

Jan. 3, 1961

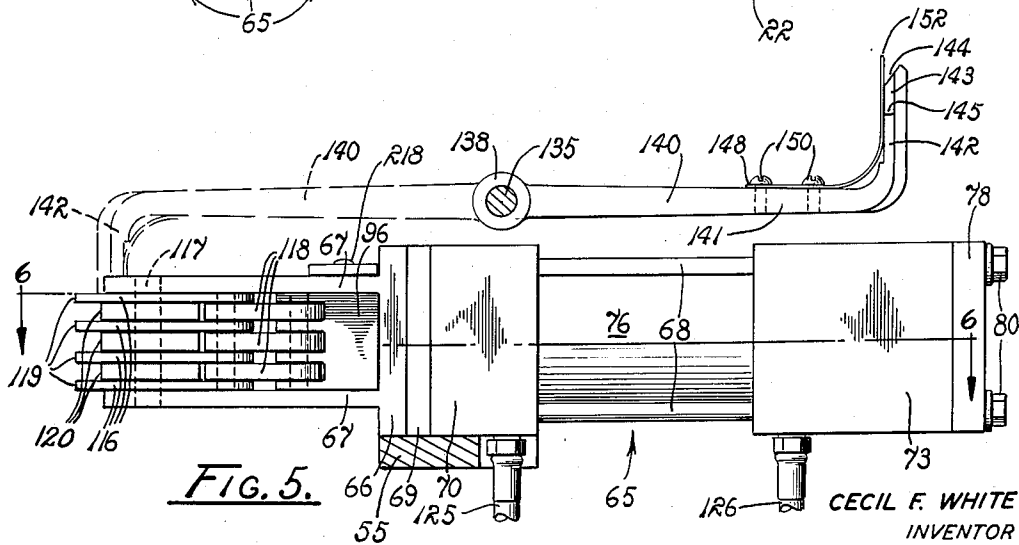
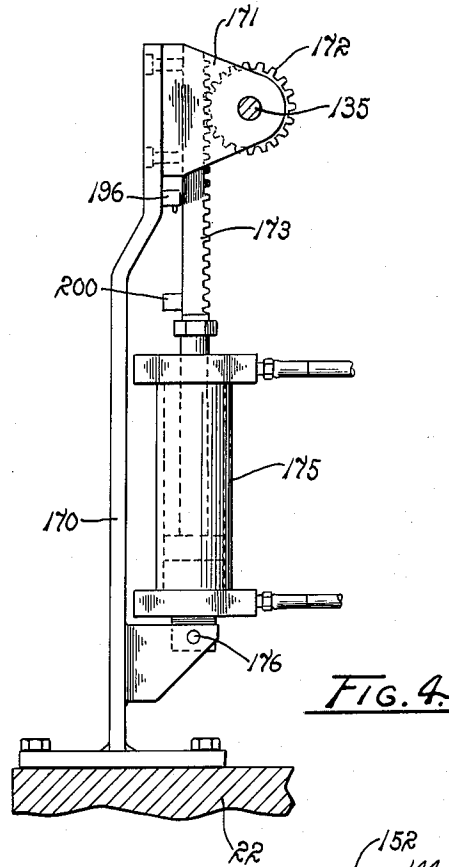
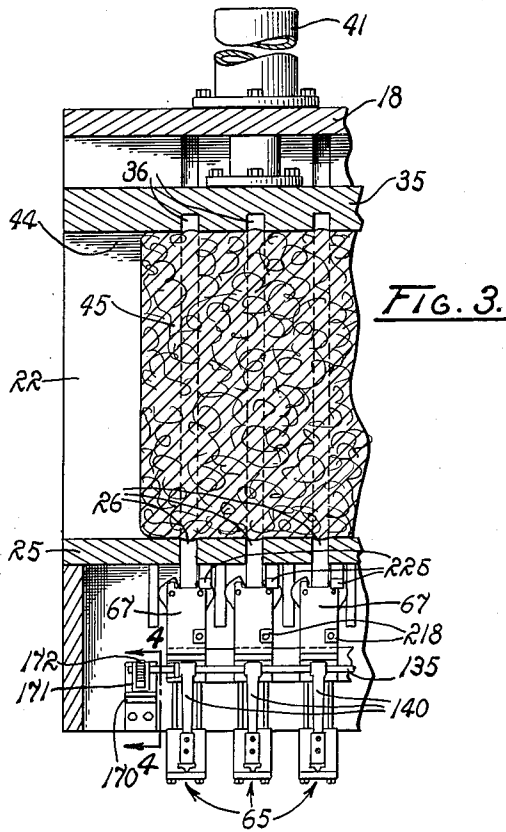
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2,966,816

CLIP POSITIONING AND CLENCHING APPARATUS

Filed Aug. 17, 1959

4 Sheets-Sheet 2



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CLIP POSITIONING AND CLENCHING APPARATUS

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4 Sheets-Sheet 3

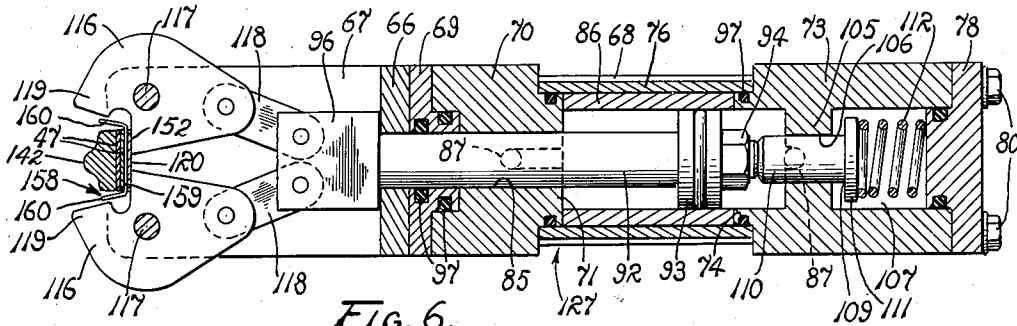


FIG. 6.

