Dec. 18, 1951 J. A. BLACK 2,578,779

FEEDING MECHANISM FOR PRINTING MACHINES

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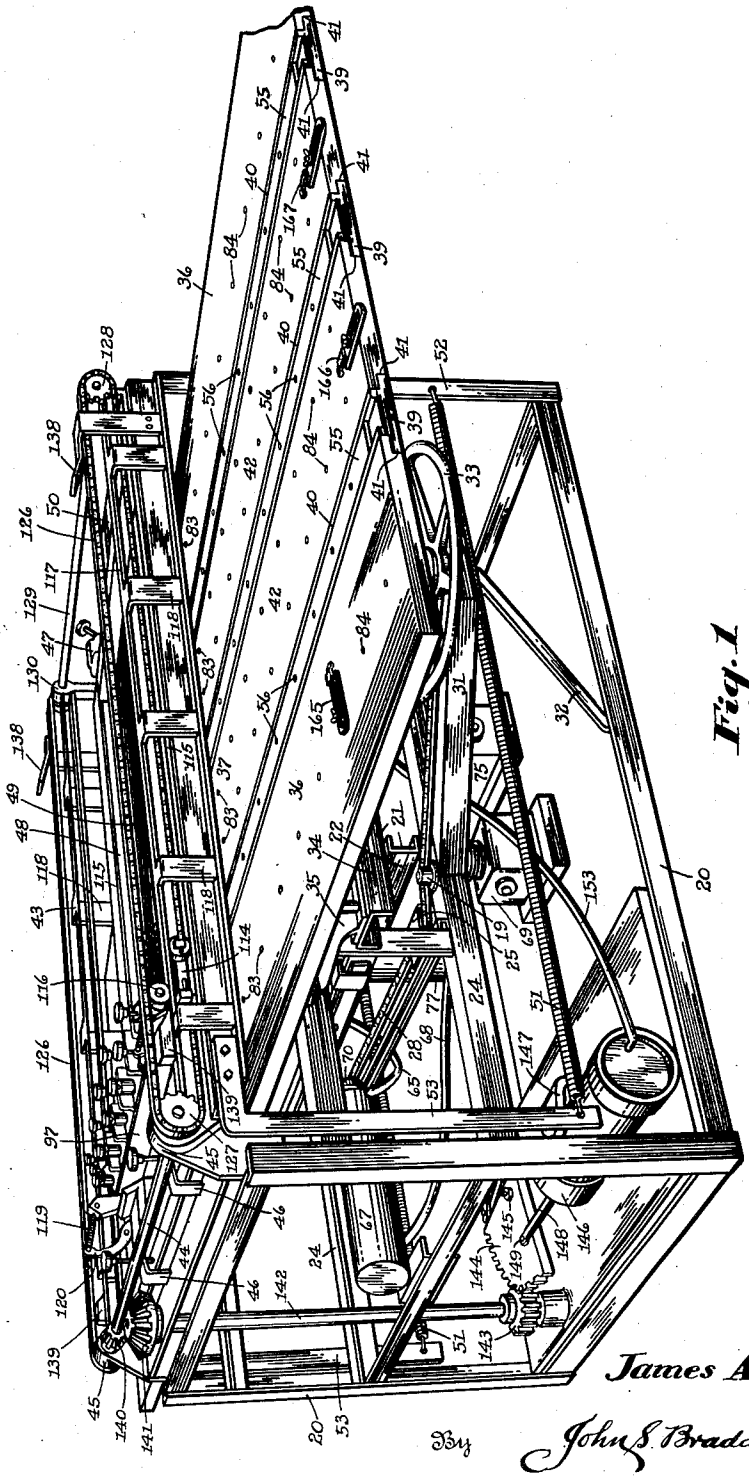


Fig. 1

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FEEDING MECHANISM FOR PRINTING MACHINES

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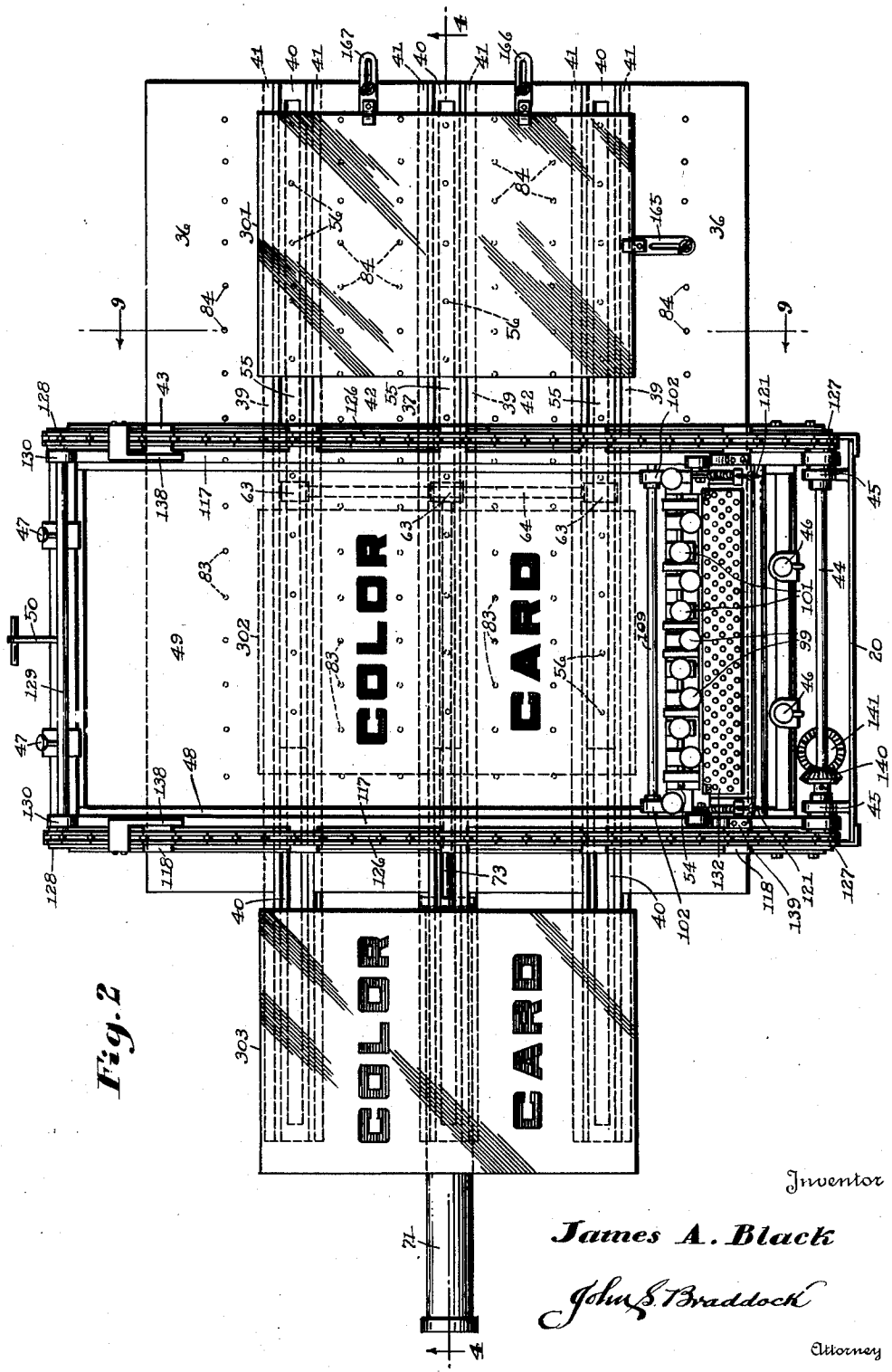


