Dec. 9, 1958 NICHOLAS CHUY 2,863,659

STEP-BY-STEP STOCK FEEDER

Filed Aug. 5, 1957 3 Sheets-Sheet 1

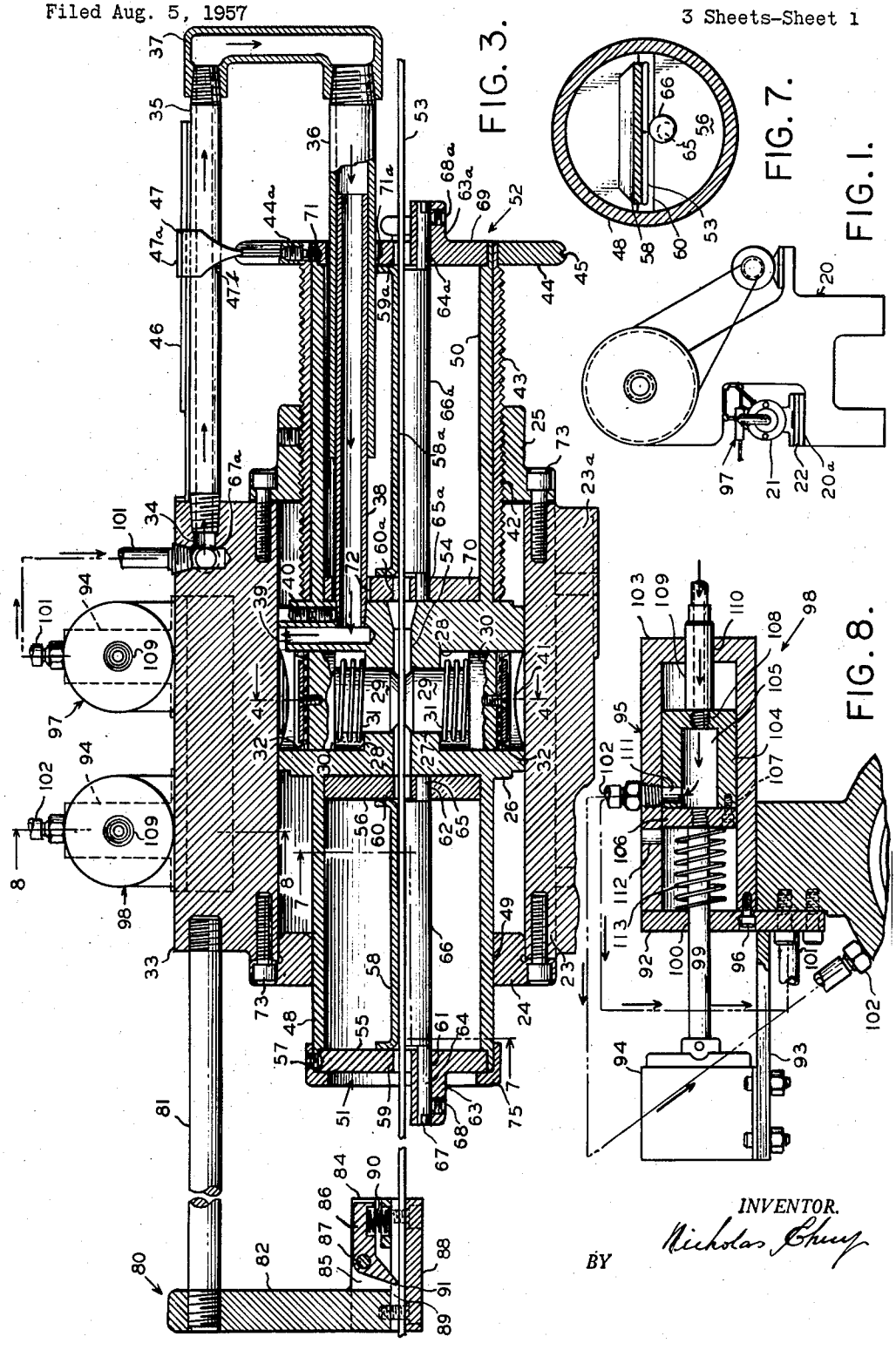


FIG. 3.

FIG. 7.

FIG. 1.

FIG. 8.

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Filed Aug. 5, 1957 3 Sheets-Sheet 2