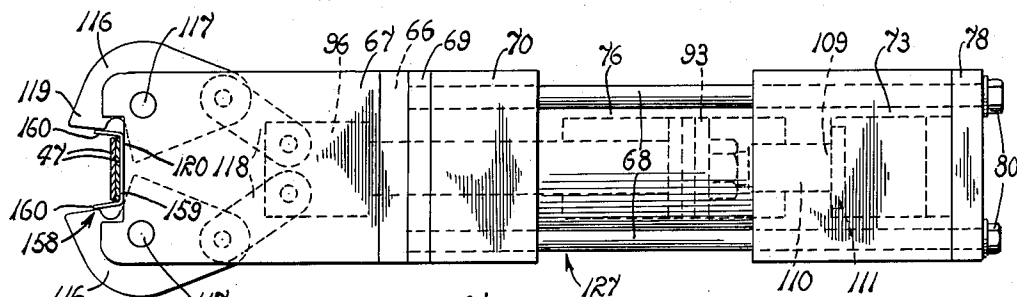


FIG. 7.

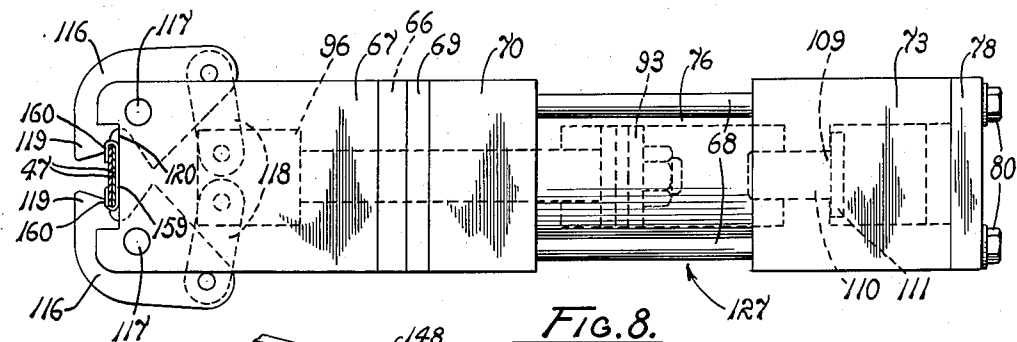


FIG. 8.

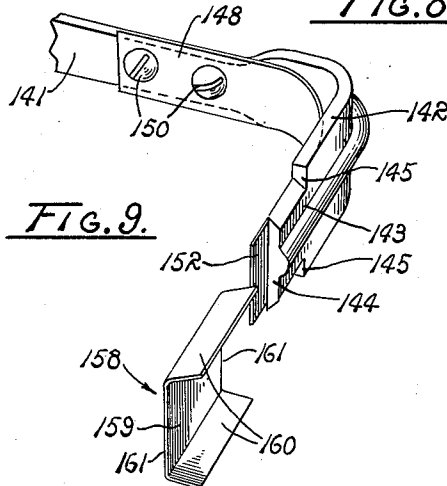


FIG. 9.

