United States Patent [19]

Scribner

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[45] **Nov. 12, 1974**

[54] **STOCK FEEDER**

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[22] Filed: **Mar. 8, 1972**

[21] Appl. No.: **232,910**

Related U.S. Application Data

[63] Continuation of Ser. No. 106,507, Jan. 14, 1971, abandoned.

[52] **U.S. Cl.** **226/115,** 226/159, 226/162

[51] **Int. Cl.** **B65h 17/36**

[58] **Field of Search** 226/108, 112, 115, 150, 226/162, 167

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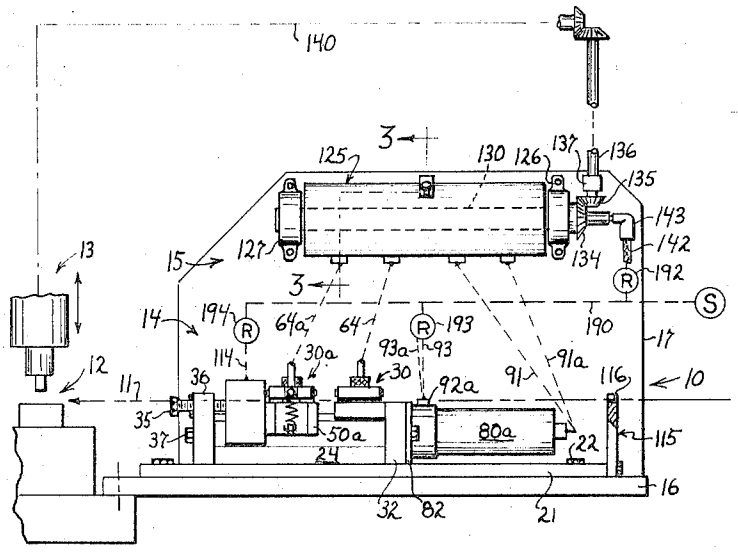
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Primary Examiner—Richard A. Schacher

[57] **ABSTRACT**

A high speed duplex stock feeding device having a reciprocating pair of alternately acting feed slides for intermittently advancing strip metal into the work station of a punch press or the like. The device is actuated and controlled by a plurality of fluid motors in combination with a valving means which comprises a grooved member and an apertured member which when relatively rotated serve to sequence the operations of said fluid motors so that said feed slides may produce a rapid series of stock feeding strokes.

