Nov. 17, 1964 G. R. BUNNELL ETAL 3,157,334

STOCK FEEDER

Filed Sept. 24, 1962 3 Sheets-Sheet 1

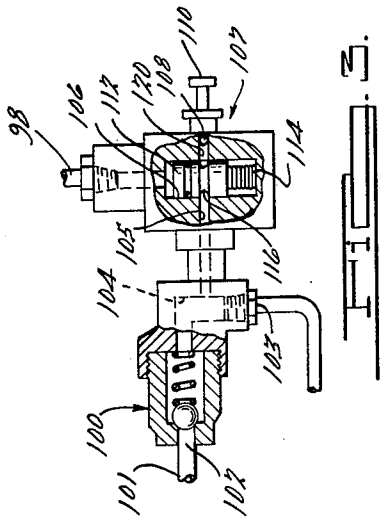


FIG. 2.

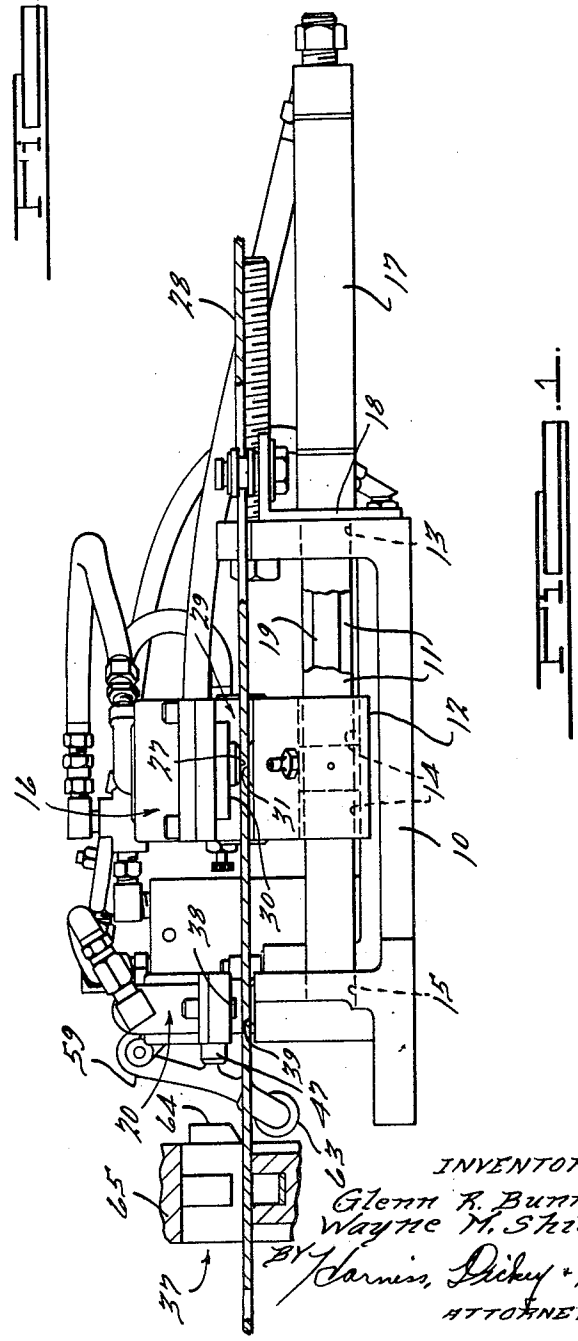


FIG. 1.

INVENTORS.
Glenn R. Bunnell
Wayne M. Shields.
BY Harness, Dickey & Pierce
ATTORNEYS.