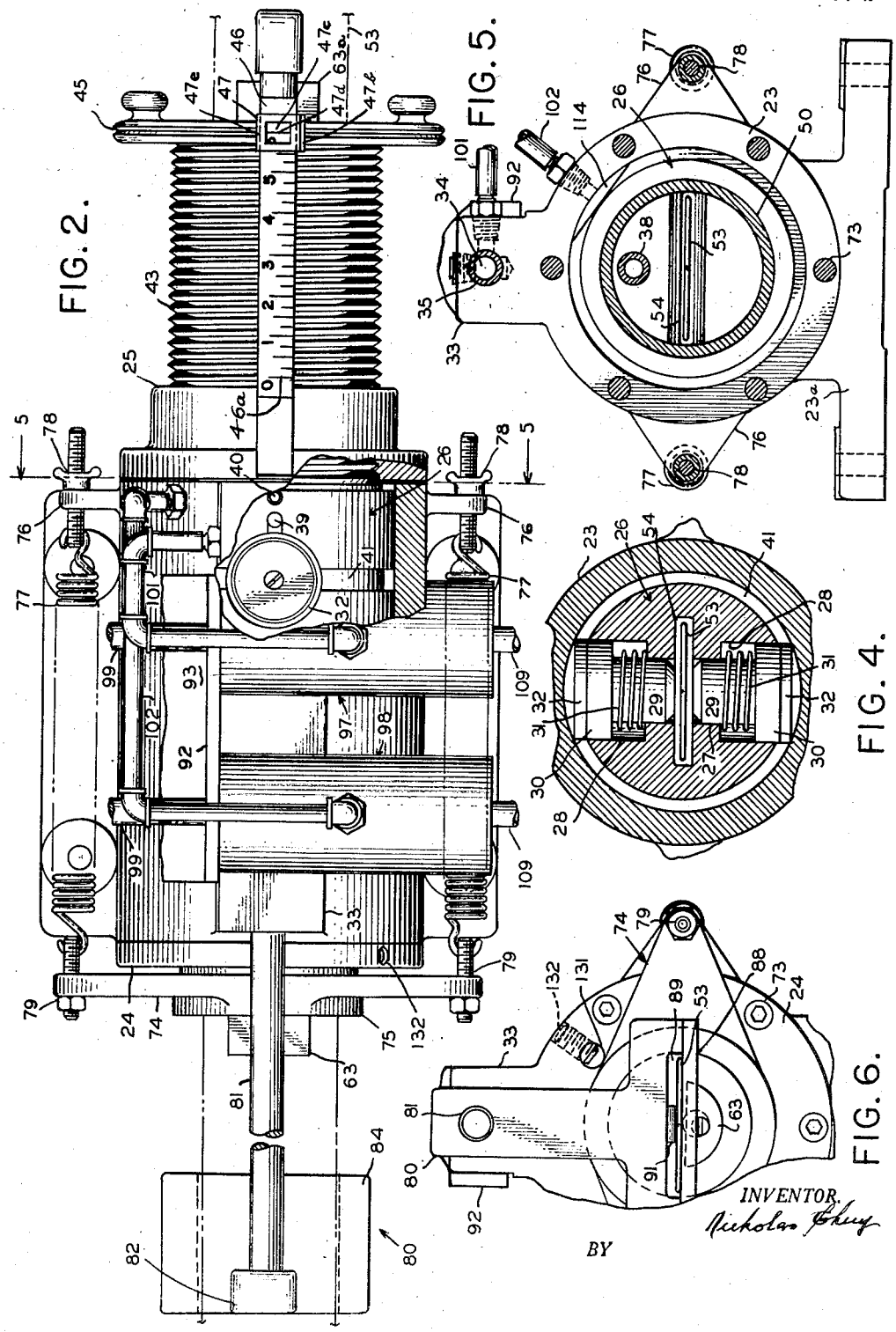


FIG. 2.

FIG. 5.

FIG. 4.

FIG. 6.

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STEP-BY-STEP STOCK FEEDER

Filed Aug. 5, 1957 3 Sheets-Sheet 3

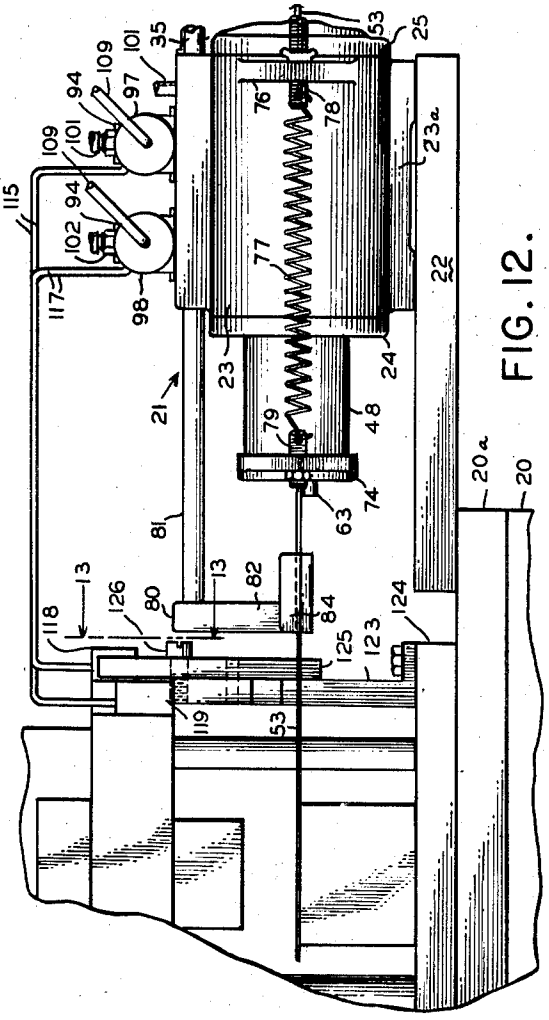


FIG. 12.