28 Claims, 15 Drawing Figures



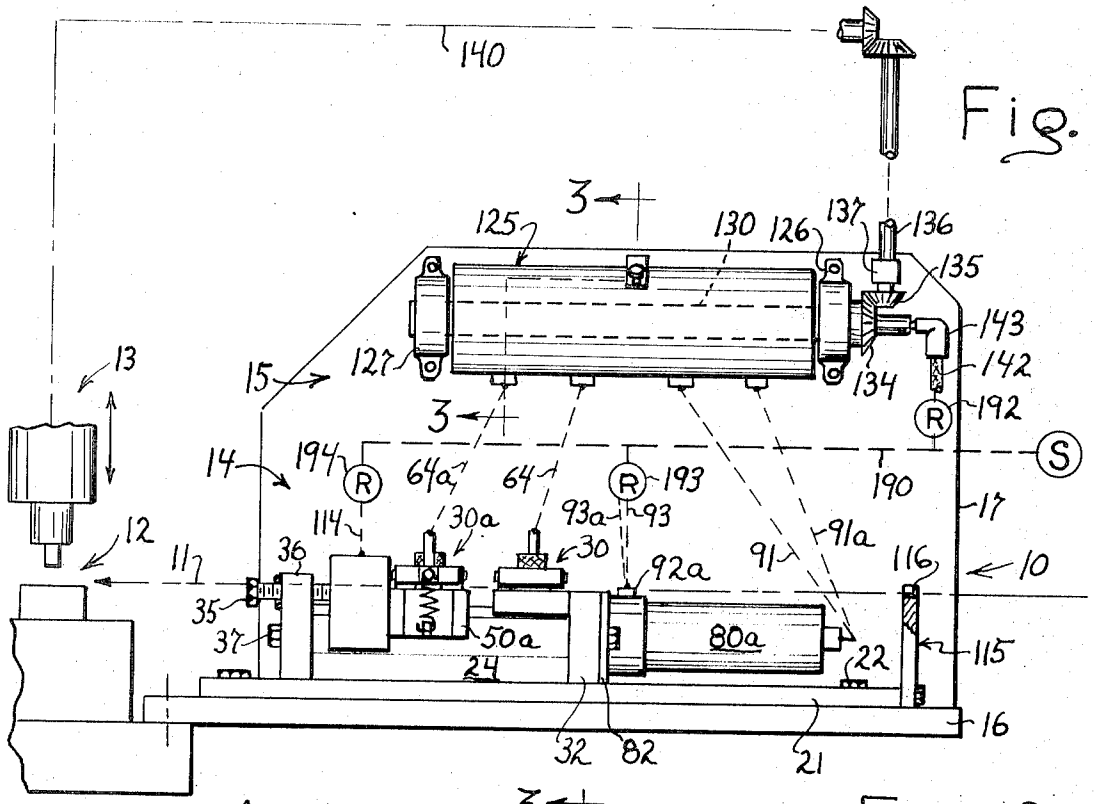


Fig. 1

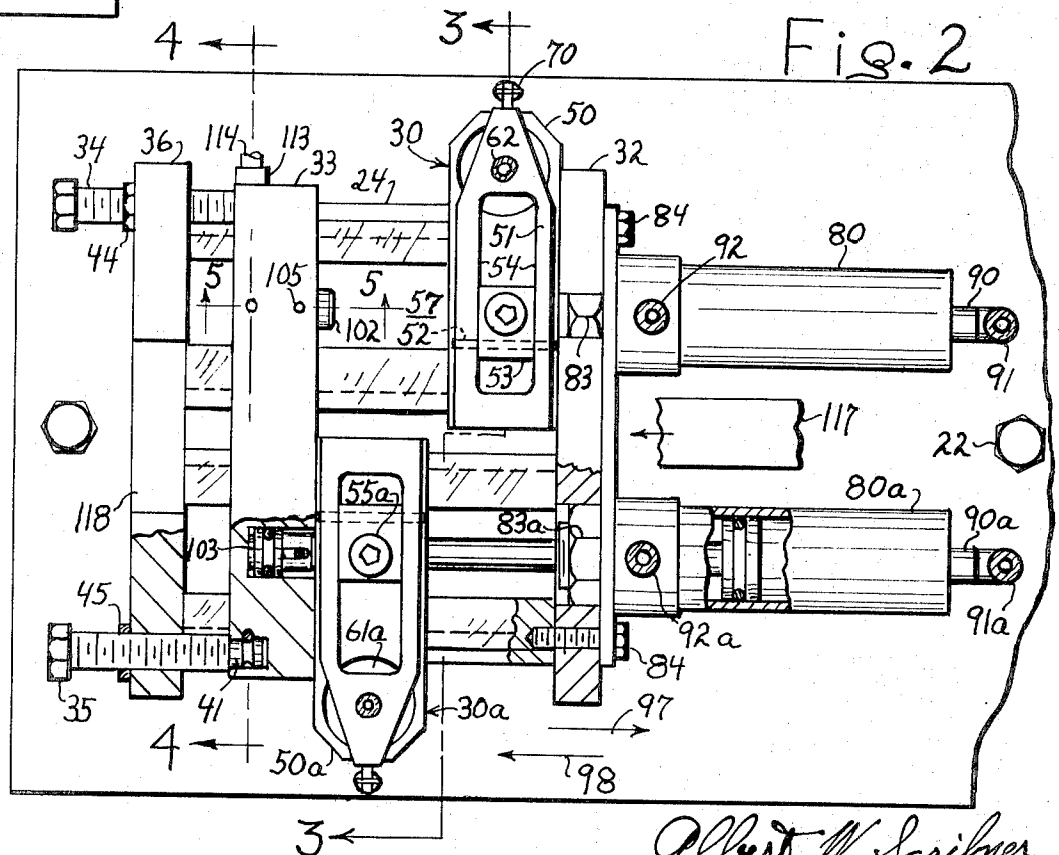


Fig. 2

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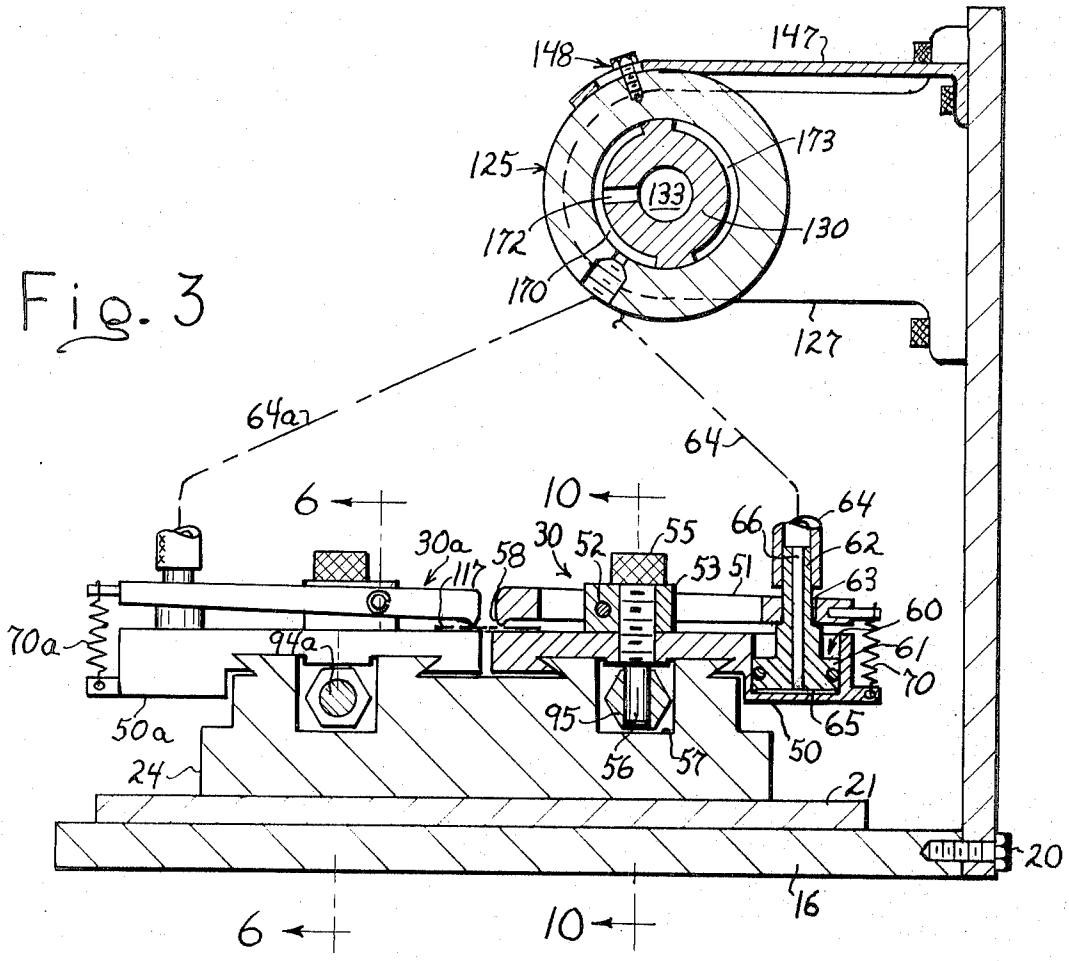