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STOCK FEEDER

Filed Sept. 24, 1962 3 Sheets-Sheet 2

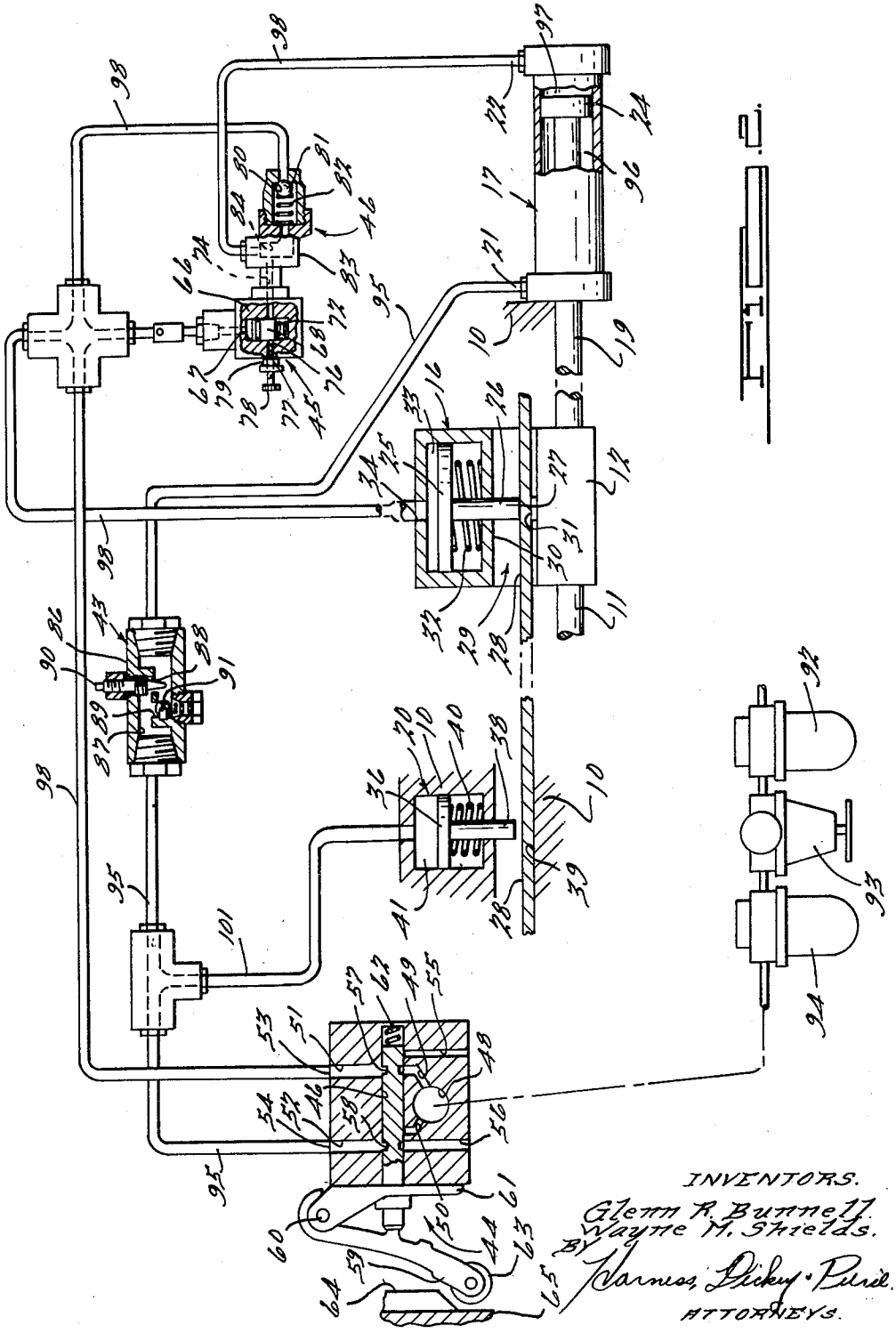


Fig. 1

INVENTORS.
Glenn R. Bunnell
Wayne M. Shields.
BY
Barnes, Dickey & Pierce
ATTORNEYS.

