

April 14, 1953

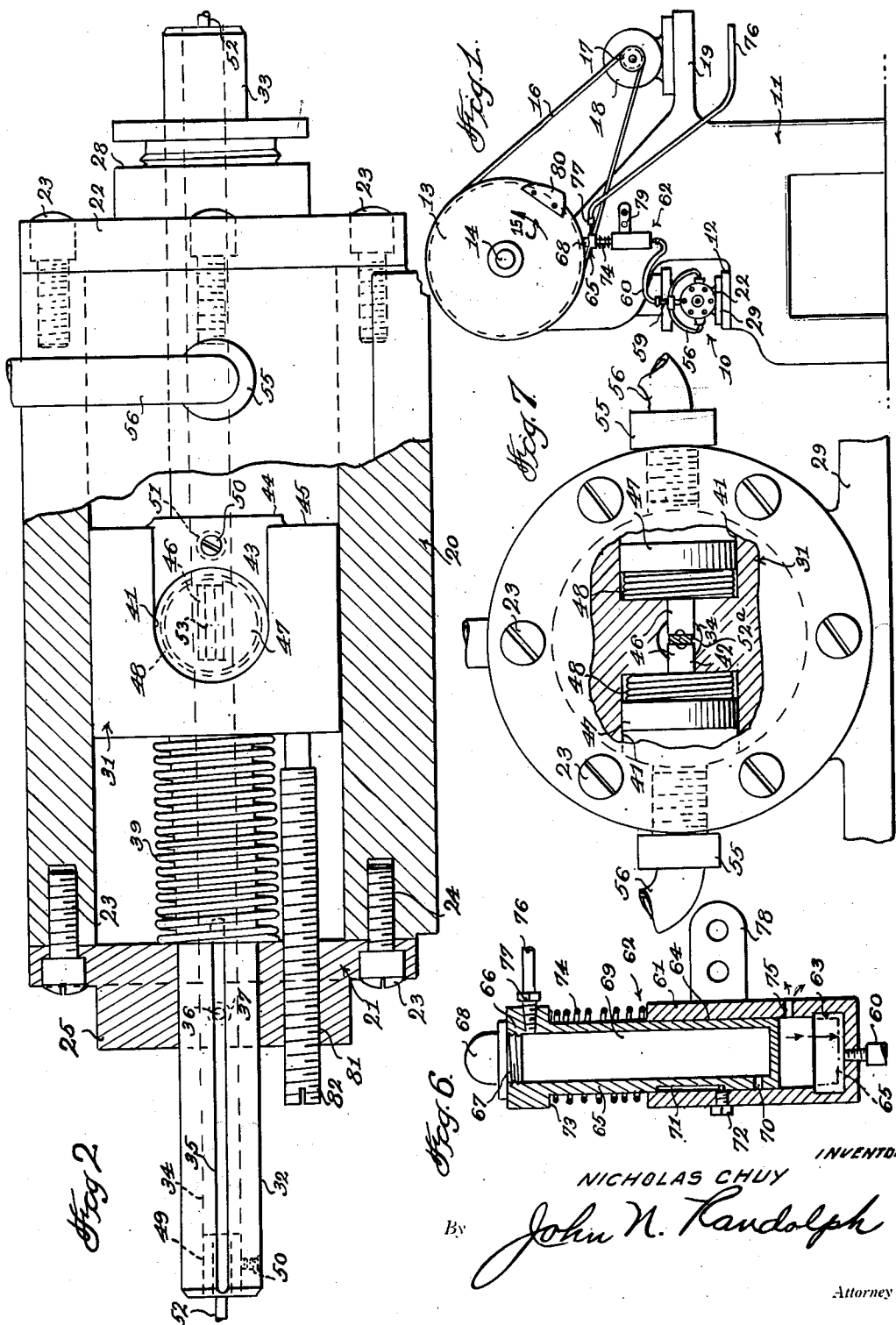
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AUTOMATIC STEP-BY-STEP STOCK FEEDER