Fig. 3

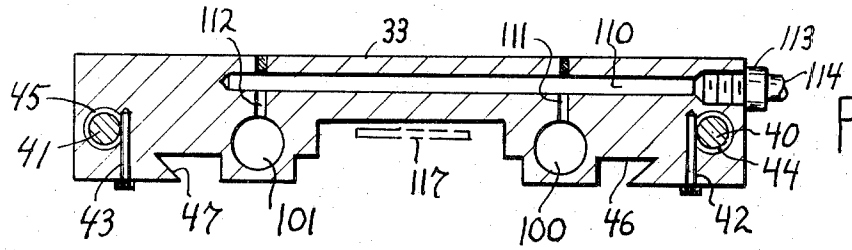


Fig. 4

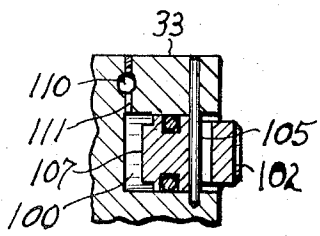


Fig. 5

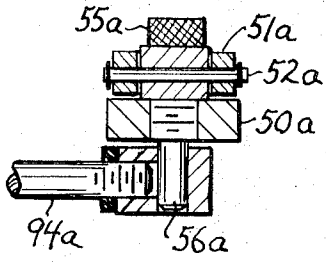


Fig. 6

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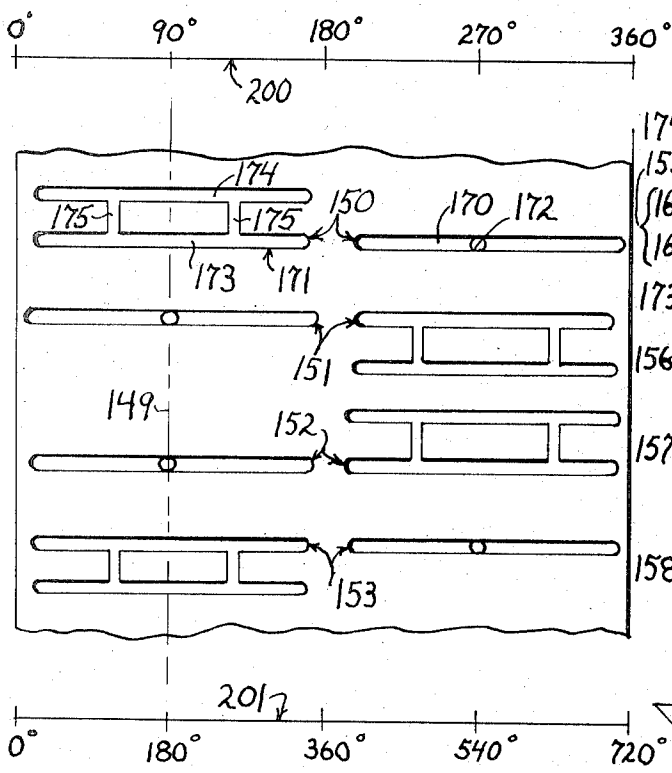


Fig. 8

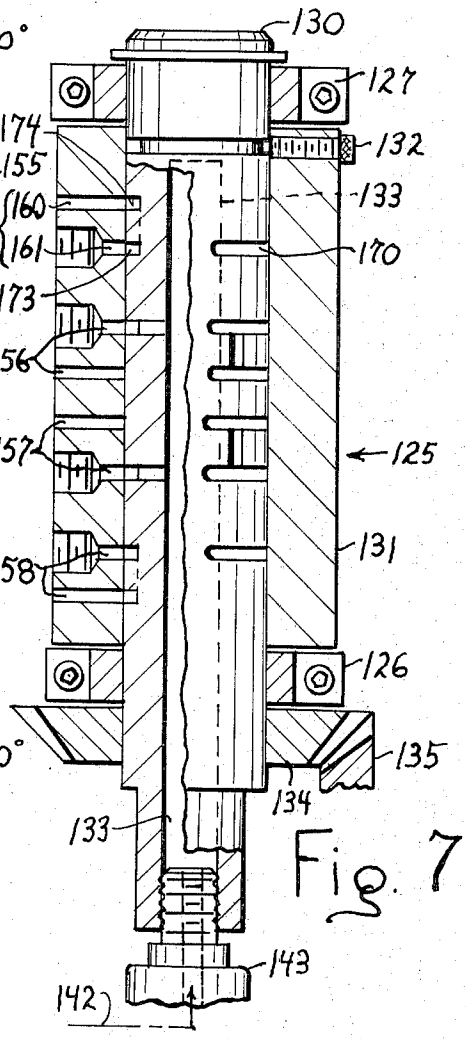
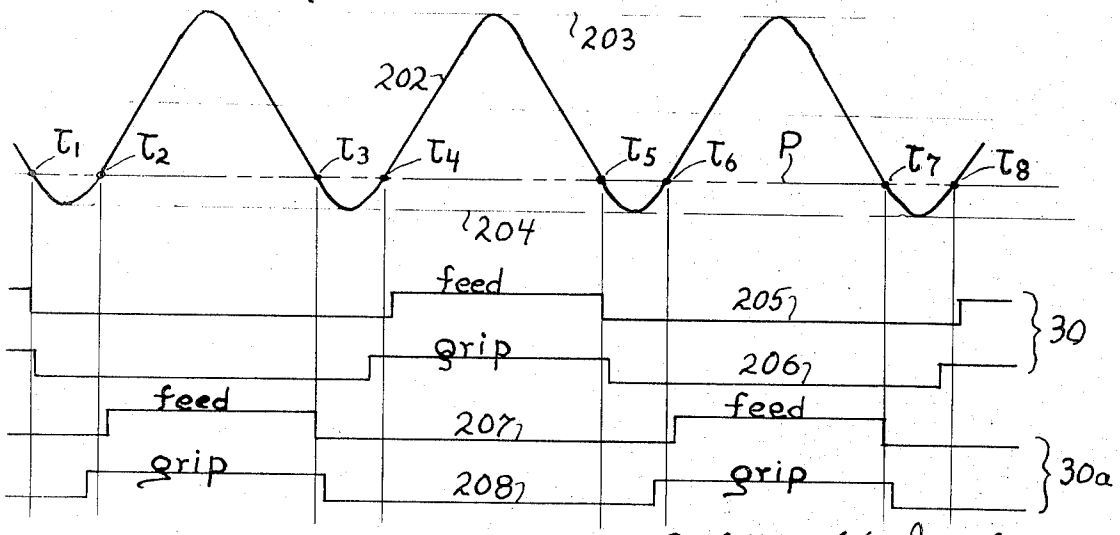


Fig. 7

Fig. 9



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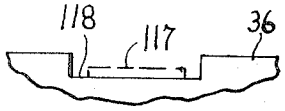