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STOCK FEEDER

Filed Sept. 24, 1962 3 Sheets-Sheet 3

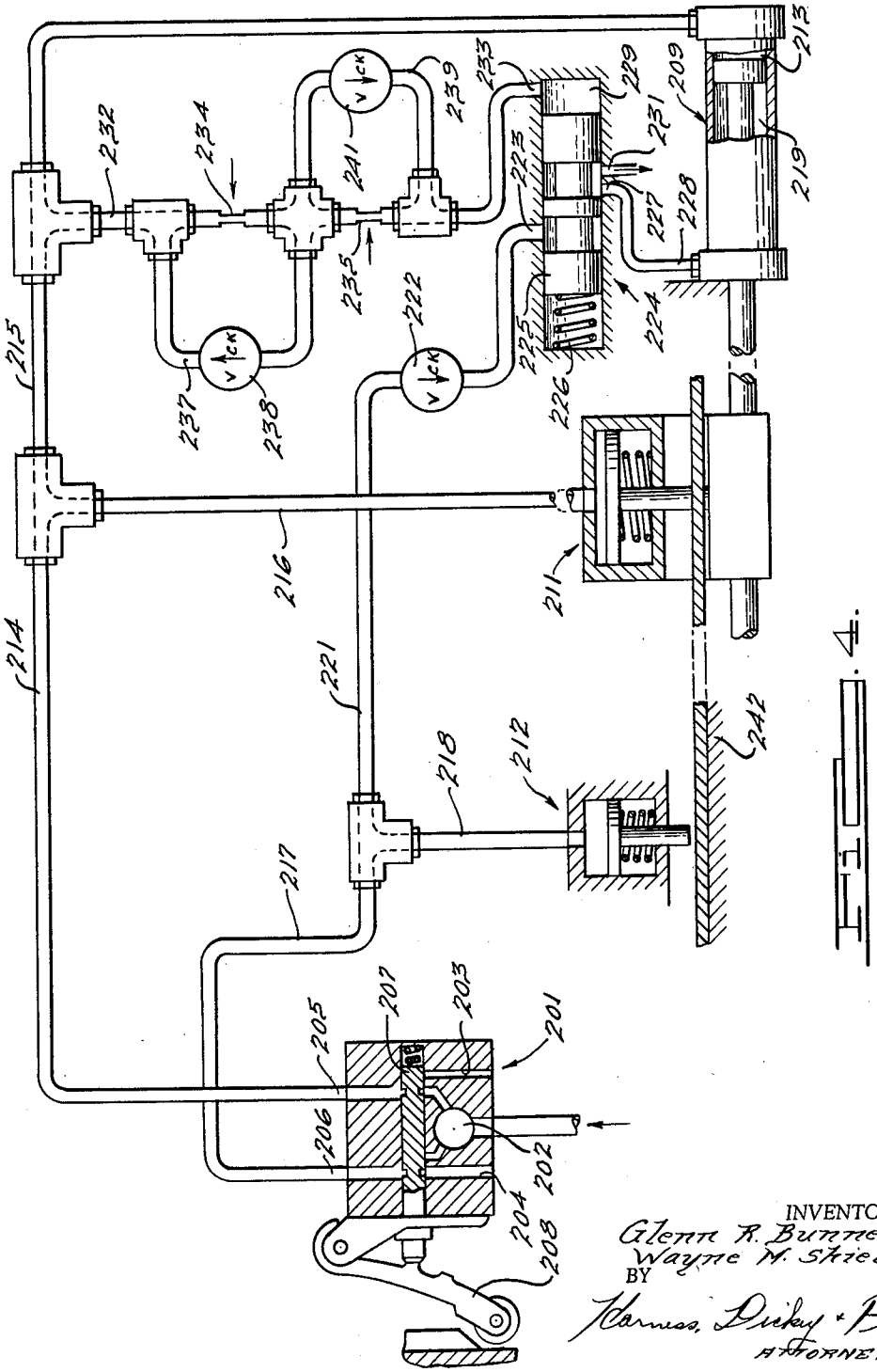


Fig. 4.

INVENTORS.
Glenn R. Bunnell
Wayne M. Shields.
BY
Harness, Dickey & Pierce.
ATTORNEYS

United States Patent Office

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3,157,334

STOCK FEEDER

Glenn R. Bunnell, Dearborn, and Wayne M. Shields, Bloomfield Township, Mich., assignors to Special Engineering Service, Inc., Dearborn, Mich., a corporation of Michigan

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20 Claims. (Cl. 226—150)

This invention relates to fluid powered strip stock feeding devices which operate to intermittently advance the stock from one station to another, and particularly concerns an improved fluid system therefor. This application is a continuation-in-part of Serial No. 140,886 filed by applicants on September 26, 1961, now abandoned.

In high speed production manufacturing plants which have operations requiring punching, stamping or forming of sheet metal, it is customary to provide stock feeding apparatus which may be attached to the side of the metal working machine or on a table which can be moved next to the machine for gripping the sheet metal stock and feeding the same thereto in intermittent steps. Where the sheet metal stock is provided to the plant in the form of large heavy coils, many problems arise in properly positioning the sheet metal in the machine and retaining it therein during the operation of the machine. It may occur, for example, that a stock feeding device does not properly release the stock prior to retraction of its carriage and gripper to their initial operating positions which thereby results in pulling of the stock backwardly from the machine. It may also occur that the stock feeding device will begin its stock advancing stroke before the stock is properly gripped and thereby results in improper positioning of the stock in the machine. Moreover, where the weight of the stock coming off of the coil tends to pull the stock back out of the stock feeder, it is desirable that some positive means be provided for preventing release of the stock by the feeder before the gripper thereof has a firm hold on the stock.

It is, therefore, an object of this invention to provide a stock feeding device having a fluid power system conveniently operable by moving portions of a metal working machine and which insures positive and accurate positioning of the stock within the machine.

Another object is to provide an actuating fluid system for a stock feeding device having an air actuated carriage, a stock gripper carried thereby and a stationary retainer, wherein the system is provided with a double acting stock feeding motor, and restriction means are provided for controlling the exhaust from the retracting end of the motor, thereby insuring proper clamping of the stock by the gripper and release by the retainer before the stock is advanced, thus eliminating the need for control of pressure to the advancing end of the stock feeding motor in order to insure proper gripper and retainer action.

