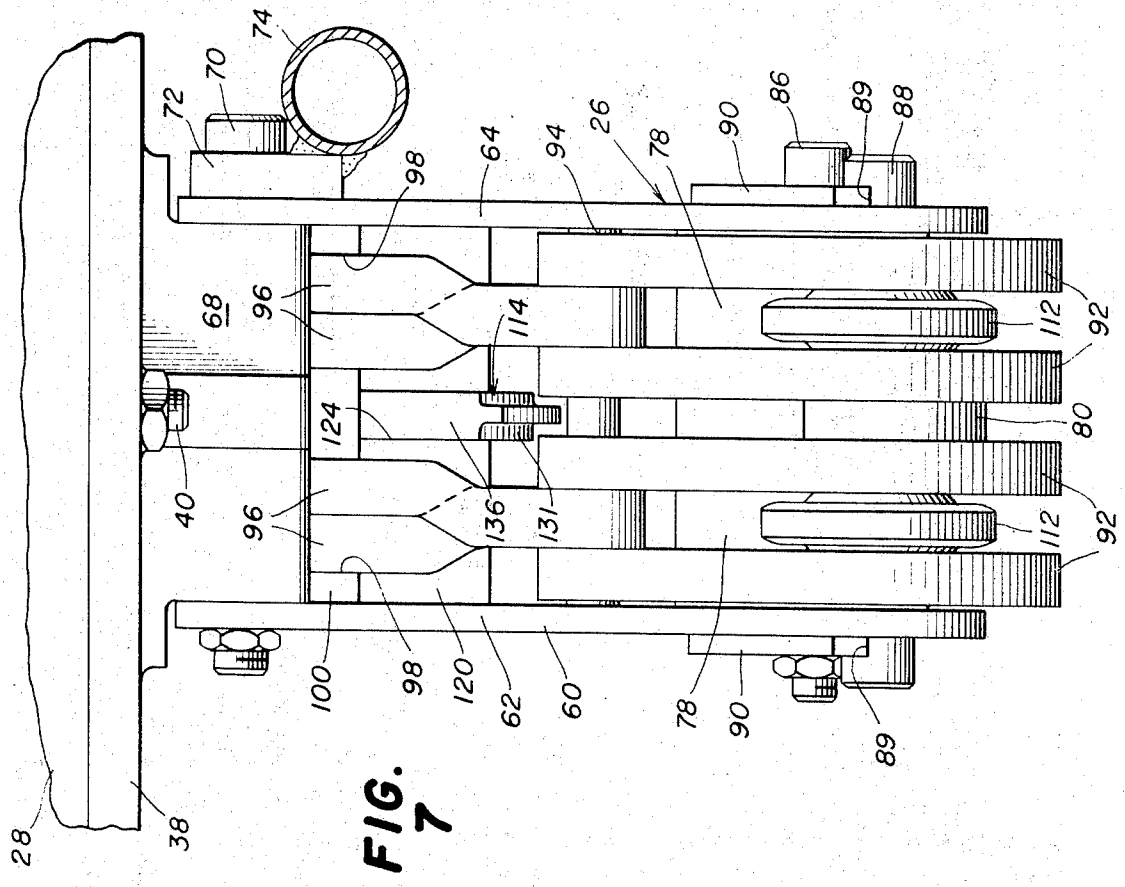
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FIG. 7

SEALING MECHANISM

The invention disclosed and claimed herein relates to improvements in powered sealing mechanisms for forming tensioning resisting joints in overlapping portions of steel strapping and an encircling metal seal blank. The joint formed by the mechanism of this invention is of the type shown in the patent of James M. Thornberry and James N. Wognum, U.S. Pat. No. 2,891,432, dated June 23, 1959.

The joints are made by crimping the edges of the tensioned overlapping strapping portions or ends and an encircling seal blank to define interlocking internal shoulders to resist opening the joint. The interlocking shoulders act in direct opposition to the tension in the strapping and are so arranged that the strapping and blank portions making up the shoulders will not slide relatively and the joint will sustain itself. Should such joint not be properly formed initially, the interlocks will fail and the joint will loosen to permit separation of the previously joined strapping portions.

The failure of such joints, particularly when using wide and heavy duty steel strapping, is due largely from failure to operate the tool through a complete joint forming stroke. In manually operated tools excuses for such failures can be made and accepted. But such should not be available in power tools where sufficient power is present to complete the joint. However, hurried or careless users may retract the joint forming mechanism too early, and a completed joint is not formed.