Filed Jan. 5, 1951

2 SHEETS—SHEET 1



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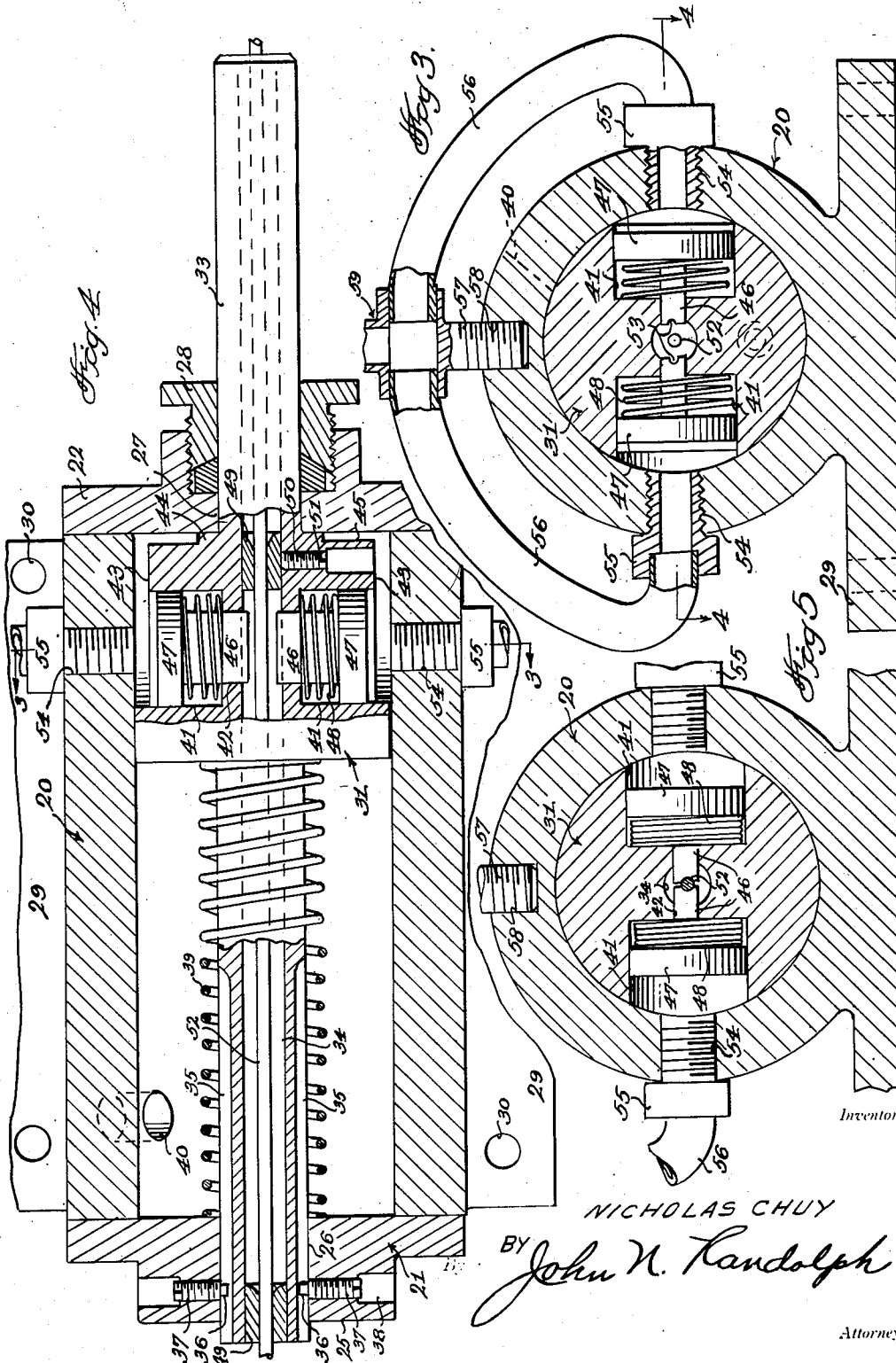
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2 SHEETS—SHEET 2



UNITED STATES PATENT OFFICE

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AUTOMATIC STEP-BY-STEP STOCK FEEDER

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7 Claims. (Cl. 271—2.5)

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This invention relates to a stock feeder adapted to be employed as an attachment for use with automatic material working machines such as punch presses, for cutting and stamping machines.