A further object is to provide the stock feeding device and fluid system of the above objects with a stock retaining device which is operable to hold the stock in its advanced position during the retraction of the carriage and gripper to their initial positions, and which is further operable to release the stock after the gripper has been actuated to grip the stock but before the carriage begins to move toward its advanced position.

Further objects, advantages and novel features will become apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of the stock feeding device with portions broken away wherein the carriage of the device and the stock are shown part way through their forward motion;

FIGURE 2 is a diagrammatic view of the stock feeding device and its fluid supply system with portions thereof shown in section, wherein the various components are shown in position for advancing the carriage and stock;

FIGURE 3 is a partial sectional view of additional valving structure for the fluid supply system shown in position for exhausting the stock retainer air chamber; and

FIGURE 4 is a diagrammatic view of another embodiment of the invention wherein the restriction means for delaying advance of the carriage motor controls shifting of a valve which controls fluid flow to the retracting end of the carriage motor.

In the drawing, the ends of a base 10 are shown supporting a pair of horizontally spaced and parallel carriage rails 11 upon which is slidably mounted a carriage 12. These rails and carriage are assembled on the base by passing the rails first through apertures 13 in one end of the base, then through the bearings 14 in the carriage and then into apertures 15 in the other end of the base which are aligned with apertures 13. One set of these apertures such as 15 may be of such a diameter relative to the diameters of the rails that the rails are tightly frictionally held therein. A gripper 16 is supported on the carriage and may be partially integrally formed therewith as in a casting operation. A carriage motor comprising a double acting air cylinder 17 is supported by a bracket 18 on the end of the base and the piston rod 19 is connected to the carriage 12. A stock retainer 20 is mounted on the other end of the base.

In further explanation of the basic portions of applicants' stock feeding device, the cylinder 17 is of the double acting type and is provided with air ports 21 and 22. These ports allow air to be received by and expelled from cylinder 17 on opposite sides of piston 24 to provide a power stroke in either direction. Gripper 16 is provided with a piston 25 having considerably more effective area than piston 24 and is provided with a rod 26, the end 27 of which is adapted to grip the sheet metal stock 28 which is slid into the laterally extending cavity 29 intermediate the bottom 30 of the gripper and a sliding surface or anvil 31 on carrier 12. A spring 32 returns the piston 25 to an up position to disengage the shaft 26 from the stock 28 when air is exhausted from the chamber 33 of the gripper through a port 34. The stock retainer 20 is of similar construction to gripper 16 and is provided with a piston 36 which may be of considerably less effective area than piston 25 since the function of retainer 20 is merely to prevent the stock from sliding from its position within the press or other machine 37 after the gripper has released its hold on the stock. The piston 36 is provided with a stock-engaging shaft 38 which engages the stock and holds it in position on a sliding surface or anvil 39 on base 10. A return spring 40 returns the piston to its up position when air is exhausted from the chamber 41 through the line 95.

The air system for supplying actuating air to cylinder 17, gripper 16, and retainer 20, and for exhausting air therefrom comprises a 4-way valve 44, a pressure responsive exhaust valve 45, and a check valve 46. An air flow control valve 43 may also be provided to enhance the operation of the system in a manner to be hereinafter described.

The valve 44 is provided with a reciprocal valve plunger 47, an air inlet port 48 communicating directly with passages 49 and 50, a pair of passages 51 and 52 providing ports 53 and 54, respectively, and a pair of exhaust passages 55 and 56. The plunger 47 is provided with a pair of circumferential grooves 57 and 58 which are adapted to connect the conduits 51 and 52, respectively, to inlet 48 and to exhaust passages 55 and 56. An actuating arm 59 is pivotally mounted at 60 to an

end plate 61 attached to the valve body and engages the end of plunger 47 to move the same to the right against the action of a spring 62. The arm is actuated when a roller 63 on the end thereof is engaged by a cam 64 on the press ram 65 which pivots the arm 59 in a counter-clockwise direction with respect to FIGURE 2.

The pressure responsive exhaust valve 45 comprises a body 66 having a bore therein forming a chamber 67 slidably receiving a piston 68. A spring 72 urges the piston to an up position so as to connect an air conduit 74 to an air conduit 76 which is connected through an air bleed or exhaust port 77 adjustable by a needle valve 78 threadedly received in boss 79.

Check valve 46 is provided with a seat 80, a ball 81, and a spring 82. This arrangement allows air flow through the check valve to the left but not to the right. Check valve 46 is threadedly received into a conduit joining member 83 provided with a passageway 84 connected to the passage 74.