The sealing mechanism of this invention incorporates a latch having stops and other surfaces engageable by a cam-like abutment carried on the piston rod. As the rod is advanced during the joint forming portion of the sealing mechanism operation, the abutment pivots the latch. If the rod advance and consequently the operation of the joint forming mechanism are not completed, the latch prevents complete retraction of the rod and mechanism by having one of its stops be engaged by the abutment. When the rod has been advanced through a complete joint forming operation of the sealing mechanism, the abutment will have pivoted the latch sufficiently far that a detent retains it in pivoted position. The latch, held in detented position, permits clearance of the abutment from engaging the previously mentioned stop during retraction of the piston rod. Near the end of the retraction stroke the abutment strikes the other latch stop to release the latch from the detent, and the sealing mechanism is conditioned for a subsequent operation.

Unless the sealing mechanism has completed the joint forming operation, the latch will not be detented and the first latch stop prevents full retraction of the piston rod, and the jaws will not open sufficiently to permit their release from the strapping and seal blank. This is an indication to the operator that he has not allowed the sealing mechanism to make a full stroke and complete the joint or that there may have been a malfunction in the mechanism.

It is, therefore, a principal object of the present invention to provide a new and improved powered sealing mechanism for forming a tension resisting joint between overlapping strapping portions and an encircling seal blank which has a means to insure that the mechanism must complete a joint forming operation for each of its functionings.

Another object is to provide a new and improved joint forming mechanism which responds to either an operator's failure to complete operation of the tool or an internal malfunctioning of the tool to prevent subsequent operation of the mechanism until a full joint forming action has been completed.

Other objects and advantages will become apparent from the following specification and appended drawings and claims.

FIG. 1 is a perspective view of a tension resisting joint formed by the sealing mechanism of the present invention;

FIG. 2 is an elevational view, partially broken into section and with some parts in changed position, of the sealing mechanism of the present invention;

FIG. 3 is an enlarged elevational view of the jaw, punch, and control mechanism of the present invention;

FIG. 4 is an enlarged fragmentary view, partially in section, of the control latch of the mechanism shown in FIG. 3 and illustrating the safety feature preventing premature withdrawal of the piston rod and joint forming mechanism;

FIG. 5 is a view similar to FIG. 3 showing the mechanism at the completion of a joint forming operation;

FIG. 6 is a vertical sectional view through the control latch in detented position and may be considered as being taken along the line 6—6 of FIG. 5, looking in the direction of the arrows;

FIG. 7 is a side elevational view of the mechanism taken from the right side of FIG. 7; and

FIG. 8 is a vertical sectional view taken along the line 8—8 of FIG. 3, looking in the direction of the arrows.

FIG. 1 in the drawing illustrates a tension resisting joint 10 between overlapping steel strapping portions 12 and 14 and an encircling metal seal blank 16 which has a back plate 15 and initially depending wings or flanges 17. Along the edges the strapping portions and seal blank are crimped or deformed at 18 to provide interlocking internal shoulders which act in substantially direct opposition to the tension existing in the strapping which encircles a bundle or contains a load of boxes, barrels, logs, and the like.

The joint 10 is formed by a sealing mechanism 20 shown in FIG. 2 which comprises a cylinder-piston combination 22 having a piston rod 24 projecting therefrom to operate a jaw type joint forming mechanism 26.

The piston cylinder combination 22 includes a cylinder 28 having a piston 30 reciprocable in and sealed against the cylinder. The cylinder 28 is closed by a head 32 which has a vertical projection 34 carrying an eye hook 36 by means of which the sealing mechanism 20 may be suspended from a hanger or the like. The opposite side of the cylinder 28 is closed by a second head 38 on which the jaw type sealing mechanism 26 is mounted. The heads 32 and 38 are interconnected and held tightly against the cylinder 22 by exterior bolts 40 in known fashion.

The piston rod 24 projects through the piston 30 and is secured thereto by a shoulder 42 on the rod and a nut 44 threaded onto a tapped portion of the rod 24. The upper end of the rod 24 has a projection 46 which is guided in the vertical projection 34 on the piston head 32. The piston 30 is biased upwardly by a pair of springs 48 acting between the inner face of the cylinder head 38 and the underside of the piston 30, as shown

in FIG. 2. The piston is driven downwardly by air under pressure entering through a fitting 50 threaded into an air inlet in the piston head 32, the fitting 50 being connected to an air conduit 52 having an air control valve 54 fitted with a handle 56 which controls the passage of air entering into the system through a nipple 58.

Depending from the lower cylinder head 38 and mounted thereto is a jaw mechanism frame 60 which includes a pair of plates 62 and 64 between which the jaw, punch, and control latch mechanism to be described hereinafter is contained. The plates are secured to a pair of depending bosses 66 and 68, which are integral with the cylinder head 38, by bolts 70. The bolts 70 also secure a handle mounting plate 72 against the outer face of the plate 64, the mounting plate 72 forming a support for a tubular main handle 74 which is welded thereto. It will be noted from FIG. 2 that the handle 74 is sufficiently close to the valve handle 56 that the latter is readily accessible. The handle 74 is primarily for the purpose of guiding the sealing mechanism 20 so that it might be properly positioned in connection with the strapping portions 12 and 14 and seal blank 16 immediately prior to and during the formation of the joint.