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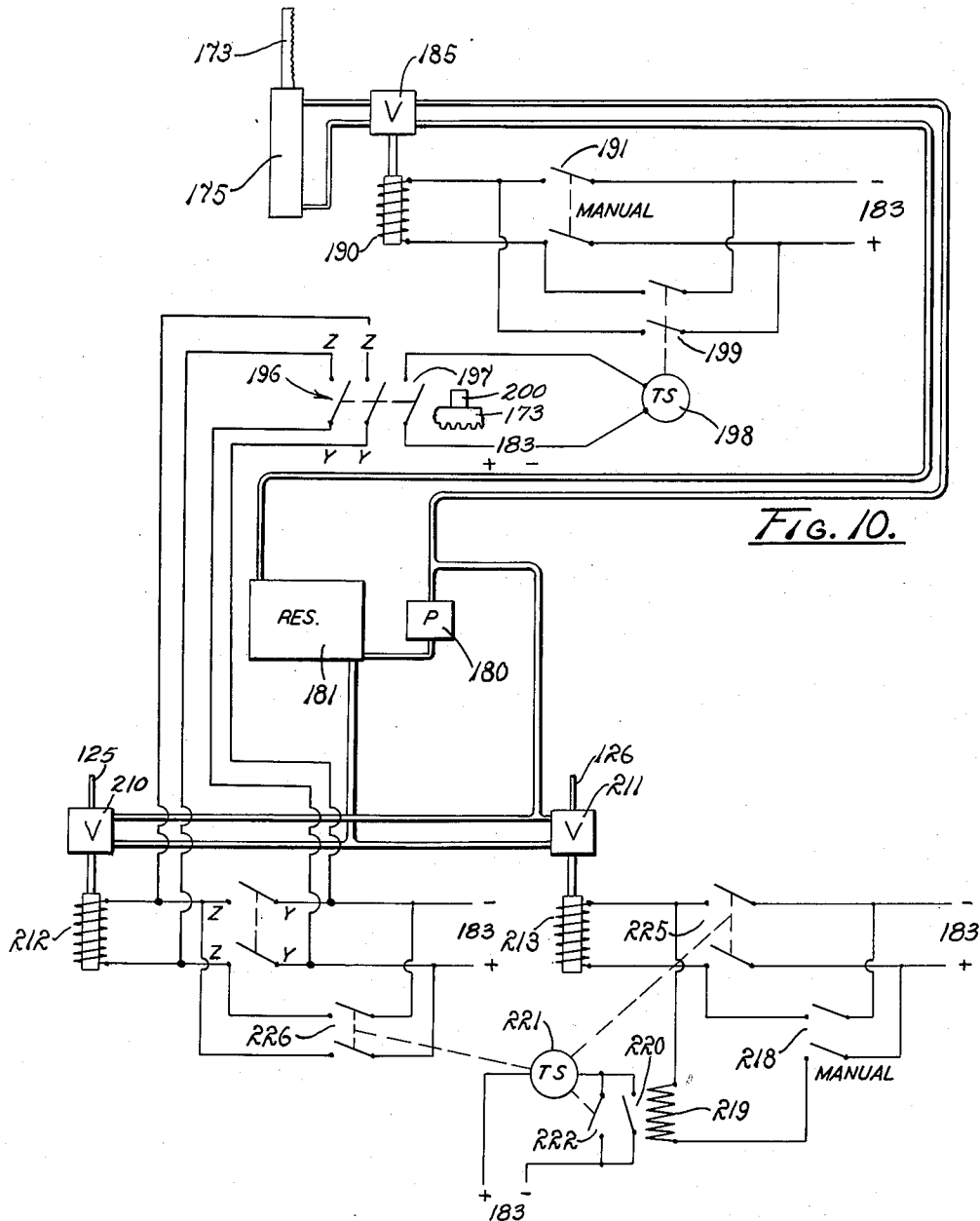
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CLIP POSITIONING AND CLENCHING APPARATUS

Filed Aug. 17, 1959

4 Sheets-Sheet 4



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CLIP POSITIONING AND CLENCHING APPARATUS

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Filed Aug. 17, 1959, Ser. No. 834,197

8 Claims. (Cl. 81-9.1)

The present invention relates to an apparatus for positioning and clenching a clip, or the like, and, more particularly, to an apparatus for receiving an open clip, for locating the clip in predetermined position, and for compressing or squeezing the clip to close the same.

It is well-known to compress certain bulk materials, such as cotton, into bales of various densities and, while under compression, to extend a plurality of bands around the bales. The free end portions of the bands are overlapped and fastened so that upon release of the bale from the compressive forces, the bale expands and is tightly confined in compressed form by the bands.

A compress of this nature is disclosed in my prior United States Patent No. 2,876,696. As an aid to understanding the principles of the subject invention, it is briefly noted that this patented compress includes a pair of right-angularly related, stationary platens and a pair of movable compress platens in right-angular relation with each other and with respectively adjacent stationary platens. One of the stationary platens and both of the movable platens have grooves therein while the other stationary platen has a plurality of slots aligned with the grooves for receiving bands for extension around work material compressed by the platens.

In this compress, after the bands were extended around a compressed bale, the opposite end portions are overlapped and a U-shaped clip placed manually around the overlapped portions. A clenching mechanism briefly referred to in said patent, is then employed for clenching the clips around the bands. The subject invention relates to further developments in the positioning and clenching of the clips and enables operation in a substantially automatic manner.

Accordingly, it is an object of the present invention to provide improvements in a band clenching apparatus for compresses.

Another object is to provide an apparatus for feeding band clips to a clenching mechanism, for holding the clips in such mechanism while the overlapped end portions of bands are positioned in the clips, for clenching the clips around said portions, and for releasing the clenched clips and end portions.

Another object is to minimize the time and labor required to interconnect the opposite end portions of bands extended around bales of work material.

Another object is to facilitate the formation of a high density bale of work material in a minimum of time and with a minimum of effort.

Another object is to enable the clenching of bands in a substantially automatic manner and for the purpose described.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawings.

In the drawings:

Fig. 1 is a front elevation of a compress employing a clenching apparatus embodying the principles of the present invention.

Fig. 2 is a fragmentary, somewhat enlarged transverse section taken on line 2-2 of Fig. 1.

Fig. 3 is a fragmentary somewhat enlarged horizontal section taken on line 3-3 of Fig. 1.

Fig. 4 is a somewhat enlarged vertical cross-section taken on line 4-4 in Fig. 3.

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Fig. 5 is a somewhat enlarged side elevation of a part of the clenching apparatus of the present invention.

Fig. 6 is a section taken on line 6-6 of Fig. 5 of the clenching mechanism, as employed in the present invention, shown in an open, clip receiving position with a clip and the overlapped end portions of a band received between the jaws of the mechanism. A clenching switch, shown in Fig. 5, is omitted in Fig. 6 for illustrative clarity.

Fig. 7 is a view similar to Fig. 6 but showing the clenching mechanism in a successive clip holding position.

Fig. 8 is a view similar to Figs. 6 and 7 but showing the clenching mechanism in a still further advanced clenching position.