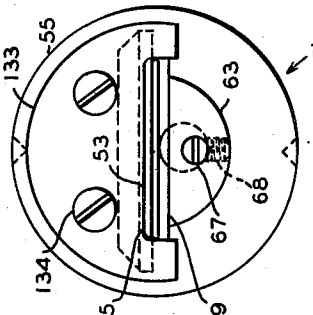


FIG. 11.

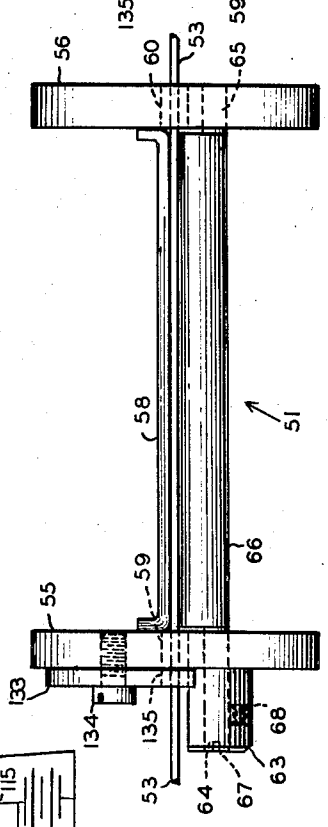


FIG. 10.

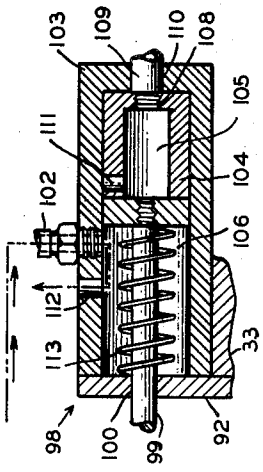


FIG. 9.

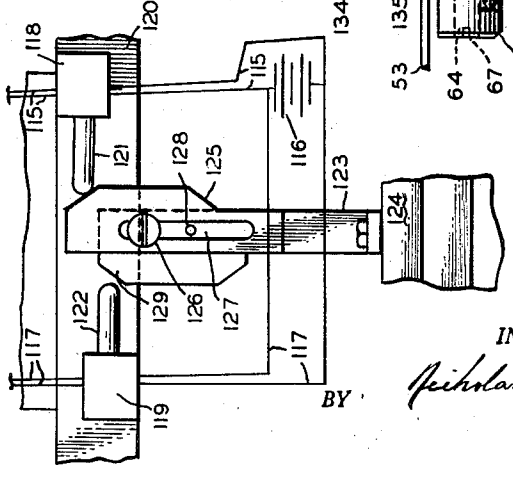


FIG. 13.

INVENTOR.

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United States Patent Office

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STEP-BY-STEP STOCK FEEDER

Nicholas Chuy, Detroit, Mich.

Application August 5, 1957, Serial No. 676,206

10 Claims. (Cl. 271—2.5)

This invention relates to an improved step-by-step stock feeder primarily adapted for use for automatically feeding stock intermittently to a punch press.

More particularly, the present invention constitutes an improvement on my prior Patent No. 2,634,974, issued April 14, 1953, and entitled Automatic Step-By-Step Stock Feeder.

One object of the present invention is to provide a step-by-step stock feeder having a separately operated means for positively gripping and holding the stock prior to operation of another means of the feeder by which the stock is advanced toward the punch press so that no slipping of the stock during the feed stroke can occur.

A second object of the invention is to provide a feeder having a more durable and more readily accessible means for accurately adjusting the length of the feeding stroke of the feeder.

A third and most important object of the present invention is to provide a feeder by means of which the stock will be straightened upon entering the feeder and will be maintained straight therein, so that variations in the length of the portion of the stock fed on each feeding stroke may not vary due to tendency of the stock to arc toward a curvature corresponding to the loose diameter of the wound stock.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is an end elevational view of a conventional punch press equipped with the stock feeder;

Figure 2 is an enlarged top plan view of the stock feeder showing a portion thereof in section;

Figure 3 is a longitudinal substantially central vertical sectional view, partly in elevation, of the stock feeder with certain of the parts in a different adjusted position, from the position of the parts as shown in Figure 2, for a reduced feed stroke of the feeder;

Figure 4 is a cross sectional view through the main feeding piston, taken substantially along a plane as indicated by the line 4—4 of Figure 3, and showing the stock gripping means in a released position;

Figure 5 is a cross sectional view taken substantially along a plane as indicated by the line 5—5 of Figure 2;

Figure 6 is a fragmentary front end elevational view looking from left to right of Figures 2 and 3;

Figure 7 is a detailed cross sectional view, taken substantially along a plane as indicated by the line 7—7 of Figure 3;

Figure 8 is a fragmentary cross sectional view, partly in elevation, taken substantially along a plane as indicated by the line 8—8 of Figure 3;

Figure 9 is a fragmentary sectional view similar to a portion of Figure 8 but showing a different position of the movable part of the valve;

Figure 10 is an enlarged side elevational view of a part of the feeder shown detached;

Figure 11 is an end view thereof, looking from left to right of Figure 10;

Figure 12 is a side elevational view of the stock feeder and of a part of the punch press on which the feeder is mounted, and

Figure 13 is a fragmentary view taken substantially along a plane as indicated by the line 13—13 of Figure 12.