The air flow control valve 43 comprises a body 85 having a passage 87 therein provided with two orifices 88 and 89. A needle valve 90 adjusts the size of orifice 88 to regulate the flow of air to the left with respect to FIGURE 2, and the port 89 is engaged by a lightly spring-urged bail 91 which allows substantially free air flow through the valve to the right but not to the left. This type of valve is well-known and is available under the name of Pneu-Trol, which is a registered trade name of Auto-Ponents, Inc., of Bellwood, Illinois.

In the operation of the air system and the stock feeding device, air is supplied under pressure preferably from about 80 to about 100 p.s.i. to a filter 92, air flow regulator 93, and an oil-type of air lubricator 94 from which the air is then conveyed through a suitable air line to the inlet port 48 of the valve 44. After the press ram has been activated to perform work on the stock 28 as shown in FIGURE 1 and the press ram 65 and cam 64 have been retracted to their up position, plunger 47 is forced to the left as shown in FIGURE 2 to connect the retracting side or chamber 96 of cylinder 17 to exhaust passage 56 through a conduit 95. The flow control valve 43 regulates the rate at which chamber 96 is exhausted to thereby control the speed of forward motion of piston 24 and carriage 12. Chamber 41 of the retainer 20 is simultaneously exhausted through line 95 and the small size of this chamber and the spring 40 allow the shaft 38 to rapidly release the stock prior to any forward motion of piston 24 to thereby prevent any buckling of the stock due to premature actuation of piston 24 to the left. A more positive acting means for exhausting chamber 41 is hereinafter described.

Simultaneously with the exhausting of chamber 96, the advancing side or chamber 97 of cylinder 17 is connected through the conduit 98 to the inlet 48 of valve 44. Ball 81 allows free passage of air to chamber 97 and piston 68 blocks the exhaust passages 74, 76. At the same time, chamber 33 of the gripper 16 is connected by conduit 98 to inlet 48, and the relative effective areas of pistons 24, 25, and 36 and the properly selected sizes of springs 32 and 40, the controlled exhaust of chamber 96, and the inertia of carriage 12 all combine to allow proper clamping of the stock by the gripper prior to the complete release of the stock by retainer 20 and forward movement of the carriage.

After the carriage has completed its forward movement to the left, the press ram is actuated downwardly and the cam 64 strikes roller 63 to actuate the valve plunger 47 to the right in FIGURE 2. Chamber 41 of retainer 20 and chamber 96 of cylinder 17 are thereupon connected to inlet 48 by line 95, and ball 91 of valve 43 retracts against its spring to allow the free flow of air into chamber 96. As retainer 20 is actuated to clamp the stock, chamber 33 of gripper 16 is exhausted and when the air pressure therein reaches a predetermined value, the piston 68 of valve 45 moves upwardly to connect chamber 97 of cylinder 17 to exhaust port 77. The spring 72 and the size of piston 68 must be considered in determining the aforesaid predetermined pressure. It is noted, however, that the sizes of piston 25 and spring 32 also are factors in determining this predetermined pressure since it must be assured that the gripper has released the stock at this pressure. The rate of exhaust of chamber 97 and the retraction rate of the carriage are regulated by the needle valve 78.

When the press ram again moves upwardly to disengage cam 64 from roller 63, plunger 47 is again moved to the left to cause the gripper to again grip the stock and the retainer 20 to release it, and to cause the carriage and stock to again be advanced to the press.

By the connection of another pressure responsive exhaust valve and another check valve in a proper manner to the stock retainer 20 and to gripper 16, it is also possible to positively coordinate the actions of the retainer 20 and the gripper 16 to insure that the retainer does not release the stock prior to the gripping thereof by the gripper.

This may be accomplished by connecting a check valve 100 into the branch 101 of line 95 so that the inlet 102 of the valve communicates directly with feed line 95, and the outlet 103 of the valve directly with chamber 41. The chamber 41 is also connected by the passages 104 and 105 to the cylinder 106 of a pressure responsive exhaust valve 107 which cylinder is connected to the air supply line 98 of gripper 16. An exhaust port 108 adjustable in size by needle valve 110 communicates with cylinder 106 and allows chamber 41 of the retainer to exhaust when the pressure in line 98 is sufficient to force piston 112 downwardly against the force of spring 114 to align the peripheral groove 116 in the piston with passages 105 and 120. The relative sizes of the springs 32, 40, and 114, and the relative sizes of pistons 25, 36, and 112 are so selected that the gripper firmly grasps the stock before the retainer releases it.

FIGURE 4 shows another embodiment of the invention in which restriction means are provided for controlling a valve which in turn controls flow of fluid to and from the retracting end of the carriage motor. A control valve is generally indicated at 201, this valve being similar in nature to valve 44 of the previous embodiment and having a supply port 202, exhaust ports 203 and 204, two working ports 205 and 206 and a spool 207 which is normally in the left-hand position shown in FIGURE 4 but is shiftable to the right by a cam-operated lever 208. It will be understood that other means, such as a solenoid (not shown) controlled by a cam-operated switch, could be utilized to shift spool 207.