The plates 62 and 64 at their lower edges have inward notches 76 to accommodate the seal blank and the strapping portions as the joint 10 is being formed. Immediately above the notches 76 the plates are properly spaced apart by a pair of intervening blocks 78 and a tie bar 80, the latter being notched at 82 in the same manner as are the plates 62 and 64. The blocks 78 and tie bar 80 are interconnected adjacent their upper ends by a pin 84 extending through aligned holes therein and having its ends abut the inner faces of the plates 62 and 64. The combination of the blocks 78 and tie bar 80 is secured in place between the plates 62 and 64 by a bolt 86.

A pair of pivot pins 88 extend through the plates 62 and 64 and across the space therebetween. They also extend through and provide further positioning for the tie bar 80. Adjacent their outer ends and immediately beyond the exterior surfaces of the plates 62 and 64, they are slotted at 89 to receive the lower edges of lock plates 90 which are secured in position by the bolt 86 (FIG. 2). The pivot pins 88 are thus restrained against longitudinal movement.

The joint forming mechanism 26 includes pairs of bending jaws or dies 92 pivoted on the pins 88. These jaws have upwardly projecting portions pivotally connected at 94 to links 96 which project upwardly into recesses 98 in a crosshead 100 which is fixed by a bolt 102 to the lower end of the piston rod 24. The pivotal connection between the links 96 and the crosshead 100 is effected by a pin 104 extending through the crosshead and restrained against longitudinal movement by the side plates 62 and 64. The crosshead is guided in its vertical movement by having its ends move in slots 106 in the inner faces of the plates 62 and 64. The vertical movement of the piston rod 24 imparts a vertical movement to the crosshead 100 which pivots the jaws 92 from the full line retracted position shown in FIG. 3 to the fully advanced position in FIG. 5 wherein the joint 10 will have been completed.

The bending jaws 92 have hooked tips 108 and adjacent thereto recesses 110. The hooked tips 108 and recesses 110 cooperate with circular deforming dies 112 which are rotatably mounted on the pins 88, there being a pair of dies 112 for each four of the bending dies 92 to make a pair of crimps 18 at the opposite edges of the sandwich of overlapping strapping portions 12 and 14 and seal blank 16. During the formation of the joint, as seen in a comparison of the changed positions of FIGS. 3 and 5, and while the strapping is held under tension by a separate tool, the bending jaws 92 are pivoted outwardly, thus moving the tips 108 inwardly so that they engage the flanges 17 of the seal blank 16 and fold them tightly against the underside of the strap portion 14. As the bending dies 92 are further moved outwardly, the sandwich of seal blank 16 and strapping portions 12 and 14 is drawn inwardly and against the circular deforming dies or punches 112 to form the crimps 18. This is done by bending of the edges of the strapping portions and seal blank inwardly or between the adjacent bending jaws 92 and the holding by the jaw tips 108 of the strapping portions and seal blank at either side of the deforming dies 112 and against the spacer blocks 78, the tie bar 80, and the side plates 62 and 64.

Joints 10 of the type formed by the crimps 18, which include the internal interlocking shoulders as previously indicated, require that the interaction of the bending jaws 92 and the deforming dies 112 must be completed for every operation. An incomplete functioning of these dies results in an imperfect joint and the tension exerted on the strapping portions 12 and 14 will cause the internal interlocking shoulders to slide and the joint to open with the loosening of the strapping portions. The apparatus shown and described herein has sufficient power to complete such a joint provided it functions completely through a joint forming operation.

To insure that this occurs, a control latch 114 is pivotally mounted on one of the bolts 70 in a slot 116 formed in the boss 66. The shape and configuration of the latch is best seen in FIGS. 3, 4, 5, and 6. It is plate-like in thickness having an upper edge 118 which abuts against the top of the slot 116 when the latch is in rest or blocking position. The latch projects downwardly and is additionally guided by a block 120 held between the plates 62 and 64 below the boss 66 by mounting bolts 122, the latch 114 moving in a slot 124 extending through the block 120. The latch is held at rest and in blocking position by a spring 126 having one end in a recess 128 in the block 120 and its opposite end extends over a stud 130 projecting from the rear edge of the latch 114. The lower edge of the latch 114 is cut away at 131 to clear the bending jaws 92 as the parts are rotated. In its normal or biased position the latch 114 presents a pair of stops 132 and 134 and a straight inclined camming surface 136 to be engaged by a cam-like abutment member 138 carried on and projecting laterally from one side or face of the crosshead 100. The member 138 has an abutment face 140 and a cam face 142 to engage and move the latch 114.