Fig. 15

Fig. 12

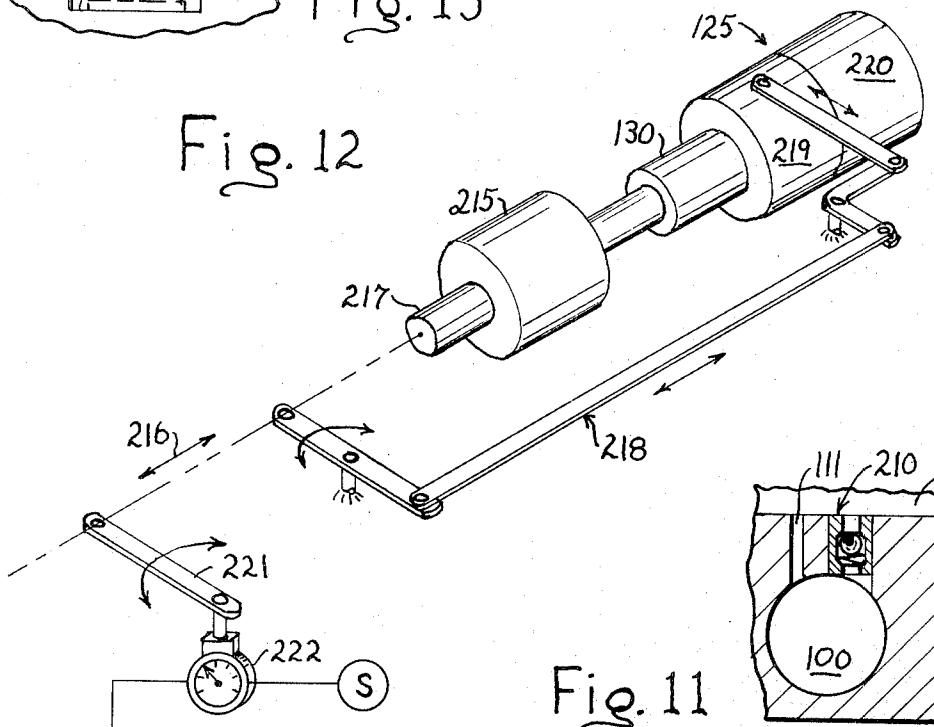


Fig. 11

Fig. 10

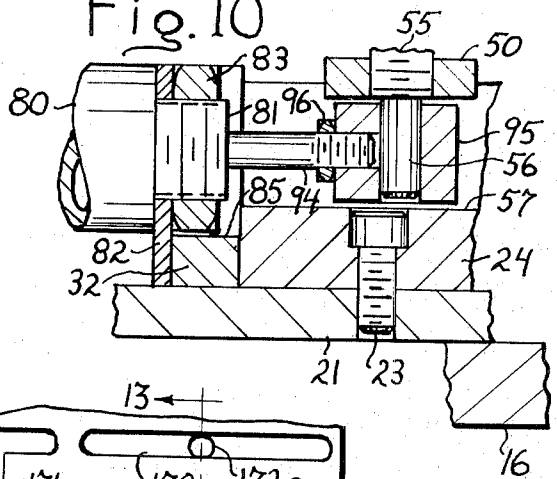


Fig. 13

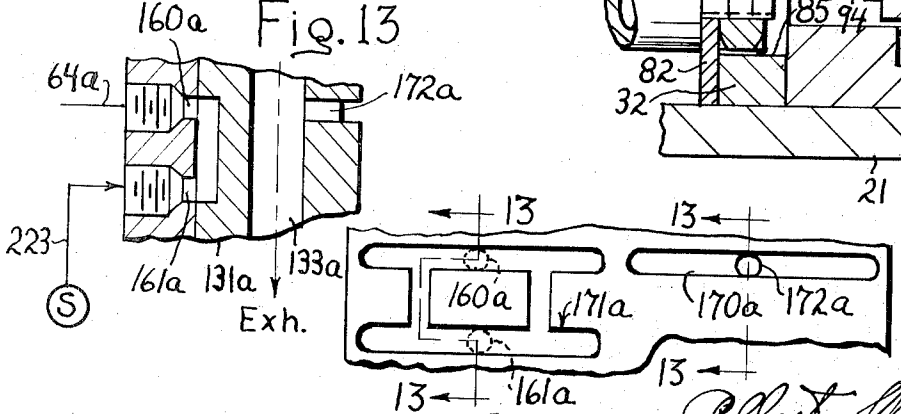


Fig. 14

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STOCK FEEDER

This application is a continuation of Ser. No. 106,507, filed Jan. 14, 1971, and now abandoned.

BACKGROUND OF THE INVENTION

To increase machine productivity punch press manufacturers are making available pressures that are capable of increasingly high operational speeds. There are many fabricators in the fastener and electronic parts industries for example who are operating at press speeds in the neighborhood of 1000 strokes per minute. The metal strip feeding equipment required to accommodate such high speed operations must necessarily become more and more sophisticated in order not only to attain the higher speeds involved but also to maintain the high degree of feed accuracy required. Further this feeding equipment must be very reliable in operation inasmuch as any serious malfunctioning at such high speeds can cause extensive damage to the tooling and/or the presses involved.

SUMMARY OF THE INVENTION

The instant high speed stock feeding device has a minimum number of moving parts including two fluid actuated feed slides each of which carries a fluid actuated stock gripping means. The supply and exhaust of fluid pressure to and from the fluid motors which actuate said feed slides and stock gripping means is controlled by a rotary fluid pressure distributor or valve means that has an inner core member and a cooperating outer substantially tubular member. The core member is formed with a plurality of sets of circumferentially extending grooves which valvingly cooperate with a plurality of respectively associated sets of apertures formed in said tubular member, each cooperating set of grooves and apertures serving to operationally control at least one of the said fluid motors. The core member is adapted to be rotated under the control the associated press thereby producing the mutually timed valving actions which reliably sequence the high speed operation of the various fluid motors that actuate the stock feeder. A dual fluid operated buffer means serves to cushion the terminal portions of the feed strokes so as to insure feed accuracy.

The primary object of the instant invention is to provide an improved high speed stock feeder for punch presses and the like.

Another object of the invention is to provide a simplified integrated fluid actuating and control system for a duplex slide type stock feeder.

Other objects of the invention will become apparent as the disclosure continues.

IN THE DRAWINGS:

FIG. 1 is a front elevational view illustrating the instant stock feeding apparatus.

FIG. 2 is a plan view in partial section illustrating the transport section of the instant feeder.

FIG. 3 is an elevational view taken along section lines corresponding to section lines 3—3 of FIGS. 1 and 2.

FIG. 4 is an elevational view of a portion of the buffer means as taken along section line 4—4 of FIG. 2.

FIG. 5 is a sectional view taken along section line 5—5 of FIG. 2.

FIG. 6 is a fragmentary sectional view taken along a section line corresponding to section line 6—6 of FIG. 3.

FIG. 7 is a partial axial sectional view illustrating the construction of the instant valving means.

FIG. 8 is a sketch showing a development of the cylindrical outer grooved surface of the core member of said valve means.

FIG. 9 is a sketch showing an illustrative timing diagram for the instant duplex feeder.

FIG. 10 is a partial sectional view taken along section line 10—10 of FIG. 3.

FIG. 11 is a fragmentary sectional view corresponding to FIG. 4 and illustrates an alternate arrangement for the fluid conduit lines for the buffer means.

FIG. 12 is a perspective view illustrating a speed sensitive system for controlling operation of some of the fluid operating means of the instant apparatus.

FIG. 13 is an axial sectional view illustrating a modified form for the valve means.