A carriage motor generally indicated 209, a gripper motor generally indicated 211, and a retainer motor generally indicated at 212 are also provided as in the previous embodiment. Working port 205 is directly connected to the advancing end 213 of carriage motor 209 and to gripper motor 211 by a conduit 214 having branches 215 and 216, respectively. Working port 206 is directly connected to retainer motor 212 by a conduit 217 having a branch 218. A connection to the retracting end 219 of carriage motor 209 is provided by a branch 221 leading from conduit 217 through a check valve 222 which permits flow to but not from a port 223 of a 3-way auxiliary valve generally indicated at 224. Valve 224 has a spool 225 which is urged to a normal right-hand position by a spring 226, the valve when in this right-hand position connecting port 223 to a port 227 which leads to a conduit 228 connected to retracting end 219 of motor 209. When pressure is applied to a chamber 229 at the end of spool 225 opposite spring 226, the spool is shifted to its left-hand position as shown in FIGURE 4, in which position port 223 is cut off from port 227, and the latter is connected to an exhaust port 231.

A branch conduit 232 leads from conduit branch 215 to a port 233 for chamber 229. First and second variable restrictions 234 and 236, respectively, are disposed

in series in branch conduit 232. A bypass 237 for restriction 234 has a check valve 238 permitting flow only from port 233 toward branch conduit 215. A bypass 239 for restriction 236 has a check valve 241 permitting flow only from branch conduit 215 toward port 233.

In operation of the embodiment of FIGURE 4, assuming an initial condition in which the press is retracted and spool 207 of valve 201 is in the left-hand position as shown in FIGURE 4, pressure will be immediately applied to gripper motor 211 and to the advancing end 213 of carriage motor 209. Valve 224 will initially be in its right-hand position, with port 227 connected to port 223 and when in this position, fluid cannot leave the retracting end 219 of carriage motor 209, because of the presence of check valve 222 which blocks escape of the fluid, and the carriage motor will therefore be prevented from advancing. However, fluid will flow from branch conduit 215 through restriction 234 and check valve 241 to valve chamber 229, and when the pressure in chamber 229 has built up sufficiently to overcome spring 226, spool 225 will shift to the left, connecting port 227 to exhaust port 231. Upon connection of retracting end 219 of carriage motor 209 to exhaust, the pressure in advancing end 213 of motor 209 will cause the carriage motor to advance. By this time, gripper motor 211 will have been moved to its gripping position and retainer motor 212 will have been moved to its retracted position since port 206 is connected to exhaust. It will therefore be assured that the advancing of stock 242 will take place only after the stock has been properly gripped by gripper motor 211 and released by retainer motor 212.

After the carriage has completed its forward movement to the left, the press ram is actuated downwardly and spool 207 of valve 201 is shifted to the right. This will cause supply port 202 to be connected to working port 206, while working port 205 is connected to exhaust port 203. Pressure will be immediately supplied to retainer motor 212, clamping stock 242 in its advanced position. Pressure will also be immediately released from gripper motor 211, causing it to move to its retracted position.

The advancing end 213 of carriage motor 209 will be immediately connected to exhaust. However, pressure will not be immediately applied to retracting end 219 of carriage motor 209, since valve spool 225 of valve 224 will be initially in its left-hand position as shown in FIGURE 4. Fluid will flow from chamber 229 through restriction 235 and check valve 238, and when the pressure in chamber 229 has been sufficiently depleted, spring 226 will shift valve spool 225 to the right, connecting ports 223 and 227. This will permit pressure to be applied to retracting end 219 of carriage motor 209, and the carriage will be retracted. It is thus assured that carriage retraction will not occur until stock 242 is properly clamped by retainer motor 212, and gripper motor 211 has been moved to its retracted position.

While it will be apparent that the preferred embodiments herein illustrated are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a stock feeder, a reciprocable carriage, a double acting piston motor for advancing and retracting said carriage, a gripper on said carriage, a single acting piston motor for moving said gripper to a gripping position, resilient means urging said gripper to a retracted position, means for simultaneously applying fluid pressure to said gripper motor and the advancing end of said carriage motor, said gripper motor having a substantially greater effective area than said advancing end of the carriage motor, means for exhausting said gripper motor and applying pressure to the retracting end of said carriage motor, and a valve coacting with one end of said carriage motor, said valve being movable to a first position in response to application of pressure to said gripper motor for preventing retraction of said carriage motor but being movable to a second position in response to diminution of pressure at said gripper motor for permitting retraction of said carriage motor.