Fig. 2

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FEEDING MECHANISM FOR PRINTING MACHINES

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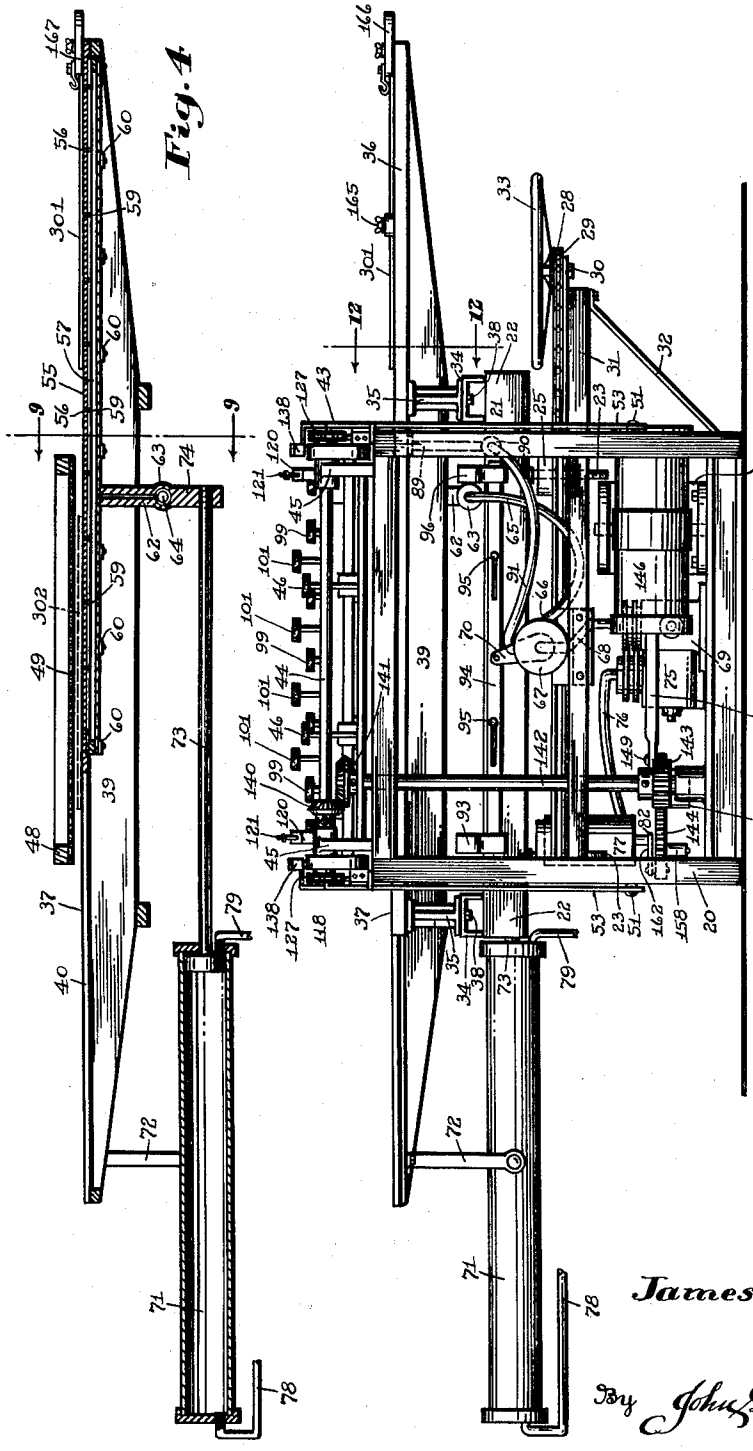


Fig. 4

Fig. 5

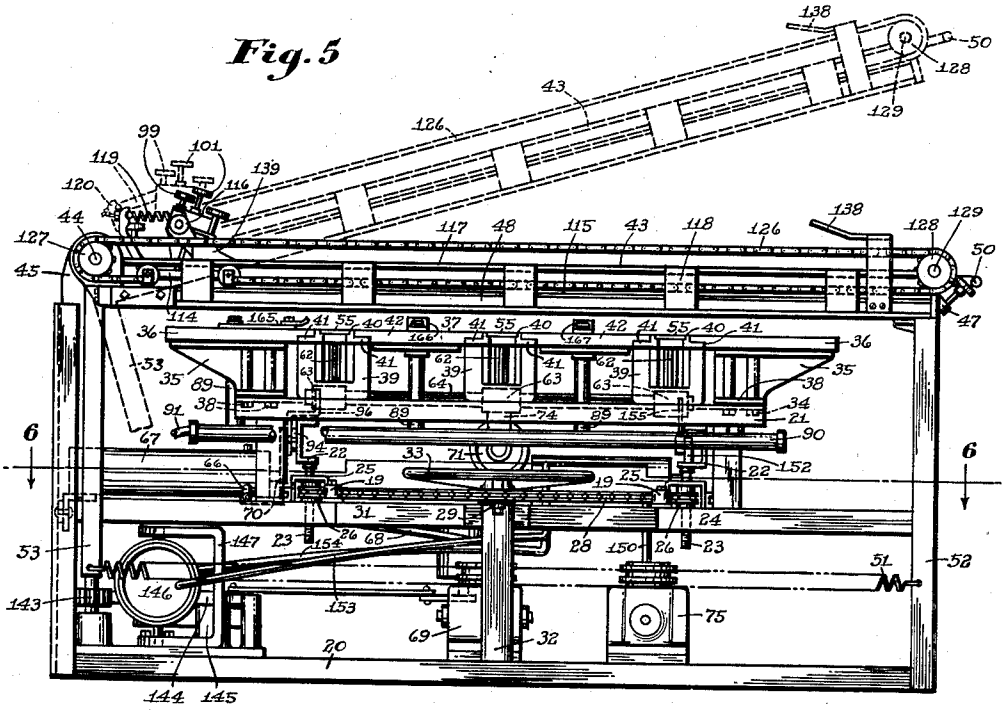
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FEEDING MECHANISM FOR PRINTING MACHINES

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Fig. 5



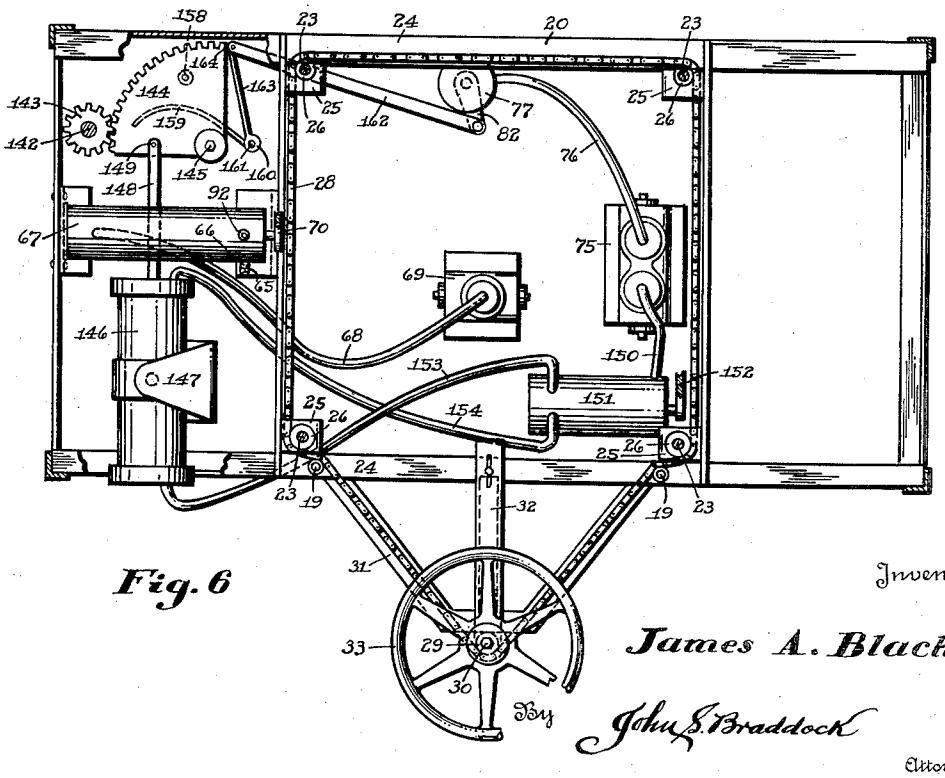


Fig. 6

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FEEDING MECHANISM FOR PRINTING MACHINES