As seen in FIG. 3, wherein the full line position with the bending jaws 92 and the crosshead 100 retracted under the force of the springs 48, the abutment face 140 on the projection 138 underlies the stop face 132 and the latch 114 is held in rest position with its top edge 118 against the upper inner edge of the slot 116.

Upon movement downwardly under the power exerted by the piston 30, the cam 142 on the abutment 138 engages a cam surface 144 immediately above the stop face 134 on the latch 114 and pivots the latch suf-

ficiently so that the abutment **138** clears the cam surface **144** and the stop face **134.** This movement causes the bending jaws **92** to move at least to the dot-dash line position of FIG. **3** bending the flanges **17** below the strapping portions **12** and **14** and beginning the formation of the joint. If at any time thereafter and prior to the completion of the joint, the operator fails to have the piston-cylinder combination **22** complete the advance stroke and permits withdrawal of the joint forming mechanism **26** under the force of the springs **48,** the latch **114** returns under the force of the spring **126** to the position of FIG. **4,** and the stop face **134** is engaged by the abutment surface **140,** complete withdrawal of the bending jaws **92** from the not yet completed joint **10** is prevented, and the operator will know that a completed joint **10** has not been obtained. This movement is such that it is not possible to withdraw the bending jaws **92** from the not completed joint, and the operator will have to resume the operation so that the joint **10** will be completed.

Completion of the joint **10** moves the latch **114** to the full line position of FIG. **5,** wherein a detent plunger **146** engages in a recess **148** in one face of the latch **114.** The detent plunger **146** is slidable in a shouldered bore **150** in the guide block **120** and is urged to detenting position by a spring **152** which is held in the bore by a threaded stud or plug **154.**

In the normal joint formation the cross head **100** travels to the position shown in FIG. **5,** and the camming surface **142** on the abutment **138,** engages the camming surface **144** on the latch, pivots the latch sufficiently to permit initial clearance. Then the camming surface engages the inclined camming surface **136** on the latch and pivots it to the full line position shown in FIGS. **5** and **6** wherein the detent **146** engages in its notch **148,** and the latch **114** is temporarily held in this position until the crosshead **100** has been nearly withdrawn. At this time in the operation of the mechanism, the bending jaws **92** will have fully cooperated with the deforming dies or punches **112** and the crimps **18** would have properly been formed and the tension resisting joint **10** completed. The spring **48** then returns the mechanism to the full line FIG. **3** position. During this movement the detent **146** holds the latch in withdrawn position until such time as the abutment face **140** engages the stop face **132.** Further movement of the crosshead **100** upwardly disengages the detent **146** from the notch **148,** and the surface **118** engages the top of the slot **116.** At this time the latch **114** is in its stop or normal position, and the upward movement of the crosshead **100** is terminated, the bending jaws **92** are restored to their normal positions, and the jaw tips **108** are separated sufficiently so as to be disengageable from the completed joint **10.**

During the advance portion of the mechanism operation, any lesser movement of the latch **114** than to that position wherein the detent **146** engages the notch **148** will cause the spring **126** to return the latch **114** so that the surface **134** is engageable by the abutment face **140** and full retraction of the bending jaws **92** is not permitted, so that they cannot be withdrawn from the joint **10** even though it may appear to have been completed.

The objectives and advantages of this mechanism are fully attained by the mechanism above described, taken in conjunction with the accompanying drawings.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a power sealing mechanism for forming tension resisting joints between overlapping strapping portions and an encircling seal blank, having a power unit with a reciprocal rod, a support frame mounted on the unit, a combination of pivotal strapping and seal blank engaging bending jaws and rotatable deforming dies mounted on the frame, linkages connecting the rod to the jaws to effect relative movement of the jaws with respect to the deforming dies upon advance of the rod to cause the jaws and deforming dies to deform the seal blank and strapping portions into a tension resisting joint, the improvement comprising a plate pivotally mounted on the frame and having an inclined camming surface at one end thereof and two spaced apart stops at the other end thereof, an abutment member on the rod and engageable with said camming surface to pivot said plate during advancement of the rod, said stop nearest to said plate being engageable by said abutment member during retraction of the rod before complete advancement of the rod and completion of the joint thereby to block full retraction of the rod before the joint is completed, and a spring biased detent continually urged toward said plate positively engaging said plate in its fully pivoted position when the rod has been fully advanced to complete the joint, the other of said stops being engaged by said abutment member during retraction of the rod after formation of a complete joint and near the end of the withdrawal thereof to release said plate from said detent to condition the mechanism for a subsequent operation.

* * * * *