More particularly, an aim of the present invention is to provide a fluid pressure operated feeding attachment adapted to be connected to and coordinated with an automatic material working machine intermittently feeding stock thereto in a coordinated relationship to the operation of the machine.

Another object of the invention is to provide a fluid pressure operated feeding device capable of being readily adjusted for feeding stock in a step-by-step movement and wherein the length of each feeding step may be readily varied as desired.

Another object of the invention is to provide a feeding apparatus wherein a fluid pressure is employed to initially operate clamping means for gripping the stock and for thereafter operating a feeding unit, by which the clamping means is carried, for advancing stock through the feeding apparatus.

A further object of the invention is to provide a novel valve structure forming a part of the feeding apparatus and which is actuated by a part of the material working machine for intermittently opening the valve to admit the fluid medium to the feeding apparatus to accomplish the intermittent or step-by-step feeding.

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 showing an automatic material working machine with the stock feeding attachment applied thereto;

Figure 2 is an enlarged top plan view partly in horizontal section of the stock feeding apparatus;

Figure 3 is a cross sectional view thereof taken substantially along a plane as indicated by the line 3—3 of Figure 4;

Figure 4 is a horizontal sectional view taken substantially along a plane as indicated by the line 4—4 of Figure 3;

Figure 5 is a cross sectional view similar to Figure 3 but showing the stock gripping elements in engaged positions;

Figure 6 is an enlarged vertical sectional view of the novel valve unit of the stock feeder, and

Figure 7 is an end elevational view partly in

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section looking from right to left of Figures 2 and 4, showing the feeder employed for feeding strip stock.

Referring more specifically to the drawings, for the purpose of illustrating a preferred application and use of the automatic stock feeder, designated generally 10 and comprising the invention, a conventional automatic material working machine is shown at 11 in Figure 1, as for example, a punch press. The machine 11 includes an upwardly facing shelf or supporting surface 12 on which a part of the stock feeder is supported and is provided with a large belt pulley 13 for driving a shaft 14 of the machine 11 which is disposed at the same end of the machine as the end thereof on which the stock feeder 10 is disposed. The belt pulley 13 is driven in a direction as indicated by the arrow 15 in Figure 1 by an endless belt 16 which is trained over a belt pulley 17 on the drive shaft of a motor 18 which is supported on a shelf bracket 19 of the machine 11. The parts 11 to 19, inclusive, constitute no part of the present invention but have merely been illustrated and briefly described to afford a better understanding of the stock feeder 10 and the manner in which it is connected to and operated in unison with the machine 11.

The stock feeder 10 includes an elongated cylinder 20 having a forward end which is closed by a cylinder head 21 and a rear end which is closed by a cylinder head 22. The cylinder heads 21 and 22 are secured to the ends of the cylinder 20 by suitable fastenings such as bolts 23 which extend loosely through openings in the heads and threadedly engage tapped recesses 24 in the ends of the cylinder 20. The head 21 is provided with an external enlargement 25 and has a bore 26 extending centrally through said head and through the enlargement 25, as best seen in Figure 4. The head 22 is provided with a centrally disposed bore 27 which aligns with the bore 26 each of which bores is axially disposed relatively to the cylinder 20. The head 22 is provided with an externally disposed stuffing box 28 which aligns with the bore 27. As best seen in Figures 3, 5 and 7, a base 29 is formed integral with a portion of the cylinder 20 and extends to adjacent the ends thereof and is provided with openings 30 adapted to receive fastenings, not shown, by which the base may be secured on the shelf 12.