Referring more specifically to the drawings, portions of a conventional punch press are shown in Figures 1 and 12, and said punch press is designated generally 20. The step-by-step stock feeder, comprising the invention, is designated generally 21 and includes a base 22 which is mounted on and suitably secured to a bolster plate 20*a* of the punch press, as best seen in Figure 12. A main cylinder 23 has a base 23*a* which is mounted on and suitably secured to the base plate 22. Said main cylinder 23 is closed at its ends by end caps 24 and 25.

A main stock feeding piston 26 is slidably mounted in the bore of the cylinder 23 and has a vertical bore extending diametrically therethrough, as best seen in Figures 3 and 4, and which includes a restricted intermediate portion 27 and enlarged end portions 28. Corresponding adjacent ends of a pair of stock gripping dogs 29 are reciprocably disposed in the restricted intermediate bore portion 27 in opposed relation to one another and project therefrom into the enlarged bore ends 28 and have enlargements at the outer ends thereof forming pistons 30 which have relatively close fitting sliding engagement in said enlarged bore ends 28. Compression springs 31 fit loosely around the outer portions of the gripping dogs 29 and are loosely disposed in the bore ends 28 between the inner ends thereof and the pistons 30 for urging said pistons and the gripping dogs radially apart into released positions thereof, as seen in Figure 4. The outer end faces of the pistons 30 are preferably equipped with neoprene cup seals 32 to prevent the escape of air under pressure inwardly through the bore ends 28 past said pistons.

The top portion of the cylinder 23 is provided with an integral raised rib 33 which extends substantially from end-to-end thereof and which is provided with an angular passage 34 in a rear end thereof. One end of a tube 35 is tapped into and communicates with a rearwardly opening end of the passage 34 and extends rearwardly therefrom. A tube 36 is disposed parallel to the tube 35. Tubes 35 and 36 have rear ends which are connected by a tubular coupling 37. The forward end of the tube 36 fits slidably over and has a relatively snug telescopic engagement with the rear end of a tube 38. The forward end of the tube 38 is tapped into an end of an angular passage 39 which opens outwardly of the rear end of the piston 26, and which passage 39 is formed in said piston. Setscrews 40 which are radially adjustable in the piston 26, as seen in Figure 3, secure the forward end of the tube 38 to said piston. The opposite end of the passage 39 communicates with the outer end of one of the enlarged bore ends 28, outwardly with respect to the piston seal 32 thereof. As best seen in Figure 4, the outer portions of the bore ends 28 are connected by a groove 41 formed in the periphery of the piston 26. Thus, when air is supplied to the tubes 35, 36 and 38 from the passage 34, by means hereinafter to be described, air will be supplied by way of the passage 39 and groove 41 simultaneously to both bore ends 28 for displacing the pistons 30 and gripping dogs 29 radially inward with respect to the piston 26.

The rear cap 25 is provided with a large threaded opening 42 to threadedly receive a stroke adjusting sleeve screw 43 which is threaded inwardly therethrough and the inner end of which is engaged by the rear end of the piston 26 to limit movement of the piston toward a

retracted position. A handwheel 44 is secured by a setscrew 44*a*, as seen in Figure 3, to the outer rear end of the sleeve screw 43. The periphery of the handwheel 44 is provided with an annular groove 45 of V-shape in cross section. A bar 46, constituting a linear rule, is secured to the upper side of the tube 35 and has a linear scale 46*a* inscribed on its upper side. A slide 47 is slidably mounted on the rule 46 and includes a top wall 47*a* which rests on and is slidable relative to the inscribed upper surface of the rule 46. A depending substantially V-shaped tapered side wall 47*b* is secured to and extends downwardly from one of the inwardly turned back side edge portions 47*e* of the top wall 47*a*. Said side edge portions 47*e* slidably engage the side edges of the rule 46. The pointed lower end of the side wall 47*b* slidably engages in the groove 45 so that when the handwheel 44 is revolved to move longitudinally of the tube 35, the slide 47 will travel with said handwheel longitudinally relative to the rule 46. A window formed by a magnifying glass 47*c* is formed in the top wall 47*a* and has a transverse hairline 47*d* which can be accurately aligned with the graduations of the linear scale 46*a* for precisely setting the stroke adjusting sleeve screw 43, by rotation of the handwheel 44, for accurately setting the lengths of the strokes of the piston to thousandths of an inch.

The main piston 26 has a hollow shaft 48 fixed to and extending from the forward side thereof and which projects slidably through an opening 49 formed in the front cap 24. A similar hollow shaft 50 is formed integral with and projects rearwardly from the opposite rear end of the main piston 26 and fits reciprocably in the stroke adjusting sleeve 43. A front stock straightener 51 is detachably mounted in the front hollow piston shaft 48 and a rear stock straightener 52 is detachably mounted in the hollow rear shaft 50. The end caps 24 and 25 are detachably secured to the ends of the cylinder 23 by screw fastenings 73, so that said end caps may be removed for applying and removing the main piston 26.

The stock straighteners 51 and 52 are provided to reduce the arc on stock 53, in the form of a strip, which is fed intermittently to the punch press 20 and which passes longitudinally through the hollow shafts 50 and 48 and through a horizontal opening 54 of the main piston 26, which is intersected by the intermediate portion of the vertical bore 27.