Fig. 9 is a somewhat enlarged, detailed perspective view of a clip feeding arm and a clip therefor both of which are employed in the present invention.

Fig. 10 is a diagrammatic view of a combined hydraulic and electrical system employed with the present invention.

Referring more particularly to the drawings, a frame is generally indicated by the numeral 15 in Figs. 1 and 3. Although the frame may assume any convenient form, it is illustrated as including upright side members 16 interconnected by a horizontal top member 17, and an upright back member 18.

A bottom, horizontal, stationary platen or table 22 is supported in the frame 15 and has a plurality of elongated, spaced, substantially parallel grooves 23 therein. An upright front stationary platen 25 is disposed in spaced parallel relation to the back member 18 and is extended between the top member 17 and the bottom platen and connected thereto. The front platen has a plurality of vertical slots 26 in spaced parallel relation to each other with corresponding slots in alignment with grooves in the bottom platen. A flange 27 extends forwardly outwardly from the front platen, and gussets 28 rigidly interconnect the front platen with the flange and with the bottom platen, as best seen in Fig. 2, for imparting rigidity to the front platen.

An auxiliary compress platen 35 is supported on the bottom platen 22 in spaced parallel relation to the front platen 25 and for reciprocal slidable movement toward and away from the front platen between compressing and retracted positions. The auxiliary platen also has a plurality of grooves 36 with corresponding grooves 36 and 23 in the auxiliary and bottom platens being in alignment. Horizontally extended auxiliary rams 37 are mounted on the back member 18 of the frame 15 and are connected to the auxiliary platen for moving the same between compressing and retracted positions.

A horizontal main compress platen 40 is positioned in upwardly spaced, substantially parallel relation to the bottom platen 22 by means of main rams 41 mounted on the top member 17 of the frame 15. Actuation of the main rams moves the main platen between a lower compressing position and an upper retracted position, as will be evident. The main platen similarly provides grooves 42 in alignment with the grooves 23 and 36, and slots 26.

The platens 22, 25, 35, and 40 are in substantially rectangular relation and define therewithin a compress chamber 44 adapted to receive bulk work material, such as cotton, for compression into a bale 45. Although well-known, it is briefly to be noted that the work material is fed to the chamber with both of the main and auxiliary platens in retracted positions, that the auxiliary platen is then moved toward compressing position to compress the work material in one dimension, and that thereafter the main platen is moved toward compressing position to compress the bale in another dimension, as

illustrated in Fig. 2. Elongated bands 46 are then thrust individually through the aligned slots and grooves and extended around the compressed bale whereby opposite end portions 47 of the bands extend forwardly outwardly through the slots. While the foregoing is known, its review is believed to be helpful in understanding the principles of the present invention to which specific reference is now made.

A table 55 includes legs 56 rigidly supported on an extension 57 of the stationary bottom platen 22. The table is thus supported in upwardly spaced relation to the bottom platen and extends longitudinally of the chamber 44 in forwardly spaced, substantially parallel relation to the front platen 25.

A plurality of clenching mechanisms 65 are rigidly mounted in horizontal positions on the table 55 and extended transversely thereof in individual alignment with corresponding slots 26 and grooves 23, 36, and 42 in the platens 25, 22, 35, and 40, respectively. As best seen in Figs. 5 through 8, each mechanism includes a mounting plate 66 and a pair of spaced parallel side plates 67 rigidly forwardly extended from the mounting plate. Four elongated bolts 68 in rectangular arrangement are rigidly secured to the opposite side of the mounting plate from the side plates and extended rearwardly therefrom. Front blocks 69 and 70 provide a plurality of bores slidably receiving the bolts and are positioned against the mounting plate. The front block has a boss 71, illustrated in Fig. 6, rearwardly extended therefrom. A rear block 73 also has bores slidably receiving the bolts and provides a forwardly extended boss 74 in opposed relation to the boss 71. A sleeve 76 has opposite ends fitted in fluid-tight relation over the bosses and thus extends between the blocks. A cap 78 provides bores receiving the ends of the bolts and is fitted against the rear surface of the rear block. Nuts 80 are screw-threadably connected to the ends of the bolts which extend rearwardly from the cap thereby releasably to connect the front and rear blocks, the sleeve, and the cap to the mounting plate.

The front block 70 has a central bore 85, and a cylinder 86 is extended between the front and rear blocks 70 and 73 in coaxial alignment with the bore 85. The front and rear blocks provide fluid ports 87 providing communication between opposite ends of the cylinder and the exterior of the clenching mechanism.

An elongated piston rod 92 is coaxially slidably fitted in the bore 85 of the front block 70 and has front and rear end portions respectively extended through the mounting plate 66 and into the cylinder 86. A piston 93 is rigidly connected to the rear end portion of the rod and is in fluid sealing, slidable engagement with the cylinder for reciprocal movement therein between the opposite ends of the cylinder. A nut 94 is screw-threadably connected to the end of the piston rod extended through the piston and adjacent to the rearward surface thereof. A mounting head 96 is rigidly connected to the forward end portion of the rod forwardly of the mounting plate 66. O-rings 97 are provided at suitable locations in the clenching mechanism to provide fluid seals where necessary and desirable.