A piston 31 is slidably mounted in the cylinder 20 and has hollow shafts or rods formed integral with the opposite ends thereof and which project therefrom. One of said rods 32 extends from

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the forward side of the piston 31 reciprocally through the bore 26. The other shaft or rod 33 extends from the rear end of the piston 31 reciprocally through the bore 27 and stuffing box 28. The rods 32 and 33 are disposed in alignment and have aligned bores 34. The piston 31 has a bore extending axially therethrough which aligns with and forms a part of the shaft bores so that said bore 34 extends between and opens outwardly of the remote ends of the hollow shafts or rods 32 and 33. The rod or shaft 32 is provided with opposed longitudinally extending grooves 35 which slidably engage the restricted inner terminals 36 of a pair of setscrews 37 which are threaded radially into the boss 25 through radial bores 38 which open into the bore 26 and outwardly of the periphery of the boss 25. Each of the bores 38 has an inner threaded end to threadedly receive a setscrew and an enlarged outer end through which the setscrew is loosely inserted or removed. The terminals 36 by engaging the slots 35 prevent the piston 31 from turning in the cylinder 20 for a purpose which will hereinafter become apparent. An expansion coiled spring 39 is disposed around the shaft 32 between the head 21 and the adjacent end of the piston 31 for urging the piston toward the head 22 and for normally retaining it in abutting engagement therewith, as illustrated in Figure 4, wherein the piston 31 and shafts 32 and 33 are shown in fully retracted position. Adjacent the head 21, the cylinder 20 is provided with a vent port 40 to exhaust the air from the cylinder space between the head 21 and piston 31 or to admit air to said space to allow the piston 31 to slide in the cylinder 20 unhampered by a vacuum or air pressure between the piston and cylinder head 21.

As best illustrated in Figures 3, 4 and 5, the piston 31, which constitutes the master piston of the apparatus 10 is provided with radially disposed, diametrically opposed recesses of circular cross section forming radial cylinders 41 having restricted openings 42 at their inner ends which open radially into the bore 34. As best seen in Figure 2, the piston 31 is provided with oppositely disposed milled-out flat surfaces 43 into which the remote ends of the cylindrical chambers 41 open and which terminate at their forward ends contiguous with the forwardmost portions of the chambers 41. The flat surfaces 43 extend to the rear end of the piston 31. Said piston 31 is provided with a central boss 44 which normally abuts against the cylinder head 22 so that the annular end surface 45 at the rear end of the piston 31, surrounding said boss 44 is spaced from the cylinder head 22, for a purpose which will hereinafter become apparent. The flat surfaces 43 extend to the annular end surface 45 and in combination with the cylinder 20 form communicating passages between the end 45 of the piston 31 and the cylindrical chambers 41.

The openings 42 are of noncircular cross section preferably being enlarged or elongated in directions longitudinally of the cylinder 20. Each of said openings 42 slidably receives therein a gripping dog 46 which is supported thereby for radial reciprocating movement relatively to the master piston 31. Each dog 46 has an enlarged head at its outer end forming a piston 47. The pistons 47 slidably engage the cylindrical chambers 41 and are each urged radially outwardly thereof by an expansion coiled spring 48 dis-

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posed around each of the gripping dogs 46 between its piston 47 and the bed of its cylindrical chamber 41.

Spaced bushings 49 are detachably secured in the bore 34 by setscrews 50. One of the setscrews 50 is threaded radially into the inner threaded end of a radial bore 51 of the piston 31 which bore has an unthreaded outer end which opens into one of the milled-out or recessed surfaces 43. The other setscrew 50 is threaded radially into the shaft 32 adjacent its forward end and is countersunk therein so as not to interfere with sliding movement of the shaft through the bore 26. Accordingly, one bushing 49 is disposed in the piston 31 and the other bushing 49 is disposed in the forward end of the shaft 32. The bushings 49 are shown as having a bore of circular cross section for receiving a strand of stock 52 of circular cross section such as a wire or rod to be fed to the machine 11 by the stock feeder 10 and the bores of the bushings 49 are sized to slidably guide the stock 52 in step-by-step movement through the feeder 10. The inner ends of the gripping dogs 46 are provided with grooves of arcuate cross section as seen at 53 which extend longitudinally of the inner face of the dogs in which the stock 52 is partially received to be effectively gripped when the dogs 46 are in projected, gripping positions, as illustrated in Figure 5. By substituting bushings, not shown, having bores of noncircular cross section, strip stock 52a of noncircular cross section may be fed through the feeder 10 and effectively gripped by the dogs 46, as illustrated in Figure 7.