FIG. 14 is a sketch showing the development of the cylindrical outer surfaces of the valve core member shown in FIG. 13.

FIG. 15 is an elevational view of a portion of the forward end plate of the transport section of the feeder.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings the instant feeder 10 is adapted as indicated by arrow 11 to intermittently advance strip stock into the work station 12 of a punch press 13 or the like. The two main parts of the feeder include a transport section 14 and a control and drive section 15, said sections being respectively carried by horizontal and vertical plates 16 and 17 which secured together by screws 20 so as to cooperatively form a machine frame. The transport section 14 comprises a base plate 21 which is secured to plate 16 by screws 22 and on which is mounted by suitable screws 23, FIG. 10, a stationary slide block 24. On block 24 there are slidably mounted two similar feed slide assemblies 30 and 30a that are each adapted to be reciprocated in indexing and stock feeding directions between a fixed rearward abutment spacer plate 32 and an adjustable forward abutment block 33. The abutment or stop block 33 is adapted to be adjustably positioned on said block 24 by means of two screws 34 and 35 which threadedly engage a forward end plate 36 that is secured by any suitable means, such as screws 37, to the forward end of said slide block 24. The reduced inner ends 40 and 41, FIG. 4, of screws 34 and 35 are disposed in suitable apertures formed in the stop block 33 so that pins 42 and 43, disposed in block 33, may engage peripheral grooves formed in said screw ends 40 and 41 respectively whereby said screw ends may rotate in said apertures but can not move axially relative to said block apertures. By this arrangement screws 34,35 may be rotatably adjusted to fixedly position the stop block 33 at varying distances from the end plate 36 so as to thereby correspondingly vary the effective stroke lengths possible for said feed slide assemblies 30, 30*a*; said screws 34,35 being locked in selected rotative position by suitable lock nuts 44,45. As is best seen in FIGS. 3 and 4 the block 24 is formed with dovetail projections the lateral outer portions of which are respectively engaged by the corresponding dovetail recess 46 and 47 in block

33, thus facilitating the adjustable positioning of the latter on the stationary slide block 24.

In that each of the opposed and mutually facing feed slide assemblies 30,30*a* and the actuating means therefor are correspondingly constructed and arranged a detailed description of one thereof will suffice here, corresponding parts of said assemblies having the same reference numerals respectively with and without a reference letter *a*. Assembly 30 comprises a feed slide 50 formed with a dovetail recess that engages the corresponding dovetail projections formed on the upper surfaces of block 24. A stock gripping lever 51 is pivotally mounted on slide 50 by means of a pin 52 which extends through suitable apertures formed through the side legs of said lever and through a pivot block 53 that is disposed in the elongated opening 54 in said lever. The outer ends of said pin 52 are provided with suitable retainer rings, as is illustrated in FIG. 6. Pivot block 53 is mounted on the upper surface of slide 50 by means of a main screw 55 which extends through a vertical hole formed through block 53 and which threadedly engages the feed slide 50. The reduced lower end 56 of screw 55 extends below the slide 50 and into a longitudinal recess 57 formed in the block 24 parallel to and between said dovetail projections for slide 50. The inner end of lever 51 is formed with a stock engaging tip 58 while the outer end thereof is adapted to be actuated by a single-acting fluid motor 60. Said fluid motor includes a piston 61 and an integral piston rod 62 which extends upwardly through a slightly enlarged opening 63 formed in the outer end of lever 51 and which is connected to the flexible tubing line 64. Piston 61 is disposed for axial movement in a cylindrical recess 65 formed in the outer end of feed slide 50 and together with piston rod 62 is formed with a central bore 66 so that fluid pressure may be supplied to and exhausted from cylinder 65 through said line 64. A shoulder 67 formed on piston rod 62 engages the lower surface of lever 51 so that when fluid pressure is supplied to said cylinder 65 lever 51 will be pivoted to a stock gripping condition. A suitable spring means 70 is provided to restore lever 51 to a stock release position when fluid pressure is exhausted from said cylinder 65.

The feed slide assembly 30 is adapted to be reciprocally actuated by a double-acting fluid motor 80 which has a conventional type threaded inner mounting end 81, FIG. 10, that extends through a suitable aperture formed in the cylinder mounting plate 82 and which is clamped to said plate 82 by means of a lock nut 83. The mounting plate 82 and said abutment spacer plate 32 are fixedly secured to the rearward end of block 24 by means of suitable screws 84, FIG. 2; the cylinder lock nuts 83,83*a* being disposed in suitable apertures, such as 85, FIG. 10, formed in said spacer plate 32.

Suitable fittings 90 and 90*a* at the head ends respectively of the double-acting fluid motors 80 and 80*a* are connected to flexible tubing lines 91 and 91*a* while suitable fittings 92 and 92*a* for the rod end of said motors 80,80*a* are respectively connected to flexible tubing lines 93 and 93*a*. The outer end of piston rod 94, FIG. 10, of motor 80 is threadedly engaged with a hexagonally cross sectioned coupling element 95 that is formed wih a vertically extending aperture in which is disposed the said lower end 56 of said main feed slide screw 55, the piston rod being locked to said coupling element 95 by a lock nut 96. As may be seen actuation of the doubleacting fluid motors 80,80a will serve to respectively reciprocate said feed slide assemblies 30, 30*a* in indexing and stock feeding directions 97 and 98 respectively, FIG. 2.

A pair of fluid operated buffer units are provided in the stop block 33 so as to be respectively engaged by said feed slide assemblies 30 and 30*a*. As is illustrated in FIGS. 2, 4 and 5 block 33 is formed with two cylindrical recesses 100,101 in which similar pistons 102 and 103 are respectively slidably mounted. The outer limit of travel of buffer piston 102 is determined by a pin 105 which extends through a suitable aperture in block 33 and through an axially elongated slot 106 formed in said piston 102 as illustrated in FIG. 5, while the inner limit of travel of said piston is ultimately determined by engagement of the reduced inner end 107 of said piston with the inner end wall of said recess 100. The limits of travel of the other buffer piston 103 are similarly determined. Fluid pressure is supplied to both cylinders 100 and 101 through a common passage 110 and then through small sized holes 111 and 112 respectively; passage 110 being connected by any suitable fitting 113 to a flexible tubing line 114. It will be seen that when fluid pressure is supplied to the cylinders 100,101 the pistons 102 and 103 will be continuously biased to their extended positions so as to be capable of yieldably resisting and cushioning the terminal portions of the successive alternate stock feeding strokes of said feed slides, pistons 102,103 each having a length such that when said feed are finally arrested by and against the flat rearward face of block 33 the reduced forward ends of the buffer pistons are very closely adjacent to the respective inner ends of said recesses 100 and 101.