The rear block 73 has an inner, radially extended, annular collar 105 providing a bore 106 in coaxial alignment with the cylinder 86. The rear block also has a chamber 107 rearwardly of the collar and between the collar and the cap 78. A stud 109 includes a shank 110 slidably fitted in the bore 106 and in coaxial alignment with the piston rod 92. The stud also provides a head 111 located within the chamber 107. A coiled compression or biasing spring 112 is also located within the chamber and has opposite ends bearing against the cap 78 and the head 111 for yieldably urging the shank forwardly into engagement with the piston rod 92.

A pair of jaws 116 are mounted by vertically disposed pivot or axle pins 117 between the side plates 67 for

movement inwardly and outwardly relative to each other. Links 118 pivotally interconnect the jaws, rearwardly of the pivot pins, and the mounting head 96. Each jaw has a plurality of spaced crimping teeth 119. Anvil teeth 120 are rigidly mounted between the crimping teeth.

Hoses 125 and 126 are individually connected to the ports 87 leading to the cylinder 86 for feeding and releasing fluid to and from the cylinder in a manner subsequently to be described. It is evident, therefore, that the cylinder, the piston rod 92 and the piston 93 constitute a clenching ram 127 adapted to control the position of the jaws 116. When fluid is supplied under pressure through the front hose 125 and fluid is allowed to bleed out of the cylinder through the rear hose 126, fluid pressure is exerted within the cylinder against the forward face of the piston 93 thereby to hold the piston rod rearwardly in a retracted position. When the piston is fully retracted, it urges the stud 109 rearwardly against the spring 112 to maintain the latter under compression. In this position, the jaws are in an open clip receiving position, as viewed in Fig. 6. When fluid pressure is allowed to bleed from the cylinder through both of the hoses, and assuming prior compression of the spring 112, said spring expands and thrusts the piston rod forwardly a predetermined distance until the spring is completely expanded. This moves the jaws toward each other into a clip holding position, as viewed in Fig. 7. When fluid pressure is supplied to the rear hose 126 and allowed to bleed out through the forward hose 125, the piston is forced forwardly into an extended position thereby to move the jaws toward each other into a completely closed clenching position, as shown in Fig. 8. Thereafter upon bleeding fluid from the hose 126 and feeding it in by way of hose 125, the piston and jaws are returned to a retracted and open position, as shown in Fig. 6.

An elongated rock shaft 135 is extended longitudinally of the table 55 in elevationally spaced relation to the clenching mechanism 65, as perhaps best illustrated in Fig. 5. The rock shaft thus extends transversely of the clenching mechanisms intermediate the forward and rearward end portions thereof. Bearings 136 are mounted on the clenching mechanisms and rotatably receive the rock shaft. Hubs 138 are rotatably mounted on the rock shaft and correspond in position and number to the clenching mechanisms, as illustrated in Fig. 1. L-shaped clip feeding arms 140 provide mounting portions 141 rigidly connected to the hubs and feeding portions 142 substantially perpendicularly extended from their respective mounting portions. With particular reference to Figs. 5 and 9, each feeding portion includes a forwardly extended projection 143 having a terminal bevel 144 and a pair of transverse shoulders 145 in rearwardly spaced relation to the bevel. An elongated leaf spring 148 provides a mounting end portion connected to the mounting portion of each arm by means of screws 150 and a holding portion 152 yieldably resiliently urged against the inwardly disposed surface of the feeding portion of each arm. The holding portion of each spring extends forwardly along and from the projection of its associated arm and in acute angular relation with its associated bevel.

It is to be noted in Fig. 5, in particular, that the distance between the rock shaft 135 and the inwardly disposed surface of each feeding portion 142 against which the holding portion 152 of the leaf spring 148 is urged, is substantially equal to the distance between the rock shaft and the forwardly disposed edges of the anvil teeth 120.

A U-shaped clip 158 is provided for use with the subject invention and is of conventional construction. However, for purposes of reference herein, the clip is described as including a central web 159 and a pair of side flanges 160 extended divergently outwardly from the same side of the web. The flanges preferably are slightly divergently extended from the web with respect

to each other prior to their insertion and use in connection with the subject invention. The clip has opposite end edges 161. It is further to be noted that the transverse dimension of the projection 143 of each clip feeding arm 140 is slightly less than the distance between the flanges 160 of the clip while the maximum transverse dimension of each feeding portion 142 at the shoulders 145 is greater than the distance between the flanges. With this relationship, the web of a clip can be slidably inserted between the holding portion 152 and the projection 143 of a clip feeding arm. The clip is inserted until the inwardly disposed end edge 161 abuts the shoulders of the arm. The spring, of course, releasably holds the clip in this position.

With reference to Figs. 1, 2 and 4, in particular, a bracket 170 is mounted on the extension 57 of the bottom platen 22 at one end of the table 55 and extends upwardly in forwardly adjacent spaced relation to the rock shaft 135. A yoke 171 is secured to the upper end portion of the bracket and rotatably journals an end of the rock shaft therein. A gear 172 is rigidly connected to the rock shaft within the yoke and is in mesh with a vertically disposed rack 173. A feed control ram 175 provides a lower end portion pivotally connected at 176 to the bracket for movement about a horizontal axis parallel to the shaft and a piston rod is coaxially rigidly connected to the rack. The ram is adapted upon actuation to elevate the rack and thereby rotate the rock shaft in a clockwise direction, as viewed in Fig. 4, to move the feeding arms 140 from their rearwardly disposed retracted positions, as viewed in Fig. 5 in full lines, into their forwardly disposed feeding positions, as shown in Fig. 5 in dashed lines. When the feeding arms are in retracted positions, the feeding portions 142 thereof are extended upwardly with respect to the clenching mechanisms 65 and thus the feeding portions are disposed for convenient reception of the clips 158, in the manner described above. In their feeding positions, the feeding portions of the arms are extended between the jaws 116 of their respective clenching mechanisms. The ram is also effective to move the rack downwardly to rotate the shaft in an opposite direction and thereby to move the feeding arms from their feeding positions to their retracted positions.