The cylinder 20 is provided with a pair of diametrically aligned threaded openings 54 adjacent the rear cylinder head 22, each of which extends radially through the cylinder wall. A nipple 55 is threaded into each opening 54. The inner ends of the bores of the nipples 55 open into the cylinder 20 and said nipples are disposed in alignment with the cylindrical recesses 41 of the master piston 31 when said master piston is in a fully retracted position against the rear cylinder head 22, as seen in Figure 4. Each nipple 55 is connected at its opposite outer end to an end of a short pipe or hose 56. A stud 57 is threaded into an upwardly opening recess 58 in the top of the cylinder 20 between the threaded openings 54. The stud 57 is provided with a head 59 forming an inverted T-shaped coupling the aligned open ends of which are connected to the opposite ends of the pipes or hoses 56, as best illustrated in Figure 3. As seen in Figure 1, a hose 60 has one end connected to the other, upwardly extending end of the coupling 59. The opposite end of the hose 60 is connected to the bottom of a housing 61 of a valve, designated generally 62 and opens into an enlarged bottom chamber 63 of said housing 61. The chamber 63 forms an enlarged bottom portion of a bore or recess 64 of the housing 61 the opposite end of which opens outwardly of the upper end of said housing 61. An elongated hollow valve body 65 has a lower portion which is externally sized and shaped to snugly fit in and slidably engage the bore 64. The valve body 65 is closed at its lower end and is provided with an internally threaded open upper end 66 which is normally closed by a threaded plug 67 having a rounded substantially hemispherical head 68 which projects upwardly from the valve body 65. The hollow interior chamber 69 of the valve body 65

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is closed at its lower end but is provided with a radial port 70 which opens outwardly of the valve body adjacent its closed bottom. The body portion 65 is provided with a longitudinally extending groove 71 in which is slidably received the restricted inner end of a headed screw 72 which is threaded radially through a portion of the wall of the housing 61 and which limits the sliding movement of the valve body 65 between its full and dotted line positions of Figure 6 so that the closed end of the valve body may not seat against and seal the nipple end of the hose 60 which opens into the chamber 63. However, the valve body 65 in its dotted line position of Figure 6 is disposed so that its radial port 70 opens into the enlarged chamber 63. The valve body 65 is provided with an externally enlarged upper end forming an annular downwardly facing shoulder 73 against which one end of an expansion coiled spring 74 seats. The spring 74 is disposed around the valve body 65 and has its opposite end bearing against the upper end of the housing 61 for urging the valve body 65 upwardly to its full line position of Figure 6. The housing 61 is provided with a radial port in the wall thereof, as seen at 75, which opens to the atmosphere and which communicates with the bore 64 above the chamber 63 and below the valve body 65, when the latter is in its raised, full line position of Figure 6.

An air hose 76 having one end, not shown, adapted to be connected to a source of air under pressure has a nipple 77 at its opposite outlet end which is threaded radially through the externally thickened upper portion of the valve body 65 and which opens into the chamber 69 beneath and adjacent the plug 67. The housing 61 is provided with a bracket 78 through which extend fastenings 79 for securing the bracket 78 to an end wall of the machine 11 for mounting the valve 62 thereon beneath and slightly outwardly of the belt pulley 13. A cam 80 is secured to the outer face of the belt pulley 13 and has an outer inclined edge disposed to strike the head 68 at each revolution of the belt pulley 13. The front cylinder head 21 has a threaded opening 81 extending therethrough to adjustably receive an elongated threaded rod 82 which extends therethrough and which has an inner end adjustably disposed in the cylinder 20 and which may be adjusted longitudinally thereof. The inner end of the rod 82 forms an adjustable stop for limiting the movement of the master piston 31 from right to left of Figures 2 and 4 or toward the forward head 21.