The front stock straightener 51 includes a front end disk 55 which is secured in the recessed forward end of the hollow shaft 48 by a setscrew 57, and a rear or inner end disk 56 which is disposed in the inner end of the hollow shaft 48, against the forward side of the piston 26. The disks 55 and 56 are connected by a rigid strip 58 which extends between and is secured to the adjacent sides of said disks. The strip 58 is disposed in a horizontal plane and is of a width only slightly less than the diameter of the bore of the hollow shaft 48, as seen in Figure 7. The end disks 55 and 56 are provided with horizontally disposed elongated openings or slots 59 and 60, respectively, which align with the opening 54 of the piston 26, and which are positioned with the lower portions thereof disposed below the level of the underside of the rigid strip or bar 58. The disks 55 and 56 have aligned bores 61 and 62, respectively, which are disposed beneath and adjacent the openings 59 and 60, respectively. The bore 61 extends through an external boss 63 formed on the outer or front side of the front disk 55. Said bores 61 and 62 provide journals for the aligned shaft ends 64 and 65, respectively, which are integrally joined by an intermediate shaft portion 66 which is enlarged and eccentrically disposed relative to the aligned shaft ends 64 and 65. The outer end of the forward shaft end 64 is provided with a screw driver blade receiving kerf 67 by means of which the shaft 64, 65, 66 can be rotated in the journals 61 and 62 for displacing the eccentric shaft portion 66 either toward or away from the bar 58. A setscrew 68 is threadedly mounted in the boss 63 and is positioned to be advanced into engagement with the shaft end 64 for securing the eccentric shaft portion 66 in a desired adjusted position relative to the bar 58.

The rear stock straightener 52 includes an outer disk 69 and an inner disk 70, which are mounted in the rear hollow shaft 50, in the same manner that the disks 55 and 56, respectively, are mounted in the hollow shaft 48. The outer disk 69 is secured by a setscrew 71 to the hollow shaft 50. The disks 69 and 70 have openings 59*a* and 60*a*, corresponding to the openings 59 and 60, respectively, and are connected by a bar 58*a*, corresponding to the bar 58. Shaft ends 64*a* and 65*a*, corresponding to the shaft ends 64 and 65, respectively, are journalled in the disks 69 and 70 in the same manner that the shaft ends 64 and 65 are journalled in the disks 55 and 56. An eccentric intermediate shaft portion 66*a*, corresponding to the shaft portion 66, extends between and is integrally connected to the shaft ends 65*a* and 64*a* and functions in the same manner with the bar 58*a* as the shaft portion 66 functions with the bar 58. The disk 69 has an external boss 63*a* in which is mounted a setscrew 68*a* which performs the same function as the setscrew 68. The upper portion of the disk 69 is provided with an opening 71*a* through which the tube 36 loosely extends and the disk 70 has an opening 72 in which a portion of the tube 38 is loosely accommodated. As clearly illustrated in Figure 3, the strip stock 53 extends through the openings 59*a*, 60*a*, 60 and 59 and between the bar 58*a* and the eccentric shaft portion 66*a* and also between the bar 58 and the eccentric shaft portion 66, behind and in advance of the horizontal piston opening 54.

A yoke 74 has an annular intermediate portion 75 which is secured around the outer end of the hollow shaft 48 by the fastening 57. A pair of apertured lugs 76 project laterally from the cylinder 23, adjacent the rear end cap 25. Corresponding ends of a pair of contractile springs 77 are adjustably connected to the lugs 76 by bolt and wingnut fastenings 78 which extend through said lugs. The springs 77 extend forwardly from the fastenings 78 and are connected at their forward ends to the ends of the yoke 74 by bolt and nut fastenings 79 which are adjustably mounted in the ends of said yoke, as best seen in Figure 2. It will be readily apparent that the contractile springs 77 urge the yoke 74 and the piston 26, which is connected to said yoke by the hollow shaft 48, rearwardly of the cylinder 23 or from left to right, to normally retain the rear end of the piston 26 in abutting engagement with the inner end of the stroke adjusting screw 43. The extent of movement of the piston 26 under the biasing action of the springs 77 varies depending upon the adjustment of the screw 43. In Figure 2 the screw 43 is in a retracted position to permit the piston 26 to move to the extreme rear end of the cylinder 23, while in Figure 3 the stroke adjusting screw 43 is advanced forwardly to stop the movement of the piston 26 at a point spaced substantially from the rear end of the cylinder 23.