With particular reference to Fig. 10, a combined hydraulic and electrical system is disclosed for use in the subject apparatus. The system includes a pump 180 and a reservoir 181 feeding into the pump. Further, a source of electrical power is indicated at 183. It is to be understood that a transformer, not shown, is normally utilized to provide various voltage and current requirements. A two-way feeding control valve 185 interconnects the feed control ram 175 and the pump and the reservoir. The valve has an extending position in which fluid is delivered to the ram from the pump for raising the rack 173 and a retracting position wherein the connections from the pump and reservoir to the valve are reversed to lower the rack.

A feed control solenoid 190 is connected to the feed control valve 185 and is connected to a manually operable, momentary contact, double-pole, rack extending switch 191. The rack extending switch is connected to the source of electrical power 183. When the feed control solenoid is energized by closing the extending switch, the feed control valve is moved into its extending position. Well-known spring means, not shown, are provided for automatically opening the extending switch upon relief of manual pressure thereagainst. However, once the valve is moved into its extending position by the solenoid, it remains in this position until it is positively returned to its retracted position.

A three-pole micro-switch 196 is mounted on the bracket 170, as shown in Fig. 4, and includes a pair of timing contacts 197. A rack control timer 198 is connected in series circuit with the timing contacts and

with the source of electrical power 183. The timer includes a retracting switch 199 mechanically connected thereto and adapted to close momentarily during each revolution of the timer. The timer is of conventional type adapted to rotate upon application of voltage thereto and to continue rotating as long as such voltage is applied. As indicated, during each cycle of its rotation, it closes the retracting switch which is connected in parallel with the extending switch 191 but which is adapted to reverse the polarity of voltage applied to the ram control solenoid upon closing. That is, the retracting switch is for the purpose of applying the source of power 183 to the solenoid 190 but in such a manner that current flows in a direction opposite to the direction of current flow when the extending switch is closed. It is evident that closure of the retracting switch moves the feed control valve 185 into its retracting position thereby to lower the rack 173.

A micro-switch depressing member 200 is mounted on the rack 173 and engages the micro-switch 196 during its movement from its lower to its upper position thereby to close the micro-switch after the rack is in its uppermost position and the feeding portion 142 of each arm 140 is fully received between the jaws 116 of its respective clenching mechanism 65. The micro-switch remains closed as long as the rack remains elevated. When the retracting switch 199 closes, the rack is lowered to open the micro-switch and to stop the timer 198 in its initial position. The rotation of the timer is thus related to subsequent phases of the operation of the clenching mechanism, as described below.

Clenching control valves 210 and 211 are individually connected to the pump 180 and to the reservoir 181 and to the hoses 125 and 126, respectively. These valves also have two positions in one of which they feed fluid from the pump into the cylinder 86. In the other position of the clenching control valves, fluid is bled from the cylinder back into the reservoir. Clench control solenoids 212 and 213 are individually connected to the clenching control valves for movement of the same between their two positions. The clench control solenoid 212 is connected to a pair of bleed contacts Z, Z of the micro-switch 196. Another pair of bleed contacts Y, Y, associated with the contacts Z, Z are connected to the source of power 183. When the micro-switch is closed, said solenoid 212 is energized to bleed fluid from the forward hose 125 into the reservoir 181.

A manual, momentary contact, double-pole, clenching switch 218 is mounted on the upwardly disposed side plate 67 of each clenching mechanism 65 and is connected to the source of power 183. This clenching switch also has contacts connected in series circuit with the clench control solenoid 213 and a coil of a triggering relay 219. When the clenching switch is closed, it energizes the clench control solenoid 213 thereby to move the associated clench control valve 211 into its feeding position. This delivers fluid under pressure through the hose 126 into the cylinder 86 to move the jaws 116 into their clenching position, as described above and as viewed in Fig. 8. Closing of the clenching switch also energizes the triggering relay to close the contacts 220 of the triggering relay which are in series circuit with a clench control timer 221 and the power source 183.

The clench control timer 221 is mechanically connected to a pair of holding contacts 222 which close immediately upon energization of the timer to maintain the same in series circuit with the source of power 183 after the relay contacts 220 have opened incident to return of the clenching switch 218 to open position. It is to be noted that the clenching switch is spring-urged into open position in a well-known manner like switch 191. The clench control timer is also mechanically connected to a double-pole, momentary contact, bleeding switch 225 which, upon closing, connects the source of power to

the solenoid 213. However, closing of the bleeding switch reverses the polarity of voltage applied to the solenoid as compared with closing of the clenching switch 218. Still further, the clench control timer is mechanically connected to a double-pole, momentary contact, feeding switch 226 which connects the solenoid 212 to the source of voltage 183 but with the polarity reversed as compared with closing of the micro-switch 196. Both of the bleeding and feeding switches 225 and 226 close momentarily during energization of the timer but otherwise remain open. Also, it is to be noted that after the timer goes through a single cycle, the holding contacts 222 are opened to stop the timer.

Operation

The operation of the described embodiment of the subject invention is briefly summarized at this point.