Assuming that the stock feeder 10 is applied as illustrated in the drawings to the machine 11 and has the stock strand 52 extending through its bore 34, as the belt pulley 13 makes each clockwise rotation the cam 80 will engage the head 68 to displace the valve body 65 downwardly to its dotted line position of Figure 6 to thus uncover the port 70 so that the compressed air in the chamber 69, supplied thereto through the hose 76 may escape through the enlarged chamber 63 into the hose 60 thence through the coupling 59, pipe or hose 56 and nipple 55 into the cylinder 20. The valve body 65 in its lowermost dotted line position of Figure 6 will seal the exhaust port 75 to prevent escape of the compressed air therethrough to the atmosphere. The compressed air entering the cylinder 20 through the nipple 55 is initially ejected against the heads 47 and the gripping dogs 46 to force said parts radially inwardly of one another against the ac-

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tion of the springs 48 from their positions of Figure 3 to their positions of Figure 5 so that the grooved portions 53 will grip the stock 52. Thereafter, the air will escape from the cylindrical recesses 41 through the spaces between the recessed surfaces 43 of the piston 31 and the wall of the cylinder 20 into the space between the rear cylinder head 22 and the annular end portion 45 of the piston 31. The air impinging against the piston surface 45 will force the piston 31 to move from right to left of the cylinder 20 from its position of Figure 4 to its position of Figure 2 against the action of the coiled spring 39. As the stock 52 is gripped by the dogs 46 during this movement of the master piston 31, the stock will be advanced from right to left of Figures 2 and 4 a distance equal to the travel of the piston 31, which distance is regulated by adjustment of the adjustable stop 82. This operation will occur while the cam 80 is in engagement with the head 68 to hold the valve body 65 in its depressed dotted line position of Figure 6. After the stock 52 has been advanced it will be engaged by a part of the machine 11, not shown, by which the operation to be performed on the stock is accomplished and while the stock 52 after advancement is thus engaged, the cam 80 will ride out of engagement with the head 68 thus permitting the spring 74 to displace the valve body 65 upwardly to its full line position of Figure 6. When this occurs the exhaust port 75 will be uncovered by the valve 65 allowing the air to escape therethrough to the atmosphere thus releasing the air pressure in the cylinder 20 between the cylinder head 22 and piston 31. When this occurs and while the stock 52 is still held by the part of the machine 11 the springs 42 will force the gripping dogs 46 radially outwardly of the piston 31 from their positions of Figure 5 to their positions of Figure 3 since the air pressure against the piston-like heads 47 of the gripping dogs will thus have been released. Immediately thereafter the spring 39 will expand and in so doing will cause the piston 31 to slide from left to right from its position of Figure 2 back to its position of Figure 4. The feeder 10 will then be ready to repeat the operation just previously described so that the stock 52 or 52a may thus be fed to the machine 11 by an intermittent or step-by-step motion. The hollow shafts 32 and 33 slide through the bores 26 and 27, respectively, during this movement of the master piston 31 and the stems 36 engaging the grooves 35 prevent the piston from turning in the cylinder 20 so that the piston-like heads 47 are always disposed to directly receive the force of each charge of compressed air admitted to the cylinder through the nipples 55 and when the piston 31 is in its retracted position of Figure 4.