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Fig. 7

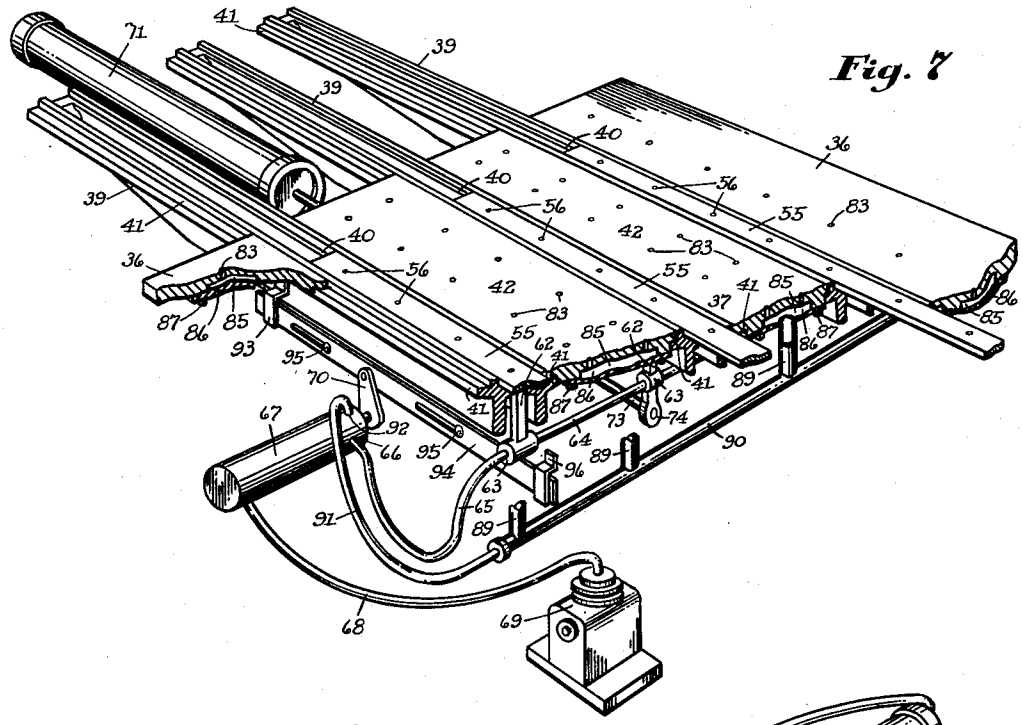
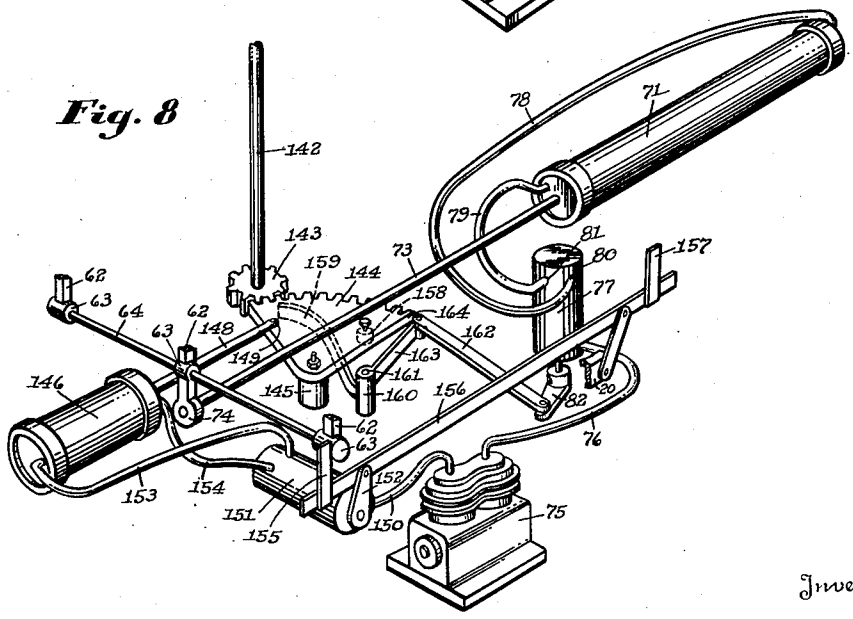