Assuming that a bale 45 has been compressed in the chamber 44 and that bands 46 have been extended therearound and their end portions 47 overlapped, or in position to be overlapped, specific operation of the apparatus of the subject invention is readily understood. Initially, of course, the clip feeding arms 140 are in their retracted positions with their feeding portions 142 extended upwardly. Attendants, not shown, place clips 158 individually on the feeding portions of the arms in the manner described. The extending switch 191 is closed to elevate the rack 173 and rotate the rock shaft 135. This moves all of the arms 140 into their extended positions with the feeding portions 142 between the jaws 116 so that the clips 158 are located between the jaws, as viewed in Fig. 6. It is to be noted that the webs 159 of the clips are positioned against the anvil teeth 120 and that the flanges 160 are initially positioned in adjacent spaced relation to the clenching teeth 119. Complete elevation of the rack closes the micro-switch 196 to start the rack control timer 198. The timer is adjusted so as not to close the retracting switch 199 until near the end of the cycle of rotation of the timer.

However, closing the micro-switch 196 energizes the clench control solenoid 212 to bleed the fluid from forwardly of the piston 93 and through the hose 125 to the reservoir 181. Since fluid is normally bled from the cylinder through the hose 126, pressure is equalized on opposite sides of the piston. The spring 112 is thus permitted to expand and the jaws are moved into their holding positions firmly to engage the flanges 160 of their respectively received clips 158, as viewed in Fig. 7. At this point in the operation, the grasping effect on the flanges 160 is normally strong enough to bend them into parallelism. Operation of the rack control timer 198 is related to the time required to move the jaws into their holding positions following entrance of the clips into the jaws. After this predetermined elapse of time, the timer closes the retracting switch 199 to reverse the flow of current through the feed control solenoid 190 thereby to lower the rack 173. The lowering of the rack retracts the feeding arms 140. This, of course, occurs when the piston 93 is still in position to cause the jaws to grasp the clips, as shown in Fig. 7. Since the depressing member 200 moves away from the micro-switch 196, the latter opens to de-energize the timer 198 and the clench control solenoid 212. It is to be noted that the forwardmost hose 125 still bleeds fluid from the cylinder 86.

The next operation is manually performed by operators. The extended end portions 47 of the bands 46 are overlapped and placed within their respectively adjacent clips 158. The clenching switches 218 are then manually depressed and thus closed to supply fluid under pressure rearwardly of the pistons 93 in their respective clenching rams 127 thereby to move the jaws 116 into clenching positions. Specifically, the crimping teeth 119 fold the flanges 160 of the clips around the

overlapped end portions of the bands and interlock the clips and the end portions of the bands.

When the clenching switches 218 are closed, the clench control timers 221 are energized so that after a predetermined time, following clenching of the clips 158 and the end portions 47 of the bands 46, the bleeding and feeding switches 225 and 226 are closed momentarily to energize their respective associated solenoids 213 and 212 to feed fluid into the cylinder 86 through the hose 125 and to bleed fluid from the cylinder through the hose 126. This opens the jaws 116 and returns the pistons 93 to retracted positions.

The main and auxiliary platens 40 and 35 are then retracted whereby the bale 45 expands into engagement with the encircling bands 46. The bale is then removed from the compress chamber 44 and the apparatus is ready for a subsequent cycle of operation.

The subject apparatus thus automatically positions the clips in the clenching mechanisms, holds the clips in positions to receive the overlapped end portions of the bands and clenches said end portions and clips together in interlocked association. The apparatus automatically returns to its initial state in readiness for a subsequent cycle of operation. It will be evident that in view of the relatively large number of bands normally applied to bales of certain work material, the performance of substantially all of the phases of the clenching in an automatic manner minimizes the time and labor involved.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for clenching a clip having a pair of flanges interconnected by a web; a frame; a clenching mechanism including a support rigidly borne by the frame, a pair of axles mounted in fixed spaced relation in the support, a pair of teeth individually pivotally mounted on the axles for movement toward and away from each other, an anvil rigidly mounted in the support and extended transversely of the axles between the teeth, a ram connected to the teeth for moving the same from an open clip receiving position, to an intermediate partially closed clip holding position, to a fully closed clip clenching position, and to return to said open position, and means borne by the support engageable with the ram in the open position of the teeth for yieldably urging the teeth into said intermediate position; a clip feeding arm mounted in the frame for movement between a feeding position extended between the teeth for inserting a clip between the teeth, and a retracted position withdrawn from between the teeth; powered ram control means connected to the ram for actuating the same to move the teeth from said intermediate position to said closed position and to return to said open position and releasably to hold the teeth in said open position against the urging of said yieldable means against the ram; and powered arm control means connected to the arm for moving the arm into said feeding position when the teeth are in said open position and to move the arm into said retracted position when the teeth are in said intermediate position whereby the flanges of a clip inserted by the arm are held between the teeth with the web against the anvil, said flanges being clenched inwardly toward the web incident to movement of the teeth into said closed position.