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

I claim as my invention:

1. An automatic stock feeding device for use with automatic material processing machines comprising a cylinder having a forward cylinder head at one end thereof and a rear cylinder head at its opposite rear end, a master piston reciprocally disposed in said cylinder, a shaft projecting from each end of the master piston, said shafts being axially disposed relatively to the cylinder, said cylinder heads having aligned bores

through which the shafts reciprocally extend, a bore extending longitudinally through said shafts and piston forming a stock passage through which an elongated strand or strip of stock is adapted to be fed from the rear end of the cylinder to and through the forward end thereof, said piston having diametrically opposed outwardly opening cylindrical recesses each provided with a restricted inner end opening radially into the piston bore, a gripping dog reciprocally disposed in the restricted end of each cylindrical recess, each of said gripping dogs having a piston-like head reciprocally disposed in its associated cylindrical recess, an expansion spring disposed in the cylinder between the forward cylinder head and piston for urging the piston toward the rear cylinder head, abutment means on the master piston normally engaging the rear cylinder head and spacing the adjacent end of the piston therefrom, said master piston having recessed portions extending from its rear end and opening into said cylindrical recesses forming passages between the cylindrical recesses and the space between the rear end of the master piston and the rear cylinder head, a conduit for a fluid medium under pressure having dual discharge ends connected to said cylinder and discharging diametrically in the cylinder in alignment with one another and with said cylindrical recesses of the master piston when said master piston is in engagement with the rear cylinder head for intermittently supplying a fluid medium under pressure to the cylinder whereby said dogs will be initially projected inwardly into gripping engagement with the stock and the piston thereafter displaced toward the forward cylinder head to advance the stock therethrough, said gripping dogs being released from gripping engagement with the stock and said piston being returned to a position in engagement with the rear cylinder head by the expansion spring when the pressure of the fluid medium is released from the cylinder.

2. A stock feeder as in claim 1, and expansion coiled springs seated in said cylindrical recesses and bearing against said piston-like heads for normally retaining the gripping dogs in retracted disengaged positions.

3. A stock feeder as in claim 1, and means for slidably keying the master piston and shafts to the cylinder to prevent rotation of the piston relatively to the cylinder whereby said cylindrical recesses will be disposed in alignment with and between the discharge ends of said fluid pressure conduit when the master piston is in engagement with the rear cylinder head.

4. A stock feeder as in claim 1, and guide bushings detachably secured in the bore of the master piston and shafts, said guide bushings having bores shaped to slidably accommodate the stock for maintaining a portion of the stock in

a position to be engaged by the gripping dogs.

5. A stock feeder as in claim 1, said gripping dogs each having an elongated gripping face extending longitudinally of the piston and shaft bore, said gripping faces being recessed to accommodate and engage a substantial portion of the stock when the gripping dogs are in projected, gripping positions.

6. A stock feeder for use with automatic material processing machines comprising a shaft, a piston interposed thereon intermediate of the ends of said shaft, said shaft having a bore extending longitudinally therethrough and through the piston adapted to form a passage for stock in strand or strip form, a cylinder in which said piston is reciprocally disposed, a forward cylinder head fixed to one end of said cylinder and a rear cylinder head fixed to the opposite end of said cylinder, said cylinder heads having aligned bores through which the ends of the shaft reciprocally extend, spring means interposed between the forward cylinder head and piston for normally retaining the piston in a retracted position in engagement with the rear cylinder head, a supply conduit for a fluid medium under pressure having dual outlets discharging radially into said cylinder, said piston having radially extending recesses aligning with said dual outlets when the piston is in engagement with the rear cylinder head, gripping dogs reciprocally disposed in said radial recesses and extending into the piston and shaft bore and adapted to engage and grip the stock when the gripping dogs are projected inwardly by a fluid medium under pressure admitted to the cylinder through said dual outlets, said piston being displaced toward the forward cylinder head by the fluid medium under pressure impinging against portions of the piston, and springs urging each of said gripping dogs to a released position for disengaging the gripping dogs from the stock when the pressure of the fluid medium in the cylinder is released, said spring means thereafter returning the piston to a position in engagement with the rear cylinder head for positioning the gripping dogs in alignment with said dual outlets.

7. A stock feeder as in claim 6 and an adjustable stop extending into the cylinder through the forward cylinder head for limiting the travel of the piston toward the forward cylinder head to regulate the distance that the stock can be fed intermittently by each movement of the piston toward the forward cylinder head.

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