Fig. 8



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Fig. 9

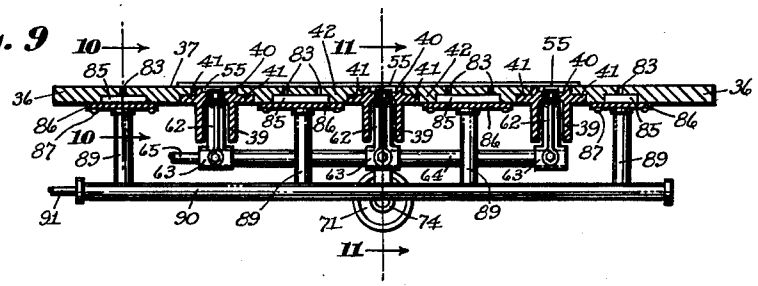


Fig. 10

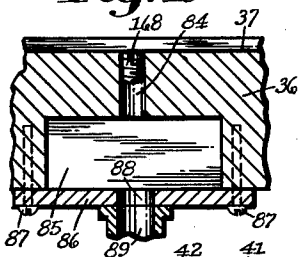


Fig. 11

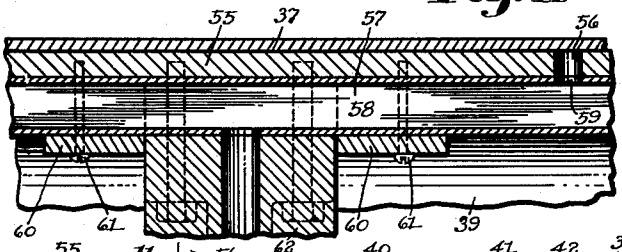
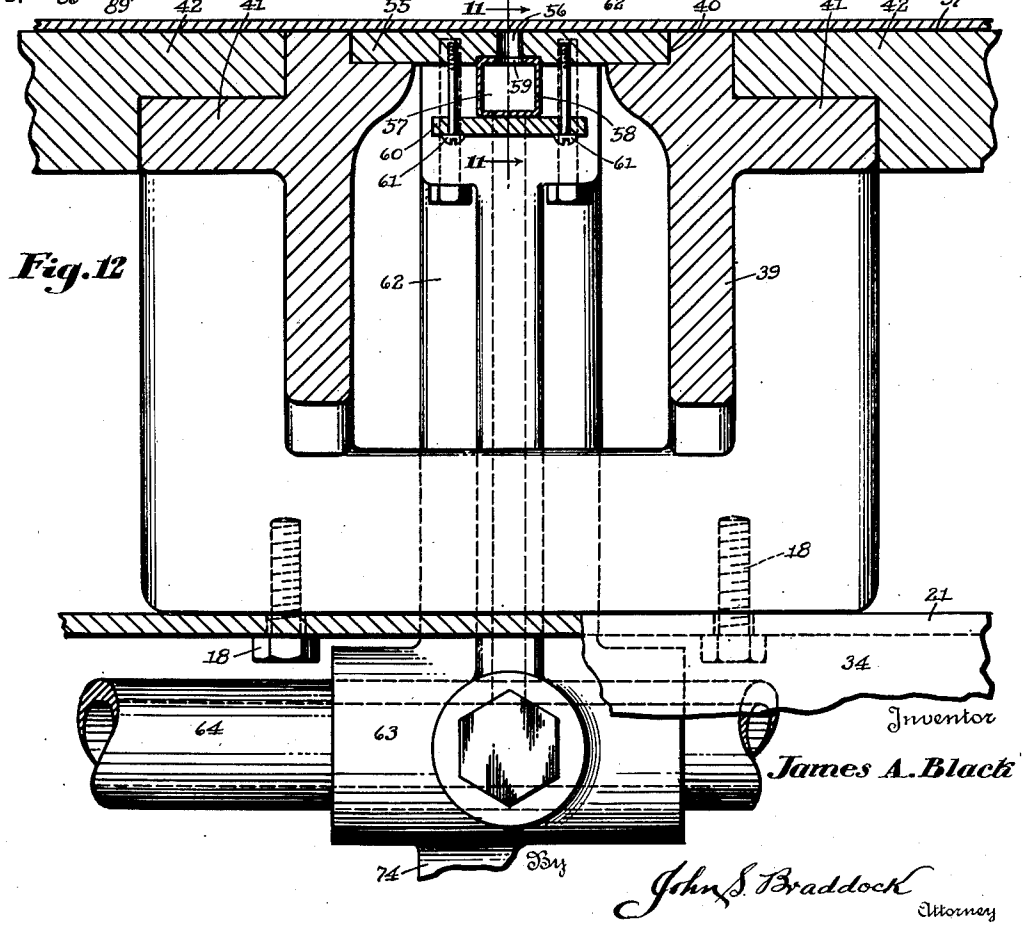


Fig. 12



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FEEDING MECHANISM FOR PRINTING MACHINES

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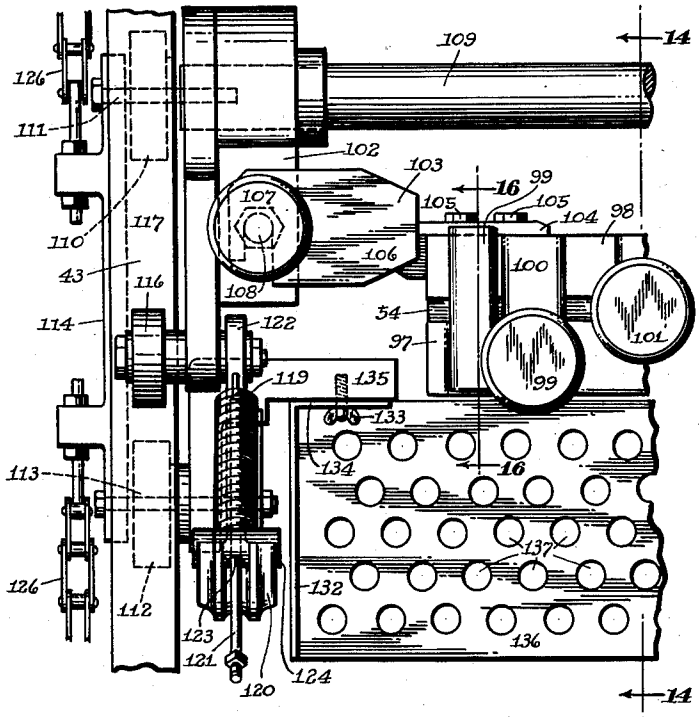
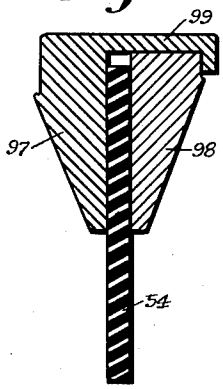


Fig. 13

Fig. 16



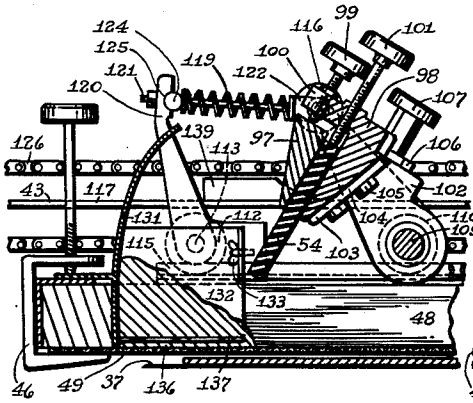


Fig. 14

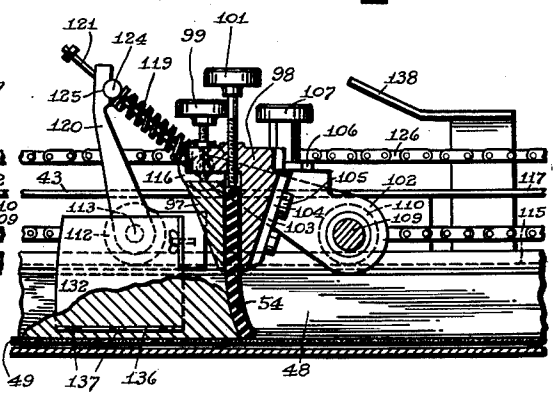


Fig. 15

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UNITED STATES PATENT OFFICE

2,578,779

FEEDING MECHANISM FOR PRINTING MACHINES

James A. Black, Grand Rapids, Mich.

Application May 2, 1947, Serial No. 745,411

10 Claims. (Cl. 271—54)

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The present invention relates to printing machines and more particularly to machines of the silk screen stencil type by means of which pigment paints, varnishes, shellacs, adhesives and other viscous or glutinous coating materials may be forced through a silk screen stencil onto paper, cardboard, sheet metal, sheet wood, etc., for the purpose of making posters, signs, decalcomanias and the like.

The primary objects of the invention are to provide a machine of the class above indicated which is automatic in operation, having co-ordinated mechanisms whereby the stock to be coated is introduced into the machine, processed thereby, and ejected therefrom in automatic, quick succession thus to enable the processing of great quantities of stock in relatively short periods of time and with a minimum of human effort; to provide such a machine having novel feeding and ejecting mechanism whereby a unit of stock to be processed is fed into the machine in the same operation in which a processed unit of stock is ejected from the machine; to provide such a machine having novel and efficient means for performing the silk screen operation on successive units of the work or stock being processed; to provide such a machine which is readily adjustable to accommodate stock of different sizes and different thicknesses such as relatively thin paper sheets or relatively thick plywood panels; to provide such a machine having conveniently operated means whereby frames carrying different silk screen stencils may be quickly interchanged; to provide such a machine which is so constructed that it may readily be cleaned or repaired; to provide such a machine whose moving parts may be actuated by means of fluid pressure; and in general to provide such a machine which is efficient in operation, attractive in appearance, and reasonably economical in manufacture.