2. In a stock feeder, a reciprocable carriage, a double acting piston motor for advancing and retracting said carriage, a gripper on said carriage, a single acting piston motor for moving said gripper to a gripping position, resilient means urging said gripper to a retracted position, means for simultaneously applying fluid pressure to said gripper motor and the advancing end of said carriage motor, said gripper motor having a substantially greater effective area than said advancing end of the carriage motor, means for exhausting said gripper motor and applying pressure to the retracting end of said carriage motor, a valve for blocking fluid flow from the advancing end of said carriage motor, and resilient means responsive to diminution of pressure at said gripper motor for moving said blocking means to an unblocking position, whereby retraction of said carriage motor will be permitted.

3. In a stock feeder, a reciprocable carriage, a double acting piston motor for advancing and retracting said carriage, a gripper on said carriage, a gripper motor for causing said gripper to move to a gripping position, a first line leading to the advancing of said carriage motor, a second line leading to the retracting end of said carriage motor, a third line leading to said gripper motor, means for simultaneously pressurizing said second line and connecting said first and third lines to exhaust, a check valve in said first line permitting flow only to the advancing end of said carriage motor, an exhaust tap in said first line between said check valve and the advancing end of said carriage motor, a blocking member in said tap movable to a blocking position in response to fluid pressure at said gripper motor, and means responsive to diminution of pressure at said gripper motor for moving said blocking member to an unblocking position whereby the advancing end of said carriage motor will be connected to exhaust.

4. The combination according to claim 3, said exhaust tap being further provided with an adjustably restricted orifice.

5. In a stock feeding device, a reciprocable carriage, a piston motor for advancing said carriage, a gripper on said carriage, a gripper motor for moving said gripper to a gripping position, means for simultaneously applying fluid pressure from a common source to said motors, the effective area of said gripper motor means being substantially greater than the effective area of said carriage motor, means for connecting the carriage and gripper motors to exhaust, and an adjustably restricted orifice in the carriage motor exhaust connection.

6. In a stock feeding device, a reciprocable carriage, a fluid motor for advancing and retracting said carriage, a gripper on said carriage, a piston motor for moving said gripper to a gripping position, a stock retainer, a piston motor for moving said stock retainer to a retaining position, an exhaust conduit for said retainer piston motor, and a blocking member in said exhaust conduit having a normal blocking position but responsive to application of pressure to said gripper piston motor for moving to an unblocking position permitting exhaustion of said retainer piston motor.

7. The combination according to claim 6, further provided with an adjustably restricted orifice in said exhaust conduit.

8. In a stock feeder, a reciprocable carriage, a piston motor for advancing said carriage, a gripper on said carriage, a piston motor for moving said gripper to a gripping position, means for simultaneously applying fluid pressure to said motors, the effective area of said gripper motor being substantially greater than the effective area of said carriage motor, a stock retainer, a piston motor for moving said stock retainer to a retaining posi-

tion, an exhaust conduit for said retainer motor, a blocking member in said exhaust conduit having a normal blocking position, and means responsive to application of pressure to said gripper motor for moving said blocking member to an unblocking position.

9. In a stock feeder, a reciprocable carriage, a double acting piston motor for advancing and retracting said carriage, a gripper on said carriage, a piston motor for moving said gripper to a gripping position, a stock retainer, a piston motor for moving said stock retainer to a retaining position, means for simultaneously applying pressure to the advancing end of said carriage motor and to said gripper motor and for exhausting the retracting end of said carriage motor and said retainer motor, the effective area of said gripper motor being substantially greater than the effective area of the advancing end of said carriage motor, the effective area of said retainer motor being substantially smaller than the effective area of the advancing end of said carriage motor, an adjustably restricted orifice in the exhaust connection for the retracting end of said carriage motor, means for preventing exhausting of said retainer motor until pressure has been applied to said gripper motor, means for simultaneously applying pressure to the retracting end of said carriage motor and to said retainer motor and for connecting the advancing end of said carriage motor and said gripper motor to exhaust, said last-mentioned means including means for delaying the exhausting of said advancing end of the carriage motor until pressure has been depleted at gripper motor, and an adjustably restricted orifice in the exhaust connection for the advancing end of said carriage motor.

10. In a stock feeder, a reciprocable carriage, a double acting fluid actuated carriage motor for advancing and retracting said carriage, a reciprocable gripper on said carriage, a fluid actuated gripper motor for moving said gripper to a gripping position, means for simultaneously applying pressure to the advancing end of said carriage motor and to said gripper motor for moving said gripper to a gripping position, an exhaust connection for the retracting end of said carriage motor, and restriction means for controlling the flow of fluid from the retracting end of said carriage motor to said exhaust connection, whereby said simultaneous application of pressure will cause said gripper to move to its gripping position before said carriage advances.