2. In an apparatus for clenching a clip having a pair of flanges interconnected by a web; a frame; a clenching mechanism including a support rigidly borne by the frame, a pair of axles mounted in fixed spaced relation

in the support, a pair of teeth individually pivotally mounted on the axles for movement toward and away from each other, an anvil rigidly mounted in the support and extended transversely of the axle between the teeth, a ram connected to the teeth for moving the same from an open clip receiving position, to an intermediate partially closed clip holding position, to a fully closed clip clenching position, and to return to said open position, and means borne by the support engageable with the ram in the open position of the teeth for yieldably urging the teeth into said intermediate position; a clip feeding arm mounted in the frame for movement between a feeding position extended between the teeth for inserting a clip between the teeth, and a retracted position withdrawn from between the teeth; powered ram control means connected to the ram for actuating the same to move the teeth from said intermediate position to said closed position and to return to said open position and releasably to hold the teeth in said open position against the urging of said yieldable means against the ram; powered arm control means connected to the arm for moving the arm into said feeding position when the teeth are in said open position and to move the arm into said retracted position when the teeth are in said intermediate position; and an electrical system operable incident to movement of the arm into feeding position to trigger the ram control means and release the teeth for movement by the yieldable means into said intermediate position whereby the flanges of a clip inserted by the arm are held between the teeth with the web against the anvil, said flanges being clenched inwardly toward the web incident to movement of the teeth into said closed position.

3. An apparatus for interconnecting a pair of band portions with a U-shaped clip comprising a support; an elongated clenching mechanism mounted on the support including a pair of jaws movable relative to each other about spaced substantially parallel axes, the clenching mechanism including means connected to the jaws for moving the same successively from a fully open clip receiving and releasing position, to a partially closed clip grasping position, to a fully closed clenching position, and to return to said open position; an elongated rock shaft journaled in the support in laterally spaced relation to said jaws and extended transversely of the clenching mechanism and of the axes of movement of the jaws; a clip feeding arm rigidly mounted on the shaft, disposed in a plane passing between the jaws, and adapted releasably to hold a U-shaped clip; means connected to the shaft for rocking the same between a clip feeding position with the arm extended between the jaws in their open position to insert such a clip between the jaws, and a retracted position with the arm withdrawn from between the jaws; means connected to the clenching mechanism responsive to movement of the arm into feeding position to move the jaws from said open to said partially closed position; and means connected to said rocking means responsive to movement of the jaws from open to partially closed position for rocking the shaft to return the arm to retracted position, said band portions being positionable in the clip grasped between the jaws in said partially closed position of the jaws, whereby upon movement of the jaws to clenching position, the clip is clenched into interlocking engagement with said band portions.

4. In a mechanism for clenching a clip including a support; a pair of jaws mounted on the support for pivotal movement toward and away from each other; and a ram providing a cylinder, a piston rod connected to the jaws, and a piston connected to the rod and reciprocal in the cylinder from a retracted position with the jaws open in maximum spaced relation to each other, to an intermediate position with the jaws closer together, to an extended position with jaws closed in minimum spaced relation to each other, and to return to said retracted position; an apparatus for controlling the ram comprising biasing means engageable with the piston rod

yieldably urging the piston into said intermediate position; and a hydraulic system connected to the cylinder operable to hold the piston in said retracted position against the urging of the biasing means, to allow said biasing means to urge the piston into said intermediate position, and to force the piston from said intermediate position to said extended position and to return to said retracted position.

5. The mechanism of claim 4 wherein the biasing means includes a shank slidably mounted in the support in coaxial alignment with the rod for engagement therewith, a stop rigidly connected to the support at the opposite end of the shank from the rod, and a compression spring interposed between the shank and the stop for yieldably urging the shank toward the rod and thereby for yieldably urging the rod into said intermediate position.

6. The mechanism of claim 4 wherein the piston has axially spaced opposite ends; wherein the cylinder provides an extension port and a retraction port opening into the cylinder at opposite ends of the piston; and wherein said hydraulic system includes a source of fluid under pressure, valve means interconnecting the source and the ports, the valve means having fluid feeding and bleeding positions respectively forcing fluid into the cylinder through said ports and allowing fluid to bleed from the cylinder through said ports, and control means connected to the valve means for operating the same successively to force fluid into the retraction port while bleeding fluid from the extension port, to subject the ports to substantially the same pressure, to force fluid into the extension port while bleeding fluid from the retraction port, and subsequently to force fluid into the retraction port while bleeding fluid from the extension port.

7. In a mechanism for clenching a clip including a support; and a pair of jaws mounted on the support for pivotal movement about spaced axes toward and away from each other; an apparatus for feeding clips to the jaws comprising an elongated shaft; means journaling the shaft in the support in spaced relation to the jaws and extended transversely of the axes thereof; a clip feeding arm rigidly mounted on the shaft and radially extended therefrom in a plane passing between the jaws and the axes thereof; and means connected to the shaft for oscillating the same between a position with the arm extended between the jaws and a position retracted therefrom, said oscillating means comprising a gear rigidly connected to the shaft, a rack in mesh with the gear, and a powered push-pull device connected to the rack for reciprocating the same.

8. In a mechanism for clenching a clip including a support; and a pair of jaws mounted on the support for pivotal movement about spaced axes toward and away from each other; an apparatus for feeding clips to the jaws comprising an elongated shaft; means journaling the shaft in the support in spaced relation to the jaws and extended transversely of the axes thereof; a clip feeding arm rigidly mounted on the shaft and radially extended therefrom in a plane passing between the jaws and the axes thereof; means connected to the shaft for oscillating the same between a position with the arm extended between the jaws and a position retracted therefrom, said arm including a mounting portion radially extended from the shaft and a feeding portion angularly extended to the arm and yieldably bearing against said feeding portion thereby releasably grasping a clip between said spring and feeding portions.

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