The above objects are attained by, and the invention finds one embodiment in, the structure particularly described hereinafter and illustrated by the accompanying drawings, wherein:

Figure 1 is a perspective view showing the machine as viewed from above, from the left hand side, and from the rear or receiving end thereof;

Figure 2 is a top plan view of the machine illustrating display cards in three positions or stations thereon;

Figure 3 is a side elevation of the machine as viewed from the left hand side of Figure 1;

Figure 4 is a fragmentary, central vertical sectional view thereof taken on line 4—4 of Figure 2;

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Figure 5 is an end elevation of the machine as viewed from the rear or receiving end thereof, and showing the processing mechanism of the machine in a lowered operative position in full lines and in an upwardly swung inoperative position in dotted lines;

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 5 and showing certain of the control mechanisms for the machine in top plan;

Figure 7 is a diagrammatic perspective view of certain parts of the machine which control the automatic feeding and ejecting means, the remainder of the machine being omitted from this view for purposes of illustration;

Figure 8 is a diagrammatic perspective view of certain other parts of the machine which control the processing means, the remainder of the machine being omitted from this view for purposes of illustration;

Figure 9 is a fragmentary vertical sectional view of the machine taken on lines 9—9 of Figures 2 and 4;

Figure 10 is an enlarged fragmentary vertical sectional view of parts thereof, taken on line 10—10 of Figure 9;

Figure 11 is a fragmentary vertical sectional view of other parts thereof taken on lines 11—11 of Figures 9 and 12, Figure 11 being on the same enlarged scale as Figure 12;

Figure 12 is an enlarged fragmentary vertical sectional view of parts of the machine taken on line 12—12 of Figure 3;

Figure 13 is an enlarged fragmentary top plan view of parts of the processing mechanism of the machine;

Figure 14 is a fragmentary vertical sectional view of the same, on a reduced scale, taken on line 14—14 of Figure 13 and showing certain parts of the processing mechanism in an upwardly tilted inoperative position;

Figure 15 is a view similar to Figure 14 and showing said parts of the processing mechanism in a lowered and operative position; and

Figure 16 is a sectional view taken on line 16—16 of Figure 13.

Referring now in detail to these drawings wherein like parts of the structure are designated by the same numerals in the several views, the various parts and mechanisms of the machine therein shown are mounted upon a frame generally designated 20 fabricated of angle iron lengths secured together as by welding to form a stationary structure or frame of open box-like or rectangular parallelepiped shape the greatest

dimension of which extends from side to side of the machine (see Figures 1, 3 and 5). A cradle 21 of generally square, channel iron construction, is vertically adjustably mounted on the frame 20 in a horizontal position approximately midway between the top and bottom of the frame, the lower longitudinally disposed channel iron members 22 of the cradle being secured as by welding to the tops of four vertically disposed jackscrews 23 which are mounted for vertical sliding movement in bearing brackets 25 secured to the cross-bars 24 and located at the four corners of the square cradle 21. Internally screw-threaded gears 26 (see Figures 5 and 6) are disposed between the upper and lower flanges of the brackets 25 and engage the jackscrews 23 respectively, and the external surfaces of the gears 26 are provided with sprockets which support a chain 28 passing around the four gears 26 and around a sprocket 29 on the lower end of a vertical shaft 30 journalled in the apex of a rearwardly convergent angle bracket 31 on the frame 20 supported by a diagonal brace 32 secured to the outer end of the angle bracket 31 and to the lower part of the frame. A handwheel 33 is mounted on the upper end of the shaft 30, and it will be seen that turning of the handwheel will cause the chain 28 to revolve the gears 26 thus effecting raising or lowering movement of the jackscrews 23 and the cradle 21 carried thereby. Idler rolls 19 turnably mounted on the frame 20 maintain tension on the chain 28.

The upper transversely disposed channel irons 34 of the cradle 21 have secured to their outer ends vertically extending corner brackets 35 of I-shaped cross-section, and each pair of corner brackets 35 at the opposite sides of the machine carries a horizontal outer section 36 of a flat work-supporting table generally designated 37. Bolts 38 pass upwardly through the channel irons 34 and through the corner brackets 35, and are threaded in the outer table sections 36 to secure these parts in assembly. Between the outer table sections 36 are three spaced channel bars 39 extending lengthwise of the machine and supported by the transversely disposed channel irons 34 of the cradle. Bolts 18 (see Figure 12) secure the channel bars 39 to the cradle 21. The upper portions of the channel bars 39 are flush with and form a part of the flat work-supporting table 37 and have longitudinally extending channels 40 in their upper faces, the function of which will hereinafter be described. The channel bars 39 also have laterally extending longitudinal flanges 41 thereon which are stepped below the upper surfaces of these bars 39. The outer flanges 41 of the outermost channel bars 39 support the inner edges of the outer table sections 36, while the inner flanges 41 of the outermost channel bars 39 support the outer edges of the inner table sections 42. The flanges 41 on opposite sides of the center channel bar 39 support the inner edges of the inner table sections 42, and thus a unitary, flat, horizontal, vertically adjustable work-supporting table 37 having three longitudinal channels 40 therein is provided.

A stencil carrier 43 of generally rectangular, flat metal bar construction is swingably mounted on the opposite end portions of a shaft 44 rotatably journalled in spaced bearings 45 at the upper left hand side of the machine's frame 20. The stencil carrier 43 is provided with clamps 46 at the left hand side of the machine and with clamps 47 at the right hand side of the machine, which clamps 46 and 47 are adapted to detachably secure a stencil frame 48 to the carrier 43, and the stencil frame 48 which is preferably constructed of wood has a silk screen stencil 49 stretched across the underside thereof and secured thereto in any known manner as by an adhesive. It will be seen that the silk screen stencil 49 and its wooden frame 48 may readily be removed from the carrier 43 by loosening the clamps 46 and 47, and a new stencil substituted therefor according to the requirements of the work. This interchanging of stencils is facilitated by swinging the stencil carrier upwardly to its dotted line position shown in Figure 5, and after a stencil and its frame are securely clamped in position the carrier is lowered to its horizontal position shown in full lines in Figure 5 where it is maintained during operation of the machine by means of a conventional latch mechanism indicated at 50 and not shown in detail. The stencil carrier 43 is counterbalanced to facilitate its raising and lowering movements by means of coiled tension springs 51 attached to the right hand corner uprights 52 of the frame 20 and to the lower ends of legs 53 secured to and depending from the carrier 43.

When the carrier 43 is in its lowered operative position, the silk screen stencil 49 is parallel to and spaced above that portion of the work-supporting table 37 which supports the work during the processing thereof, and the space between the stencil 49 and the table 37 may be varied by turning the handwheel 33 so that the stencil is spaced the correct distance above the upper surface of the stock to be processed, no matter what the thickness of the stock may be. When the stencil is in its lowered operative position with a unit of stock in position thereunder for processing, a print stroke (from right to left) of a squeegee 54 across the stencil forces coating material through the stencil and onto the stock. The details of construction and operation of the squeegee are hereinafter fully described, but the description immediately following pertains to the feeding mechanism whereby units of stock are introduced into the machine in position for processing and ejected from the machine after processing.

It will be seen that the work-supporting table 37, which includes the full lengths of the channel bars 39, has three distinct stations, as best illustrated in Figure 2. The station indicated by a fresh sheet of stock designated 301 is where the work is placed on the machine either manually or by automatic means not shown. The station indicated by a unit of stock designated 302 is where the work is processed. The station indicated by a printed unit of stock designated 303 is where the work is removed from the machine either manually or by automatic means not shown. The mechanism by means of which the stock is advanced from station 301 to station 302 and thence after processing to station 303 comprises a set of three rails 55 longitudinally reciprocally mounted in the channels 40 of the channel bars 39. The length of the rails 55 is approximately two-thirds of the length of the channel bars 39, said rails having only two stations for units of the stock. It will be seen that the rails 55 are free to be reciprocated through a distance of approximately one-half their length.