Any suitable stock guide means 115, FIG. 1, secured to plate 21 and having a horizontal stock guide surface such as 116 may be provided so as to assist in guiding the stock 117 through the instant feeder and to the said work station 12. In this connection the surface 116, the effective upper surfaces of the mounting and spacer plates 82 and 32 and the feed slides 50 and 50*a*, and the recess surface 118, FIGS. 2 and 15, on end plate 36 are all substantially coplanar thus supporting the stock at various points along its path through the feeder.

Considering now the said control and drive section 15 of the instant feeder, a fluid pressure distributor or valve means 125 is provided for controlling the supply and exhaust of fluid pressure to and from the single-acting stock gripping cylinders 65,65*a* and the head ends of the double-acting fluid motors 80,80*a* through flexible tubing lines 64,64*a*,91,91*a* respectively. Referring particularly to FIGS. 1, 3 and 7 the vertical frame plate 17 has a pair of horizontally spaced bearing brackets 126 and 127 fixedly secured thereto which are adapted to rotatably support a grooved cylindrical core member 130. The cylindrical core valving member 130 closely fits within an outer tubular valving member 131 that is formed with a plurality of apertures that respectively valvingly cooperate with the grooves in member 130. The inner end of a set screw 132 mounted in member 131 rides in an annular groove formed in member 130 so as to prevent relative axial movement between said members 130 and 131. Core member 130 is adapted to be rotatably driven by means of a bevel gear 134 that is rotatably secured thereto, said gear being driven by a bevel gear 135 secured to the lower end of a drive shaft 136, FIG. 1, that is rotatably mounted in a bearing bracket 137 secured to said frame plate 17.

The upper end of shaft 136 is adapted to be supported and driven by the main crank shaft, diagrammatically illustrated at 140 of FIG. 1, of the punch press 13 through any suitable gear set 141. This drive gearing is such that the core member 130 makes one revolution for each two revolutions of the press. The valving means 125 is adapted to supplied with fluid pressure from a line 142 which is connected to the input end of a conventional type rotary joint 143, the output end of the latter being threadedly connected to the end of said rotatable core member 130 so as to conduct fluid pressure to an axial passage 133 formed part way through member 130. The tubular valving member 131 is normally rotatably fixed but may be rotatably adjusted, for phasing the valve means 125 with respect to the press operation, by means of a bracket 147 that is fixed to frame plate 1 and has a slot and set screw locking arrangement 148 as illustrated in FIG. 3.

The details of the valving arrangement will now be discussed with particular reference to FIGS. 7 and 8 wherein the plane of the axially sectioned portion of the core member 130, as seen in FIG. 7, corresponds to that located along a line 149 positioned as shown in the surface development sketch of FIG. 8. The cylindrical outer surface of core member 130 is formed with four sets 150,151,152 and 153 of grooves or channels which are elongated in the direction of their respective travel and which respectively cooperate with four sets 155,156,157 and 158 of apertures formed through the tubular walls of said outer valving member 131. In that each set of grooves and its associated set of apertures are arranged and operate in similar fashion a detailed description of one combination of said groove and aperture sets need be made here. The groove set 150, FIG. 8, comprises a fluid pressure supply groove 170 which extends circumferentially part way (less than 180°) around the periphery of said core member 130, and an exhaust groove 171 which also extends part way around an opposed portion of said core member. A hole 172, FIGS. 3 and 8, is formed through the wall of core 130 so as to interconnect the said axial fluid supply passage 133 with said supply groove 170. Exhaust groove 171 comprises parallel groove portions 173 and 174 that are interconnected by groove portions 175; groove portion 173 being substantially coplanar with supply groove 170. The cooperating aperture set 155 comprises a pair of apertures 160 and 161, aperture communicating with the surrounding medium and thus constituting an exhaust passage while the fluid motor control aperture 161 is connected by means of a suitable fitting not shown to the said flexible tubing line 64*a* which serves the single-acting fluid motor on the feed slide assembly 30*a*. Rotation of the core member 130 will cause the fluid motor control aperture 161 to alternately register with the fluid supply groove 170 and the exhaust groove 171 whereby fluid pressure may be alternately supplied to and exhausted from said fluid motor on said feed slide assembly 30*a* through said line 64*a*. The three other sets 156,157 and 158 of apertures are similarly associated with the single-acting fluid motor for the feed slide assembly 30, and the head ends of the double-acting motors 80 and 80a respectively. It will be apparent that when the core member 130 is rotatable driven the two double-acting motors and the two single-acting motors will be operated in predetermined mutual timed relation, depending on the lengths of said grooves and the relative positions of said grooves and apertures. The fluid pressure supply line arrangement to the various parts of the instant apparatus is illustrated in FIG. 1. Here a main supply line 190 which communicates with a source 191 is connected to the valve line 142 through a pressure regulator 192, to cylinder biasing lines 93 and 93*a* through a pressure regulator 193, and to the buffer line 114 through a pressure regulator 194. Regulator 193 is set for approximately one half the pressure set for by regulator 192 while regulator 194 is adjusted to give the desired extent of buffer cushioning action. With these line connections the core member 130 of the distributor 125 and the buffer means will be constantly supplied with fluid pressure as will the rod ends of the fluid motors 80,80*a*; the latter thus constantly urging said feed slide assemblies 30,30*a* in an indexing direction until fluid pressure is admitted to the head ends of said motors 80,80*a* whereupon said feed slides will be respectively displaced in said stock feed direction. Upon exhaust of said head ends of motors 80,80*a* the feed slides will again be respectively driven in an indexing direction due to the fluid biasing action at said motor rod ends. The buffer pistons 102 and 103 will here be yieldably urged toward their extended positions and will offer substantial resistance to the rapid axial displacement by said feed slides because of the relatively small size of the passages 111 and 112, this action cushioning the terminal portion of the respective stock feeding strokes of said feed slide assemblies.