A stock locking assembly, designated generally 80, includes a rod 81 having a rear end which is anchored in the forward end of the upstanding cylinder rib 33, as seen in Figure 3. The rod 81 extends forwardly from said rib 33 and has an L-shaped bracket 82 connected to and supported by the forward end thereof and which extends downwardly therefrom. The horizontal bottom portion 84 of the bracket 82 extends inwardly or toward the forward end of the cylinder 23 and includes a recessed upper portion 85 in which a stock locking pawl 86 is pivotally mounted on a pin 87. The bracket 82 includes a detachably mounted bottom plate 88 which combines with a portion of the bracket disposed thereabove to provide a slot 89 which extends longitudinally of the horizontal bracket portion 84 and which is disposed in alignment with the opening 59 to slidably re-

ceive the stock 53. A spring 90, carried by the bracket portion 84 and bearing against an underside of the rear end of the pawl 86, urges said pawl to rock about its pivot 87 for urging the nose 91 of the pawl downwardly into the slot 89. Said pawl nose 91 is inclined downwardly and forwardly from the pivot 87, in a direction away from the cylinder 23, as seen in Figure 3. Thus, the pawl nose 91 engages the stock 53 to prevent the stock from sliding rearwardly through the slot 89 toward the hollow shaft 48, but will yield upwardly to permit the stock to slide in the opposite direction or forwardly through the slot 89. The bracket 82 is disposed in advance of the forwardmost extent of travel of the boss 63, as seen in Figure 12.

As best illustrated in Figure 8, a plate 92 is fastened to one side of the upstanding rib 33 and extends upwardly therefrom. A bracket arm 93 is fixed to and projects laterally from the plate 92, in a direction away from the rib 33 and is disposed adjacent the level of the upper surface of said rib. Two solenoids 94 are disposed in side-by-side relation on the bracket arm 93. Two valve housings 95 have open ends which are secured aaginst one side of the upper portion of the plate 92 by fastenings 96. Said valve housings 95 extend from the plate 92 across the upper surface of the rib 33 and have portions thereof resting thereon. The valve housings 95 are disposed in alignment with the solenoids 94, one housing constituting a part of a valve, designated generally 97, and the other housing constituting a part of a valve, designated generally 98. Rods 99 forming extensions of the armatures of the solenoids 94 extend slidably through openings 100 in the plate 92 and into the valve housings 95. An end of a conduit 101 is tapped into the top portion of the valve housing 95 of valve 97 and an end of a conduit 102 is tapped into the top portion of the housing of the valve 98. Said conduits connect with the valve housings approximately midway between the plate 92, which closes corresponding ends of said valve housings, and the opposite closed ends of said valve housings.

Each housing 95 contains a reciprocably mounted hollow piston or core 104 having a hollow interior providing an air chamber 105. Said valve cores or pistons have detachable end walls 106 facing the plate 92 and which are detachably applied for sealing the chambers 105 by fastenings 107. The opposite end of each piston 104 has a threaded opening 108 to receive a telescopic end of a tube 109 which is threadedly connected thereto and which extends slidably through an opening 110 in the housing end wall 103. The tubes 109 lead from a source of air supply under presure, such as a compressor, not shown, for supplying compressed air to the valve core chambers 105. Each piston 104 has a radial port 111 opening outwardly thereof and communicating with the chamber 105 of said piston. The ports 111 are disposed to move into communication with the ends of the conduits 101 and 102, which connect with said valves, when the solenoids 94 are energized, as illustrated in Figure 8. Each valve housing 95 is provided with an exhaust port 112 disposed between the point where the conduit 101 or 102 connects therewith and the plate 92. A compression spring 113 is mounted in the housing of each valve on the rod 99 thereof, between the plate 92 and the valve piston end wall 106, for urging said valve pistons 104 to positons against the end walls 103, when the solenoids are de-energized, as illustrated in Figure 9. With the valve cores 104 thus disposed, the ends of the conduits 101 and 102 which are tapped into the valve housings are in communication with the exhaust ports 112 to allow the air under pressure to escape back through said conduits and be exhausted through the valves 97 and 98 to the atmosphere.

As best seen in Figures 2 and 5, the other end of the conduit 101 leading from the valve 97 is tapped into the rib 33 and communicates with the air supply tube 35 through the passage 34. The opposite end of the conduit 102 is tapped into the wall of the cylinder 23 and communicates with the bore of said cylinder adjacent the rear end cap 25, as best seen in Figure 5. The rear end of the piston 26 has a bevel surface 114 into which the conduit 102 opens, so that even when the piston 26 is in a fully retracted positon against the rear cap 25, as seen in Figure 2, the connection of the conduit 102 with the cylinder will not be sealed off and compresed air can be supplied to the cylinder 23 behind the piston 26 for forcing the piston from right to left toward the front cap 24 to accomplish the stock feeding stroke of the feeder 21.

As best seen in Figure 13, the solenoid 94 of the valve 97 is connected by electric wiring 115 to an electric current source 116, and the solenoid 94 of the valve 98 is connected by electric wiring 117 to the current source 116. Two normally open electric switches 118 and 119 are supported on a stationary part 120 of the punch press 20. Said switches 118 and 119 have actuating lever arms 121 and 122, respectively, extending toward one another and which are swingable upwardly to cause the switches 118 and 119 to assume circuit closing positions, and which actuating arms normally return to circuit interrupting positions of the switches. The switch 118 is interposed in the circuit 115 and the switch 119 is interposed in the circuit 117. A standard 123 is fixed to and rises from the base of the vertically reciprocating die shoe 124 of the punch press 20. A cam 125 is supported in different vertically adjusted positions on the standard 123 by a clamping screw 126 which extends through a vertically elongated slot 127 of the cam 125 and which is threaded into a part of the standard 123. A pin 128 projects from the standard 123 into the slot 127 to cooperate with the fastening 126 to prevent turning of the cam 125 relative to the standard. The standard 123 has a cam part 129 which is formed integral therewith and which is disposed to engage the lever arm 122 when the standard is displaced upwardly with the die shoe base 124 for closing the electric circuit 117. The cam 125 is disposed to engage the switch arm 121 as the standard 123 moves upwardly for closing the switch 118 of the electric circuit 115. As seen in Figure 13, the cam 125 is adjustable for engaging and actuating the switch 118 prior to the time that the switch 119 is moved to a circuit closing position by the cam 129 and this time interval can be varied by vertical adjustment of the cam 125 on the standard 123.