Each rail 55 has a plurality of longitudinally spaced apertures 56 in its upper surface and an aeriform fluid chamber 57 therein extending the

length of the rail and communicating with the apertures 56 (see Figures 4, 11 and 12). Each chamber 57 is formed by a length of square metal tubing 58 closed at its ends and having apertures 59 in registry with the apertures 56 in the rail. The tubing 58 is secured to the underside of the rail by means of cross-pieces 60 thereunder which are fastened to the rail by means of machine screws 61. Depending from each rail 55 slightly forwardly of the middle thereof is a hollow arm 62 with a horizontal sleeve 63 at its lower end, and the three sleeves 63 are connected by means of a pipe 64 having a flexible tube 65 coupled to one end thereof. The other end of the tube 65 is connected to one port 66 of an exhaust value 67, and a flexible tube 68 connects the other end of the valve 67 with an exhaust pump 69 connected to a suitable source of power such as an electric circuit (not shown). When the operating arm 70 of the valve 67 is in a rearward position opposite to its position shown in Figure 7, the exhaust pump exhausts air from the tube 68, valve 67, tube 65, pipe 64, hollow arms 62 and chambers 57, thus creating a suction at the apertures 56 of the rails 55, which suction maintains the work (stock units 301, 302 or 303, in an adjacent pair thereof) in position on the rails thus permitting movement of the work with the rails to and away from processing position on the work-supporting table.

The rails 55 are reciprocated in the channels 40 of the work-supporting table 37 by means of a fluid pressure operated cylinder 71 mounted on metal straps 72 depending from the forward ends of the channel bars 39 and having a rearwardly extending piston rod 73 connected to an arm 74 depending from the sleeve 63 of the middle rail 55. As best seen in Figure 8, fluid pressure is supplied to the cylinder 71 from a compressor 75 operated by a suitable source of power such as an electric current (not shown), through a tube 76, a valve 77, and through one or the other of two tubes 78, 79 leading from the discharge ports 80, 81 of the valve 77 to the front and rear ends respectively of the cylinder 71. When the operating arm 82 of the valve 77 is in its right hand turned position shown in Figure 8, pressure is admitted through the tube 78 to the front end of the cylinder 71 thus moving the rails 55 in a rearwardly direction, and when the operating arm 82 of the valve 77 is in its opposite or left hand turned position pressure is admitted through the tube 79 to the rear end of the cylinder 71 thus moving the rails 55 in a forwardly direction.

The work-supporting table 37 is provided with suction apertures 83 and 84 in its upper surface similar to the apertures 56 in the rails. The apertures 83 are located in the work-processing area designated station 302 of the work-supporting table, and the apertures 84 are located in the work-feeding area designated 301 of the work-supporting table. Aeriform fluid chambers 85 (see Figures 7, 9, and 10) in the outer and inner table sections 36 and 42 respectively, communicate with the apertures 83 and 84 and are formed by means of recesses in the undersides of the table sections which are sealed by plates 86 secured to the bottoms of the table sections as by machine screws 87. Each plate 86 has an aperture 88 to which is coupled a depending pipe 89, and the lower ends of the three pipes 89 are connected by a horizontal pipe 90 which is closed at its right hand end and which has a tube 91 connecting its left hand

end to the other port 92 of the exhaust valve 67. It will be seen that when the operating arm 70 of the valve 67 is moved from its rearwardly turned position to its forwardly turned position shown in Figure 7, the suction created by the exhaust pump 69 is transferred from the apertured rails 55 to the apertured work-supporting table 37.

Forward turning movement of the operating arm 70 (see Figure 7) of the exhaust valve 67 is effected when the rails 55 reach their forwardmost position, by contact of the sleeve 63 on the left hand rail 55 with a striker arm 93 on the forward end of a slide bar 94 slidably mounted on pins 95 secured to the cradle 21 of the machine. Rearward turning movement of the exhaust valve's arm 70 is similarly effected by contact of said sleeve 63 with a striker arm 96 on the rearward end of the slide bar 94 when the rails 55 reach their rearwardmost position.

The squeegee 54 is mounted on the stencil carrier 43 for reciprocating movements across the silk screen stencil 49 from side to side of the machine, and these movements of the squeegee are co-ordinated with the movements of the rails 55 which feed the stock to and remove it from processing position beneath the stencil. The mountings for the squeegee 54, which is an elongated, flat, relatively stiff bar of rubber, are best shown in Figures 13–16 inclusive. The squeegee is clamped between two metal bars designated 97 and 98. Arms 99 on the bar 97 extend over the top of and downwardly behind the bar 98, so that the bar 97 is suspended on the bar 98 with the rubber squeegee 54 therebetween (see Figure 16). Handscrews 99 are vertically threaded in arms 100 of the bar 98 which arms overhang the bar 97, and it will be seen that downward turning movement of the handscrews 99, whose lower ends bear against the top of the bar 97, forces the bar 97 into clamping relation with the bar 98 and with the squeegee therebetween. Vertical adjustment of the squeegee may be effected by slightly loosening the handscrews 99 and moving the squeegee upward or downward to the desired position by means of adjustment screws 101 threaded in the bar 98 and bearing against the upper edge of the squeegee. This adjustment is best effected when the squeegee is resting against the silk screen stencil. The squeegee assembly thus formed is mounted on carriage arms 102 at opposite ends thereof by means of brackets 103 having arms 104 secured by machine screws 105 to opposite ends of the bar 98 and having arms 106 laterally adjustably and removably secured to the carriages 102 by means of knobs 107 the lower ends 108 of which are threaded in the carriage arms 102.

The right hand ends of the carriage arms 102 are swingably journalled on a shaft 109 extending across the stencil carrier 43 and having rollers 110 turnably mounted on pintles 111 in the opposite ends of the shaft 109. The squeegee carriage comprises the shaft 109, rollers 110, and similar rollers 112 mounted on pintles 113, the pintles 111 and 113 being connected by carriage plates 114. The rollers 110 and 112 travel on lower tracks 115 which constitute the side rails of the stencil carrier 43. The free left hand ends of the carriage arms 102 are provided with rollers 116 which are adapted to travel on upper tracks 117 secured by brackets 118 to the stencil carrier 43 and which rollers 116 support the squeegee carriage at its left hand end when the

squeegee assembly is in its lowered position shown in Figures 13 and 15. The squeegee assembly is spring-pressed past the center of its turning movement to its raised or "free stroke" position shown in Figure 14, or past center to its lowered or "print stroke" position shown in Figure 15, by means of coiled pressure springs 119 interposed between the carriage arms 102 and the upper ends of posts 120 which are rigidly mounted on the inner ends of the pintles 113. The squeegee assembly is guided during these turning movements by pins 121 extending from lugs 122 on the carriage arms 102 through the coiled springs 119 and through eyes 123 in cylindrical blocks 124 which are turnably seated in concave recesses 125 in the upper ends of the posts 120.

The squeegee is reciprocated across the silk screen stencil, from side to side of the machine, by means of chains 126 which have their opposite ends connected to opposite ends of the carriage plates 114 and which pass under and over sprockets 127 mounted on the extreme outer ends of the shaft 44 at the left hand side of the machine, and which pass under and over sprockets 128 mounted on the extreme outer ends of a shaft 129 journalled in bearings 130 on the opposite or right hand end of the stencil carrier 43. Driving mechanism for the sprockets 127 and the chains 126 carried thereby, is hereinafter more fully described.