When the punch press 13 is operated the valving or core member 130 will be rotated in timed relation therewith so as to properly sequence the stock feeding strokes of said feed slide assemblies 30,30*a*; the scales 200 and 201 of FIG. 8 indicating the 2 to 1 gearing ratio between the rotation of the main crank shaft of the press and the core member. FIG. 9 illustrates a timing diagram for the instant feeder. Here curve 202 represents the timed reciprocation of the press ram as it moves between its top and bottom dead center positions indicated by lines 203 and 204 respectively, and with respect to the stock penetration line P; the points (times) T1–T8 being preferrably located between 135° to 165° from said top dead center. The two timing lines 205 and 206 are for the fluid motors 80 and 60 respectively which operate the feed slide assembly 30 while the other two timing lines 207 and 208 are for the fluid motors 80*a* and 60*a* respectively which operate the feed slide assembly 30*a*. During a first press cycle feed slide assembly 30*a* will partake of a stock feeding stroke between times T2 and T3 while assembly 30 is partaking of a non-feed or indexing stroke. During the next cycle of the press feed slide assembly 30 will partake of a stock feeding stroke between time T4 and T5 while assembly 30*a* is moving through an indexing stroke. During the next press cycle assembly 30a will again move through a stock feed stroke and so on whereby these two assemblies alternately advance the stock 117 into the work station 12 in a rapid succession of feed strokes.

FIG. 11 shows an alternate fluid conduit arrangement for the buffer means, there being illustrated here a check valve 210 to facilitate rapid filling of the buffer cylinders.

FIG. 12 illustrates a speed responsive device for controlling one or more of the fluid operated means of the present feeder. Here a conventional centrifugal type speed sensitive device 215 is adapted to control the

axial movement 216 of output member 217 whereby through linkage 218 the rotational position of at least one of the tubular parts 219 and 220 (which in composite correspond to valving member 131) can be rotatively adjusted relative to core member 130 so as to shift the phase relation between the press and feeder in response to changes in press speeds. Movement 216 is also adapted through linkage 221 to adjust a pressure regulator 222 in the fluid pressure supply lines to the buffer means and/or to the rod ends of the main fluid motors 80,80*a*.

FIGS. 13 and 14 illustrate an alternate groove and aperture arrangement for the valve means 125. Here the grooves and apertures are similarly shaped and located as before however the groove 171*a*, FIG. 14, is now a fluid pressure supply groove, the cooperating aperture 161a being connected to a supply line 223, and the groove 172*a* is now an exhaust groove, the valve core passage 133*a* being vented to the surrounding medium. The fluid motor control aperture 160*a* is coupled to said line 64*a*. The other three pairs of apertures in this modified valving embodiment will be similarly connected to lines 64,91 and 91*a*.

The surface interfaces between valve members 130 and 131 may be tapered so as to making possible wear compensation.

I claim:

1. A duplex feeder for intermittently advancing stock into the work station of a punch press or the like: comprising a frame;

a pair of feed slides reciprocally mounted on said frame for movement in indexing and stock feeding directions;

a first pair of fluid motors for respectively actuating said feed slides;

stock gripping means carried by each of said feed slides and being adapted to grip and release the stock to be fed;

a second pair of fluid motors for respectively actuating said stock gripping means;

a rotary fluid pressure distributor arranged and connected to control the operation of said fluid motors, said rotary fluid pressure distributor including an inner valving member having a plurality of arcuately extending grooves formed therein, and an outer valving member having a plurality of apertures formed therein that respectively valvingly cooperate with said grooves in said inner member;

means for mounting said inner and outer members for relative rotation, one of said members being adapted to be coupled to a source of fluid pressure whereby relative rotary movement between said members permits said apertures and grooves to control the supply and exhaust of fluid pressure to and from the respective fluid motors;

drive means adapted when operated to rotate one of said members relative to the other of said members so that said fluid motors may be actuated in predetermined sequence whereby said feed slides alternately partake of stock feeding strokes; and fluid operated buffer means for cushioning the terminal portions of the respective stock feeding strokes of said feed slides.

2. Apparatus as defined by claim 1 wherein selected ones of said grooves in said inner valving member are each adapted to be simultaneously and constantly supplied with fluid pressure, and wherein said drive means is connected to rotate said inner valving member.

3. Apparatus as defined by claim 1 wherein said inner valving member of said distributor has substantially cylindrical operative outer surfaces in which a plurality of sets of said grooves are formed, and wherein said outer valving member is substantially tubular in configuration and surrounds said inner member and is formed with a plurality of sets of apertures which respectively valvingly cooperate with the respectively associated sets of said grooves, each set of grooves and its associated set of apertures being arranged to control the supply and exhaust of fluid pressure to and from at least one of said fluid motors.

4. Apparatus as defined by claim 3 wherein said inner member is formed with a longitudinal passage which is adapted to be connected to a fluid pressure source and which communicates with a selected one of the grooves in each of said sets of grooves so as to be capable of constantly supplying fluid pressure to each of said selected ones of said grooves.

5. Apparatus as defined by claim 1: additionally comprising adjustable means for variably locating and determining the ends of the stock feeding strokes of each of said feed slides.

6. Apparatus as defined by claim 1 wherein said feed slides and frame are cooperatively formed with a dovetail type feed slide mounting arrangement.

7. Apparatus as defined by claim 1 wherein each of said first pair of fluid motors is double-acting and is adapted to be continuously air biased so as to normally urge its associated feed slide in said indexing direction.

8. Apparatus as defined by claim 1 wherein each of said second pair of fluid motors includes a piston and a piston rod which are formed with a fluid conducting passage therethrough, which passage is connected by means of a flexible tube to one of said apertures in said outer valving member of said rotary fluid pressure distributor.

9. Apparatus as defined by claim 1 wherein each of said stock gripping means includes a pivoted lever means.

10. Apparatus as defined by claim 1 wherein said buffer means includes a pair of fluid operating piston-cylinder units that are respectively associated with said pair of feed slides: and additionally comprising

means for supplying fluid pressure to each of said pair of buffer units; and

means for varying the pressure of the fluid supplied to said buffer means.

11. Apparatus as defined by claim 1 wherein at least one of said apertures is adapted to be continuously connected to a pressure source.

12. A stock feeding device for intermittently advancing strip into the work station of a punch press or the like: comprising

a frame;

feed slide means reciprocally mounted on said frame for movement in indexing and stock feeding directions;

a first fluid motor means for actuating said feed slide means; stock gripping means carried by said feed slide means for gripping and releasing the stock to be advanced;

a second fluid motor means for actuating said stock gripping means;

control means arranged and connected to control the operation of said first and second fluid motor means, said control means including a rotary fluid pressure distributor mounted on said frame and including a first valving member having a plurality of arcuate grooves circumferentially formed therein, and a second valving member having a plurality of apertures formed therein for respectively valvingly cooperating with said arcuate grooves in said first member;

means mounting said first and second valving members for relative rotational movement, one of said members being adapted to be coupled to a source of fluid pressure whereby said relative movement between said members permits said apertures and grooves to sequentially control the supply and exhaust of fluid pressure to and from said fluid motor means; and

drive means for rotating one of said valving members relative to the other of said members so that said first and second fluid motor means may be actuated in predetermined mutually timed relation whereby said feed slide means may partake of a rapid series of stock feeding strokes.