11. In a stock feeder, a reciprocable carriage, a double tacting fluid actuated carriage motor for advancing and retracting said carriage, a stock retainer, a fluid actuated retainer motor for moving said stock retainer to a retaining position, means for simultaneously supplying fluid under pressure to the advancing end of said carriage motor and connecting said retainer motor to exhaust, an exhaust connection for the retracting end of said carriage motor, and restriction means for controlling the flow of fluid from the retracting end of said carriage motor to said exhaust connection, whereby said retaining motor will be connected to exhaust before said carriage advances.

12. In a stock feeder, a reciprocable carriage, a double acting fluid actuated carriage motor for advancing and retracting said carriage, a reciprocable gripper on said carriage, a fluid actuated gripper motor for moving said gripper to a gripping position, a stock retainer, a fluid actuated retainer motor for moving said retainer to a retaining position, means for simultaneously supplying fluid under pressure to the advancing end of said carriage motor and to said gripper motor and connecting said retainer motor to exhaust, an exhaust connection for the retracting end of said carriage motor, and restriction means for controlling the flow of fluid from the retracting end of said carriage motor to said exhaust connection, whereby said gripper will be moved to its gripping position and said retainer motor will be connected to exhaust before said carriage advances.

13. In a stock feeder, a reciprocable carriage, a double acting fluid actuated carriage motor for advancing and retracting said carriage, a reciprocable stock gripper on said carriage, a fluid actuated gripper motor for moving said gripper to a gripping position, means for simultaneously applying pressure to the advancing end of said carriage motor and to said gripper motor, means for simultaneously connecting the advancing end of said carriage motor and said gripper motor to exhaust, and means for applying fluid pressure to the retracting end of said carriage motor a predetermined time after the advancing end of said carriage motor and said gripper motor have been connected to exhaust.

14. The combination according to claim 13, said last-mentioned means comprising a pressure connection for the retracting end of said carriage motor, a valve in said last-mentioned connection, means responsive to application of pressure to the advancing end of said carriage motor for moving said valve to a position closing said connection, and time delay means responsive to connection of the advancing end of said carriage motor to exhaust for moving said valve to a position opening said connection.

15. The combination according to claim 14, said time delay means comprising a variable restriction and a check valve in parallel relation between said valve and the advancing end of said carriage motor.

16. In a stock feeder, a reciprocable carriage, a double acting fluid actuated carriage motor for advancing and retracting said carriage, a reciprocable stock gripper on said carriage, a fluid actuated gripper motor for moving said gripper to a gripping position, means for simultaneously applying pressure to the advancing end of said carriage motor and to said gripper motor, said gripper motor having a substantially greater effective area than said advancing end of the carriage motor, means for simultaneously connecting the advancing end of said carriage motor and said gripper motor to exhaust, and means for applying fluid pressure to the retracting end of said carriage motor a predetermined time after the advancing end of said carriage motor and said gripper motor have been connected to exhaust.

17. In a stock feeder, a reciprocable carriage, a double acting fluid actuated carriage motor for advancing and retracting said carriage, a reciprocable gripper on said carriage, a fluid actuated gripper motor for moving said gripper to a gripping position, a stock retainer, a fluid actuated retainer motor for moving said stock retainer to a retaining position, control valve means having a supply connection, an exhaust connection, and first and second working ports, said control valve means having a first position in which said supply port is connected to said first working port and said second working port is connected to exhaust, and a second position in which said supply port is connected to said second working port and said first working port is connected to exhaust, means connecting said first working port directly to the advancing end of said carriage motor and to said gripper motor, means connecting said second working port directly to said retainer motor, auxiliary valve means having a first port connected to the retracting end of said carriage motor and a second port, a connection between the second port of said control valve means and the second port of said auxiliary valve means, a check valve in said last-mentioned connection permitting flow only from said control valve means to said auxiliary valve means, an exhaust port in said auxiliary valve means, the auxiliary valve means being movable between a first position in which said retracting end of the carriage motor is connected to exhaust and a second position in which the retracting end of said carriage motor is connected to the second port of said control valve means, a piston chamber pressurizable to move said auxiliary valve means to its first position, and a connection between the first port of said control valve means and said piston chamber.

18. The combination according to claim 17, further provided with a restriction in said last-mentioned con-

nection, and a bypass for said restriction having means permitting flow only away from said piston chamber.

19. The combination according to claim 17, further provided with a restriction in said last-mentioned connection, and a bypass for said restriction having means permitting flow only toward said piston chamber.

20. The combination according to claim 17, further provided with first and second restrictions in series in said last-mentioned connection, a bypass for each of said restrictions, means in one of said bypasses permitting flow only away from said piston chamber, and means in the other bypass permitting flow only toward said piston chamber.

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