During the operation of the machine a quantity of the coating material to be applied to the stock is stored in the stencil frame at the left hand end thereof (see Figure 14). A splatter shield 131 is secured to the frame by the clamps 46 for preventing splashing of the material out of the frame. A spreader 132 is secured to the squeegee carriage for movement therewith by means of wing screws 133 passing through openings in flanges 134 of the spreader and threaded in inward projections 135 at the lower ends of the posts 120. The horizontal portion 136 of the spreader 132 is spaced slightly above the silk screen stencil 49, and is provided with a multiplicity of apertures 137 therein. The spreader 132 dips into the quantity of coating material whenever it reaches the left hand side of the stencil frame. During the squeegee's travel from left to right across the stencil, the squeegee assembly is turned upwardly out of contact with the stencil as shown in Figure 14, and during this travel the spreader 132 spreads a quantity of the coating material over the stencil. This is the squeegee's "free stroke." When the squeegee reaches the extreme right hand side of the stencil carrier, the rollers 116 on the squeegee carriage arms 102 strike cam plates 138 mounted on the right hand side of the stencil carrier, and the squeegee is turned downwardly into contact with the stencil as shown in Figure 15. The squeegee is then reciprocated from right to left (by means hereinafter more fully described) and makes its "print stroke," forcing coating material through the stencil onto the unit of stock (302) therebeneath and pushing excess material ahead of it to clean the stencil. When the squeegee reaches the extreme left hand side of the stencil carrier, it is again turned upwardly out of contact with the stencil by means of cam blocks 139 mounted on the upper tracks 117.

The mechanism for reciprocating the squeegee 54 and for co-ordinating this reciprocation with the stock feeding mechanism includes a bevel gear 140 secured on the horizontal shaft 44 and meshing with a bevel gear 141 secured on the upper end of a vertical shaft 142 journalled in the upper and lower left hand corners of the frame 20. A pinion 143 secured on the shaft 142 near the shaft's lower end meshes with a toothed sector 144 mounted at 145 on the base of the frame 20 for turning movement about a vertical axis. A fluid pressure cylinder 146 turnably mounted in a yoke 147 secured to the base of the frame 20 has a piston rod 148 pivotally connected at 149 to the sector 144, and it will be seen that reciprocation of the piston within the cylinder 146 effects reciprocation of the squeegee 54 through the gear train above described. This piston is reciprocated by fluid pressure from the compressor 75 through a tube 150 leading from the compressor to the right hand end of a pressure valve 151 having an operating arm 152 which when in its forwardly moved position shown in Figure 8 admits fluid pressure through a tube 153 to the rearward end of cylinder 146 and when in its rearwardly moved position admits fluid pressure through the tube 154 to the forward end of cylinder 146. The operating arm 152 of the pressure valve 151 is moved rearwardly from its position shown in Figure 8 by contact of the sleeve 63 on the right hand rail 55 with a striker arm 155 on the rearward end of a switch bar 156 (see Figure 8) slidably mounted on the frame 20 of the machine. The operating arm 152 is similarly moved in a forwardly direction by contact of the sleeve 63 on the right hand rail 55 with a striker arm 157 on the forward end of the switch bar 156. These movements of the pressure valve's operating arm 152 are effected only when the feeding rails 55 reach their most extreme rearward and forward positions, and the squeegee's movement is therefore from left to right when the rails 55 reach their rearwardmost position, and from right to left when the rails reach their forwardmost position.

The forward and rearward movements of the rails 55 are initiated by the arrival of the squeegee at its extreme limits of movement to the right and to the left, respectively. When the squeegee reaches the end of its movement to the right a depending stop 158 on the sector 144 strikes an arm 159 of a bell crank lever 160 pivotally mounted at 161 on the base of the frame 20, thus moving to the left a link 162 which connects the other arm 163 of the bell crank lever 160 to the operating arm 82 of the pressure valve 77. This movement of the arm 82 of valve 77 admits fluid pressure through tube 79 to the rearward end of the pressure cylinder 71 thus moving the rails 55 forwardly. This action is reversed when the squeegee reaches the end of its movement to the left, whereupon the right hand end 164 of the sector 144 contacts the arm 163 of the bell crank lever 160 thus moving the link 162 and the arm 82 of valve 77 to the right and admitting fluid pressure through the tube 78 to the forward end of the pressure cylinder 71 and thus starting rearward movement of the rails 55.

The apertures 84 in the rearward portion of the work-supporting table 37, which portion of the table is indicated as station 301, serve merely to hold fresh stock in correctly placed position on the table until the rails 55 carry said stock forwardly, at which time the suction through said apertures 84 is relieved. Adjustable stops 165, 166 and 167 may if desired be provided to facilitate the correct positioning of stock on the

machine, and some of the apertures 84 may be screw threaded to receive the wing screws which hold the adjustable stops in position. Furthermore any of the apertures 83 and 84 which because of the size of the stock being run would not be covered by the stock, may be plugged by means of threaded plugs 168 inserted in said apertures as illustrated in Figure 10, in order to prevent undesired intake of air through these apertures 83 and 84 during operation of the machine.

Operation

With the various parts of the machine in their positions shown in Figures 2, 5, 6, 7, 8 and 14 of the drawings, the rails 55 are just completing their rearward movement and suction is on the work-supporting table to maintain in position the units of stock at stations 301 and 302 while the rails 55 pass freely thereunder, there being no suction on the rails during this phase of the operation. A fresh unit of stock at station 301 has just been placed on the machine against the stops 165, 166 and 167, and the unit of stock at station 302 has just been screened by a print stroke of the squeegee 54 from right to left. The squeegee has just been turned by the cam blocks 139 from its position shown in Figure 15 to its position shown in Figure 14. The previously printed unit of stock at station 303 is ready to be moved off the machine. From this point on a complete cycle of the machine's operation, divided into two phases, is as follows:

Phase I. Sleeve 63 on the left hand rail 55 strikes the striker arm 96 on the sliding bar 94, thus moving the bar 94 and the operating arm 70 of the exhaust valve 67 rearwardly, and the suction created by the exhaust pump 69 is thus switched from the tube 91 and the work-supporting table 37 to the tube 65 and the rails 55. At the same time, sleeve 63 on the right hand rail 55 strikes the striker arm 155 on the switch bar 156, moving this switch bar and the operating arm 152 of the pressure valve 151 rearwardly. This movement of the arm 152 switches fluid pressure from the compressor 75 through the tube 150, to the tube 154 leading to the front end of cylinder 146 whose piston rod 148 is thus moved rearwardly. Sector 144 is moved by the piston rod 148 in a counter-clockwise direction (about a quarter turn), and this movement of the sector 144 turns pinion 143, shaft 142 and bevel gear 141 in a clockwise direction. Bevel gear 140, shaft 44, sprockets 127 and chains 126 are thus actuated to move the squeegee 54 across the stencil from left to right for its free or non-print stroke. Upon completion of the counter-clockwise movement of the sector 144, the depending stop 158 on the sector strikes arm 159 of the bell crank lever 160, thus moving arm 163 of said lever, link 152, and operating arm 82 of the pressure valve 77 to the left. Fluid pressure from the compressor 75 through tube 76 is thus switched through tube 79 to the rearward end of cylinder 71, and the piston rod 73 and rails 55 are thus moved forwardly, carrying the printed unit of stock at the processing station 302 to the removal station 303, and at the same time carrying the fresh unit of stock at station 301 to the processing station 302.

Phase II. When the rails 55 reach the limit of their forward movement, sleeve 63 on the left hand rail strikes the striker arm 93 on bar 94, thus moving bar 94 and the operating arm 70 of the exhaust valve 67 forwardly, and the suction created by the exhaust pump 69 is thus switched from tube 65 and the rails 55 to tube 91 and the work-supporting table 37, releasing units of stock from the rails and maintaining the unit of stock now at the processing station 302 firmly in position on the work-supporting table. At the same time, sleeve 63 on the right hand rail 55 strikes the striker arm 157 on the switch bar 156 thus moving this switch bar 156 and the operating arm 152 of the pressure valve 151 forwardly. Fluid pressure from the compressor 75 through tube 150 is thus switched to tube 153 and the rear end of cylinder 146, and the piston rod 148 is moved forwardly. Sector 144 is moved by the piston rod 148 in a clockwise direction (about a quarter turn) thus actuating the squeegee mechanism to move the squeegee across the stencil from right to left, and the squeegee now makes its print stroke forcing coating material through the stencil and onto the unit of stock now at the processing station 302. When the sector 144 completes its clockwise movement, the sector's right hand end 164 strikes the left hand end of link 162, moving link 162 and the operating arm 82 of the pressure valve 77 to the right thus switching fluid pressure from the compressor 75 through tube 76, to tube 78 and the forward end of cylinder 71. Rails 55 are thus again moved rearwardly and the cycle of operation is completed as the rails 55 approach their rearwardmost position.