13. Apparatus as defined by claim 12 wherein at least one of the grooves in said first valving member is adapted to be continuously supplied with pressure fluid.

14. Apparatus as defined by claim 12 wherein said first member has a plurality of sets of grooves circumferentially formed therein and wherein said second member is substantially tubular and has a plurality of sets of apertures formed therein that valvingly cooperate with the respectively associated sets of said grooves.

15. Apparatus as defined by claim 12: additionally comprising speed sensitive means for controlling the fluid pressure flow to at least some of said means.

16. Apparatus as defined by claim 12 wherein at least one of said apertures is adapted to be continuously connected to a source of pressure fluid.

17. Apparatus as defined by claim 12: additionally comprising biasing means for normally biasing said feed slide means in one of said directions.

18. Apparatus as defined by claim 12: additionally comprising fluid operated buffer means for respectively cushioning the terminal portions of the successive feed strokes of said feed slide means.

19. Apparatus as defined by claim 12 wherein said first valving member is formed with a first set of grooves and said second valving member is formed with a first set of apertures which valvingly cooperate with said set of grooves;

said set of grooves including a fluid pressure supply groove and a fluid pressure exhaust groove, and said set of apertures including a first and a second aperture;

said first aperture being connected to one of said fluid motor means and being adapted to cooperate with said fluid pressure supply groove and then with said fluid pressure exhaust groove, said second aperture continuously communicating with the surrounding medium and being adapted to cooperate only with said exhaust groove; and

fluid conduit means adapted to continuously supply fluid pressure to said supply groove.

20. Apparatus as defined by claim 12 wherein said first valving member is formed with a firstset of grooves and said second valving member is formed with a first set of apertures which valvingly cooperate with said set of grooves;

said set of grooves including a fluid pressure supply groove and a fluid pressure exhaust groove, and said set of apertures including a first and a second aperture;

said first aperture being connected to said fluid motor means and being adapted to cooperate with said fluid pressure supply groove and then with said fluid pressure exhaust groove, said second aperture being adapted to be continuously supplied with fluid pressure and to cooperate only with said fluid pressure supply groove; and

fluid conduit means adapted to continuously connect said exhaust groove to the surrounding medium.

21. A stock feeding device: comprising

a frame;

a pair of feed slides reciprocally mounted on said frame for movement in indexing and stock feeding directions; stock gripping means carried by each of said feed slides for gripping and releasing the stock to be advanced;

actuating means for actuating said feed slide means and stock gripping means so that said feed slides may alternately partake of a rapid series of stock feeding strokes, said actuating means including fluid motor means;

control means arranged and connected to control the operation of said fluid motor means;

said control means including a fluid pressure distributor mounted on said frame and including a first and a second relatively moving valving members, said first valving member having a plurality of fluid conducting channels formed therein that are elongated in the direction of relative movement between said members, said second valving member having a plurality of apertures formed therein for respectively valvingly cooperating with said elongated channels in said first member;

means mounting said first and second valving members for relative movement, one of said members being adapted to be coupled to a source of fluid pressure whereby said relative movement between said valving members permits said apertures and channels to sequentially control the supply and exhaust of fluid pressure to and from said fluid motor means; and

drive means for moving one of said members relative to the other of said members whereby said fluid motor means may be actuated in predetermined timed relation so that said feed slide means may partake of said rapid series of stock feeding strokes.

22. Apparatus as defined by claim 21 wherein said first valving member is formed with a first set of channels and said second valving member is formed with a first set of apertures which valvingly cooperate with said set of channels;

said set of channels including a fluid pressure supply channel and a fluid pressure exhaust channel, and said set of apertures including a first and a second aperture;

said first aperture being connected to said fluid motor means and being adapted to cooperate with

said fluid pressure supply channel and then with said fluid pressure exhaust channel, said second aperture continuously communicating with the surrounding medium and being adapted to cooperate only with said exhaust channel; and fluid conduit means adapted to continuously supply fluid pressure to said supply channel.

23. Apparatus as defined by claim **21** wherein said first valving member is formed with a first set of channels and said second valving member is formed with a first set of apertures which valvingly cooperate with said set of channels: said set of channels including a fluid pressure supply channel and a fluid pressure exhaust channel, said set of apertures including a first aperture and a second aperture;

said first aperture being connected to said fluid motor means and being adapted to cooperate with said fluid pressure supply channel and then with said fluid pressure exhaust channel, said second aperture being adapted to be continuously supplied with fluid pressure and to cooperate only with said fluid pressure supply channel; and fluid conduit means adapted to continuously connect said exhaust channel to the surrounding medium.

24. A high speed duplex stock feeder for intermittently advancing metal strip into the work station of a punch press or the like; comprising

a frame;

a pair of feed slides reciprocally mounted on said frame for movement in indexing and stock feeding directions; adjustable abutment means carried by said frame and engaged by said feed slides for variably limiting the effective extent of movement of said feed slides in said stock feeding direction; a pair of double-acting fluid motors for respectively actuating said feed slides;

conduit means adapted to continuously supply fluid pressure to the rod end of each of said double-acting fluid motors so as to respectively bias said feed slides in an indexing direction; stock gripping means carried by each of said feed slides and being adapted to grip and release the stock to be fed; means for biasing each of said gripping means towards a stock release condition;

a pair of single-acting fluid motors respectively carried by said feed slides for respectively actuating said stock gripping means to their stock gripping conditions; a plurality of valve means respectively connected to said single-acting fluid motors and to the head ends of said double-acting fluid motors for respectively controlling the operation of said fluid motors;

drive means for operating said valve means so that said fluid motors are operated in predetermined sequence so that said feed slides alternately partake of stock feeding strokes; and a pair of alternately acting buffer means for cushioning the respective terminal portions of the feed strokes of said slides.

25. Apparatus as defined by claim **24** wherein said buffer means includes a pair of fluid operated pistons carried by said abutment means, said abutment means being formed with passages for continuously supplying fluid pressure to said fluid operated buffer means.

26. Apparatus as defined by claim **24**: additionally comprising speed sensitive means for controlling the fluid pressure supplied to at least one of said fluid motors and buffer means.

27. Apparatus as defined by claim **24** wherein said frame and feed slides are mutually formed to provide a dovetail type feed slide mounting arrangement.

28. Apparatus as defined by claim **24** wherein said drive means includes at least one set of gears that are driven at a predetermined speed.

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