As seen in Figure 3, a setscrew 130 which is threadedly mounted in the cap 25 can be advanced against the stroke adjusting screw 43 to secure said screw in a desired adjusted position relative to the cylinder 23. As seen in Figure 6, the front end cap 24 is provided with a vent port 131 which opens into the cylinder 23 and to the atmosphere. A screw 132 is threaded radially into the cap 24 to restrict the port 131 to a desired extent to regulate the passage of air through the port 131 to or from the cylinder 23.

As seen in Figures 10 and 11, the outer side of the front disk 55 may have a stock centering plate 133 secured thereto by fastenings 134, above the boss 63. The bottom edge of the plate 133 which overlies the disk opening 59, has a notch 135 of a desired width, to expose a desired portion of the opening 59 for accommodating stock 53 of a particular width, to maintain the stock horizontally centered as it passes from the front stock aligner 51. Obviously, plates 133 having notches 135 of different widths may be interchangeably mounted in the outer side of the disk 55.

Assuming that the stock feeder 21 is assembled as illustrated in the drawings and that the strip stock 53 is extending therethrough, as illustrated in Figures 3 and 12, on the upstroke of the die shoe base 124 the cam 125 will initially engage the switch arm 121 to close the switch 118 so that the solenoid 94 of the valve 97 will be energized. When this occurs, the rod 99 of said solenoid will be pulled from right to left to cause the piston 104 of

the valve 97 to move from the valve position as shown in Figure 9 to the valve position of Figure 8 for connecting the piston port 111 thereof with the conduit 101 so that the compressed air will be supplied to the conduit 101 from the tube 109, as clearly illustrated in Figure 8. The compressed air from the conduit 101 will pass through the passage 34, tube 35, coupling 37, tubes 36 and 38 and passage 39 to the groove forming passage 41, so that air will be supplied under pressure simultaneously to the outer ends of the bore portions 28 for displacing the pistons 30 inwardly to cause the stock gripping dogs 29 to clamp a portion of the stock 53 therebetween.

The aforedescribed stock gripping operation of the feeder 21 is accomplished during the brief time interval after the switch 118 is moved to a circuit closing position by the cam 125 until the switch 119 is thereafter moved to a circuit closing position by the cam 129.

When the switch 119 subsequently closes the circuit 117 the solenoid 94 of the valve 98 is energized for moving the piston 104 of said valve to the position as shown in Figure 8 so that air under pressure is then supplied through the valve 98 and conduit 102 to the rear end of the cylinder 23. The compressed air in the cylinder 23 behind the piston 26 will drive said piston and the hollow shafts 48 and 50 thereof forwardly or from right to left from the retracted positions of said parts as disclosed in Figure 2 or 3 to a projected position as seen in Figure 12, for accomplishing the feeding stroke of the feeder 21. The stock 53 will be carried forward with the piston 26 on the feed stroke, due to the fact that a portion thereof is clamped between the dogs 29. The stock 53 will slide forwardly through the stock locking assembly 80, as previously described, during the feed stroke. During the feed stroke the contractile springs 77 are placed under tension. This tension and the restriction in the escape of air from the cylinder 23 in advance of the piston 26, through the port 131 regulates the speed of movement of the piston 26 on the feed stroke, so that the die shoe 124 will commence its downward movement before the piston 26 reaches the front cap 24. During the initial stages of downward travel of the die shoe 124, the cam 125 first moves out of engagement with the lever 121 to permit the switch 118 to resume a circuit interrupting position, after which the cam 129 moves out of engagement with the lever arm 122 to allow the switch 119 to resume a circuit interrupting position. Thus, the solenoid 94 of the valve 97 is first de-energized so that the spring 113 of said valve can move the valve piston 104 to the position as seen in Figure 9 for releasing the compressed air from the pistons 30 to allow the springs 31 to displace the gripping dogs 29 away from one another and out of engagement with the stock 53. The compressed air, as previously stated, escapes through the conduit 102 through the housing of the valve 97 and thence to the atmosphere through the escape port 112. Thereafter, the solenoid 94 of the valve 98 is de-energized so that the piston 104 of said valve will also assume the position as shown in Figure 9 to allow the compressed air to escape to the atmosphere in the same manner from the cylinder 23, behind the piston 26. As this escape of air commences, the tension springs 77 will draw the piston 26 and the parts connected thereto rearwardly or from left to right as seen in Figure 3 on the return stroke of the feeder. During the return stroke the pawl nose 91 by engagement with the stock 53 will hold the stock immovable relative to the stock locking assembly 80, so that the piston 26 and the stock aligners 51 and 52 will slide rearwardly relative to the stock 53. The vent port 131 will retard the travel of the piston 26 on its return stroke so that it will not forcibly strike the stroke adjusting sleeve screw 43. It will also be apparent that during the feed stroke and return stroke the tube 38 will telescope outwardly and then inwardly with respect to the tube 36.