The mechanism for effecting the movements of the rails 55 and of the squeegee 54 has been herein shown and described as being operated by compressed air from the compressor 75, but it will be understood that liquid under pressure, or any equivalent mechanical means may be substituted for effecting said movements. It will also be understood that the one specific embodiment of the invention herein shown and described contains numerous details of construction which might be altered or omitted without departing from the spirit of the invention as the same is defined by the claims which follow.

I claim:

1. In a machine of the class described: a work-supporting table having a flat upper surface with a work-processing position thereon and a channel therein; a rail reciprocally disposed in the channel and having a flat upper surface flush with that of the work-supporting table, said rail having a pair of work-engaging stations thereon; means for reciprocating the rail relative to said processing position; means associated with each of said stations for engaging a work unit whereby movement of the rail in one direction carries one station and the work unit thereon away from processing position on the work-supporting table and carries the other station and the work unit thereon into processing position on the work-supporting table; said table and said rail together forming a flat unbroken surface for supporting flat work throughout its entirety during the processing of said work.

2. In a machine of the class described: a work-supporting table having a flat upper surface with a work-processing position thereon and a channel therein; a rail reciprocally disposed in the channel and having a flat upper surface flush with that of the work-supporting table, said rail having a pair of work-engaging stations thereon; means for reciprocating the rail relative to said processing position; means associated with

each of said stations for engaging a work unit whereby movement of the rail in one direction carries one station and the work unit thereon away from processing position on the work-supporting table and carries the other station and the work unit thereon into processing position on the work-supporting table; means for disengaging both work units from the rail upon completion of said movement; and means associated with the table for engaging the work unit in processing position while the rail moves freely thereunder in its opposite direction; said table and said rail together forming a flat unbroken surface for supporting flat work throughout its entirety during the processing of said work.

3. In a machine of the class described: a work-supporting table having a flat upper surface with a work-processing position thereon and a channel therein; a rail reciprocally disposed in the channel and having a flat upper surface flush with that of the work-supporting table, said rail having a pair of work-engaging stations thereon; means for reciprocating the rail relative to said processing position; means associated with each of said stations for engaging a work unit whereby movement of the rail in one direction carries one station and the work unit thereon away from processing position on the work-supporting table and carries the other station and the work unit thereon into processing position on the work-supporting table; means for disengaging both work units from the rail upon completion of said movement; means associated with the table for engaging the work unit in processing position while the rail moves freely thereunder in its opposite direction; said table and said rail together forming a flat unbroken surface for supporting flat work throughout its entirety during the processing of said work and means for disengaging both work units from the table during movement of the rail in its first-mentioned direction.

4. In a machine of the class described: a work-supporting member having a work-processing surface provided with a plurality of apertures and an aeriform fluid chamber therein communicating with said apertures; means for feeding work to said work-processing surface; and means for exhausting the aeriform fluid from said chamber to maintain by suction the work in supported position on the apertured work-processing surface during the processing thereof, the apertured work-processing surface being substantially co-extensive with the work whereby the entire work is so maintained in supported position during processing.

5. In a machine of the class described: a work-supporting table having an apertured flat upper work-processing surface and an aeriform fluid chamber communicating with said apertured surface; means for feeding flat work to said work-processing surface; and means for exhausting the aeriform fluid from said chamber to maintain by suction the work in supported position on the apertured work-processing surface during the processing thereof, the apertured work-processing surface being substantially co-extensive with the work whereby the entire work is so maintained in supported position during processing.

6. In a machine of the class described: a work-supporting table having an apertured flat upper surface, an aeriform fluid chamber communicating with said apertured surface, and a channel therein; a rail reciprocally disposed in the channel and having a flat upper surface flush with that of the work-supporting table; means for reciprocating the rail; means associated with the rail for engaging the work whereby the work may be moved to and away from processing position on the work-supporting table; and means for exhausting the aeriform fluid from said chamber to maintain by suction the work in position on the apertured work-supporting surface during the processing thereof.

7. In a machine of the class described: a work-supporting table having an apertured flat upper surface, an aeriform fluid chamber communicating with said apertured surface, and a channel therein; a rail reciprocally disposed in the channel and having a flat upper surface flush with that of the work-supporting table; means for reciprocating the rail; means associated with the rail for engaging the work whereby the work may be moved to and away from processing position on the work-supporting table; means for exhausting the aeriform fluid from said chamber to maintain by suction the work in position on the apertured work-supporting surface during the processing thereof; and means for admitting aeriform fluid to said chamber to release the work from the work-supporting table during movement of the work away from processing position on said work-supporting table.

8. In a machine of the class described: a work-supporting table having an apertured flat upper surface, an aeriform fluid chamber communicating with said apertured surface, and a channel therein; a rail reciprocally disposed in the channel and having an apertured flat upper surface flush with that of the work-supporting table and an aeriform fluid chamber communicating with the apertured surface of said rail; means for reciprocating the rail; means for exhausting the aeriform fluid from the rail's chamber to engage by suction the work with the rail's apertured surface and permit movement of the work with the rail to and away from processing position on the work-supporting table; and means for exhausting the aeriform fluid from the table's chamber to maintain by suction the work in position on the apertured work-supporting surface during the processing thereof.

9. In a machine of the class described: a work-supporting table having an apertured flat upper surface, an aeriform fluid chamber communicating with said apertured surface, and a channel therein; a rail reciprocally disposed in the channel and having an apertured flat upper surface flush with that of the work-supporting table and an aeriform fluid chamber communicating with the apertured surface of said rail; means for reciprocating the rail; means for exhausting the aeriform fluid from the rail's chamber to engage by suction the work with the rail's apertured surface and permit movement of the work with the rail to and away from processing position on the work-supporting table; means for exhausting the aeriform fluid from the table's chamber to maintain by suction the work in position on the apertured work-supporting surface during the processing thereof; and means for admitting aeriform fluid to the table's chamber to release the work from the work-supporting table during movement of the work away from processing position on said work-supporting table.

10. In a machine of the class described: a work-supporting table having an apertured flat upper surface, an aeriform fluid chamber communicating with said apertured surface, and a

channel therein; a rail reciprocally disposed in the channel and having an apertured flat upper surface flush with that of the work-supporting table, an aeriform fluid chamber communicating with the apertured surface of said rail, and a pair of work-engaging stations on said apertured surface of said rail; means for reciprocating the rail; means for exhausting the aeriform fluid from the rail's chamber to engage by suction a work unit with each of said stations whereby movement of the rail in one direction carries one station and the work unit thereon away from processing position on the work-supporting table and the other station and the work unit thereon into processing position on the work-supporting table; means for admitting aeriform fluid to the table's chamber to release the work from the work-supporting table during said movement of the rail in said one direction; means for exhausting the aeriform fluid from the table's chamber to maintain by suction the work in position on the apertured work-supporting surface during the processing thereof; and means for admitting aeriform fluid to the rail's chamber to release both work units from said rail during the processing of the work unit in position therefor while the rail moves freely thereunder in its opposite direction.

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