The shaft portions 66 and 66a are adjusted relative to the bars 58 and 58a, respectively, so that when the stock straighteners 51 and 52 slide relative to the stock 53 on the return stroke of the feeder 21, the stock will be held flat as it enters the feeder and the portion thereof disposed between the disks 55 and 69 will be maintained flat. Thus, the stock which is normally supplied to the feeder 21 from a reel will be prevented from arcing toward a curvature corresponding to the lose diameter of the wound stock which would cause a variation of the length of the stock fed on each feeding stroke, depending upon the extent that the stock was permitted to arc in advance of the gripping dogs 29.

The operation previously described will be repeated on each up and down stroke of the die shoe 124 to thus intermittently feed the stock 53 in a step-by-step movement to the punch press 20 and with a high degree of accuracy as to the length of the stock fed on each feeding stroke. As previously described, the length of the stock fed on each stroke can be accurately adjusted by turning the handwheel 44 and utilizing the rule 46 in conjunction with the slide 47 to obtain accurate adjustments of the stroke adjusting screw 43, for thus accurately adjusting the distance of movement of the piston on the feed stroke from its retracted position in engagement with the screw 43 to its forwardmost projected position in engagement with the cap 24.

Various modifications and changes are contemplated and may be resorted to, without departing from the function or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. In a stock feeder for use with an automatic material processing machine comprising, in combination with a cylinder having a forward end and a rear end provided with aligned openings, hollow shafts extending reciprocably through said openings of the cylinder ends, a piston reciprocably mounted in said cylinder and interposed between and connected to adjacent ends of said hollow shafts, fluid pressure actuated gripping dogs reciprocably mounted radially in said piston in opposed relation to one another, spring means urging said gripping dogs away from one another toward released positions, said piston having an opening extending therethrough and disposed crosswise of the gripping dogs forming a passage for stock in strip form, spring means connected to and disposed externally of the cylinder and connected to the hollow shaft which extends through the forward cylinder end for urging the piston toward a retracted position adjacent the rear cylinder end, and stock locking means supported by said cylinder and disposed in advance of the forwardmost position of movement of the hollow shaft which extends through the front cylinder end, said stock locking means including a slot through which the stock is fed and gripping means permitting the stock to be fed through the stock locking means away from the cylinder and preventing movement of the stock through the stock locking means toward the cylinder; means for supplying a fluid medium under pressure to the piston for moving said gripping dogs into gripping engagement with the stock, and means for subsequently supplying a fluid medium under pressure to the cylinder between the piston and the rear cylinder end for moving the piston and the stock forwardly in a direction toward the front cylinder end.

2. In a stock feeder as in claim 1, said means for supplying the fluid medium under pressure to the piston including a conduit having a telescopic section extending forwardly through the rear cylinder end and connected to the end of the piston located adjacent said rear cylinder end.

3. In a stock feeder as in claim 2, wherein said means for supplying a fluid medium under pressure to the piston additionally includes a passage formed in the piston and communicating with said conduit for supplying the fluid medium under pressure to the outer ends of both gripping dogs simultaneously.

4. In a stock feeder as in claim 1, a stock straightener

assembly mounted in the hollow shaft which extends through said front cylinder end and including spaced elements between which the stock is adapted to extend and which are adapted to engage opposite sides of the stock to prevent arcing of the stock between the piston and said stock locking means.

5. In a stock feeder as in claim 4, one of said elements of said stock straightening assembly being adjustable toward and away from the other element for varying the spacing between said elements.

6. In a stock feeder as in claim 5, said adjustable element of the stock straightening assembly comprising an eccentric shaft portion forming an intermediate part of a shaft having aligned ends, one of said aligned ends having an exposed terminal provided with a screw driver blade receiving kerf for turning the shaft to move said eccentric portion toward or away from said other element.

7. In a stock feeder as in claim 1, and a hollow stroke adjusting screw extending threadedly through said rear cylinder end and in which the hollow shaft which extends rearwardly from the piston is reciprocably mounted, the inner end of said stroke adjusting screw being engageable by the piston when the piston is moved to a retracted position for varying the spacing between the piston and the rear end of the cylinder, in the retracted position of the piston, for varying the length of the feed stroke of the piston.

8. In a stock feeder as in claim 7, a handwheel fixed to an outer rear end of said stroke adjusting screw and having an annular portion defining an index line, and a fixed linear scale disposed longitudinally of said cylinder and extending beyond the rear end thereof and along which the index line of the handwheel is movable.

9. In a stock feeder as in claim 8, and a second stock straightening assembly mounted in the other rear horizontal shaft.

10. In a stock feeder as in claim 1, said forward cylinder end being provided with a vent port, and means for adjustably restricting the size of said vent port to vary the rate of the passage of air therethrough into and out of the forward portion of the cylinder for varying the rate of movement of the piston on the feed stroke and return stroke thereof.

No references cited.