

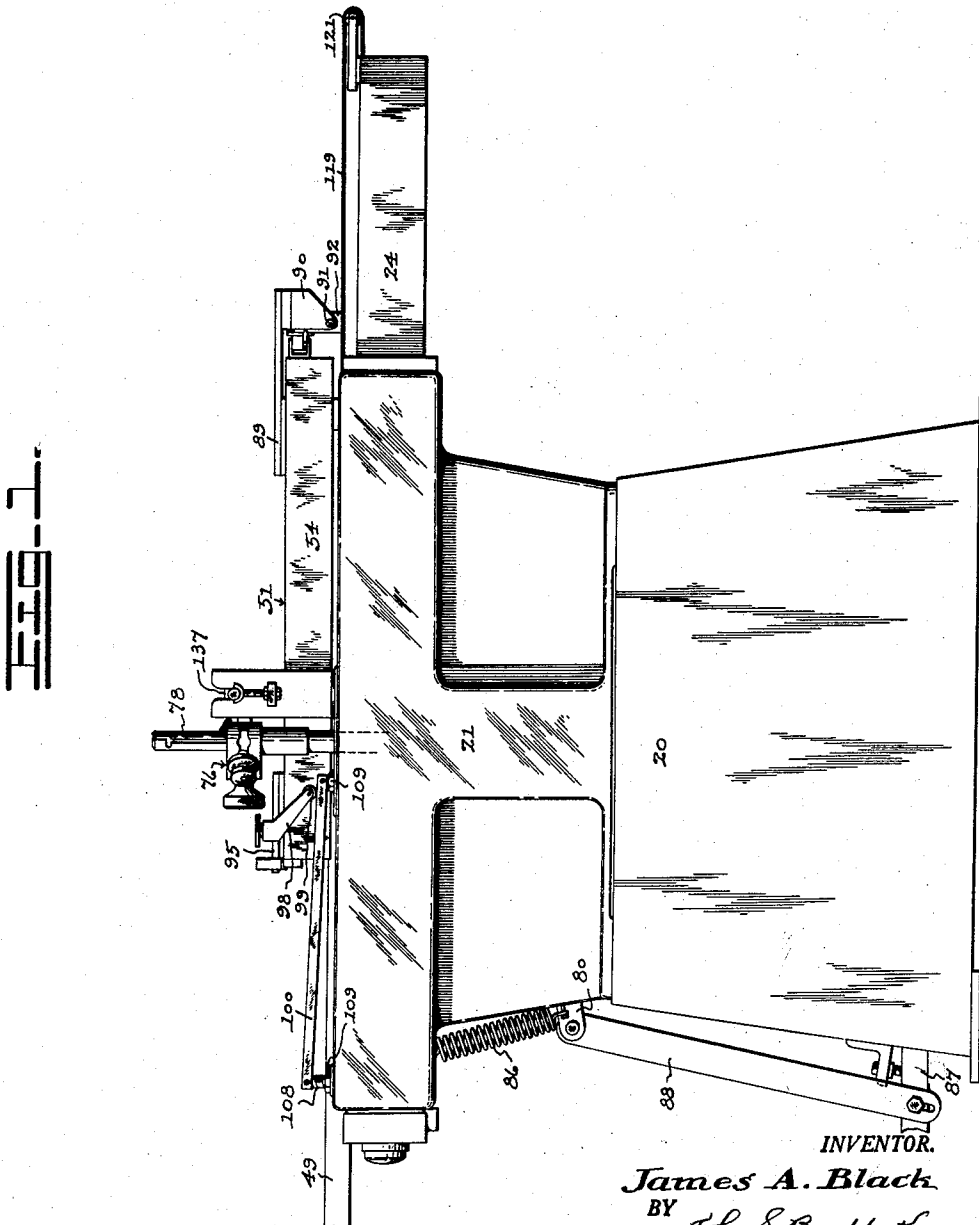
Dec. 22, 1959

J. A. BLACK  
STENCILLING MACHINE

2,917,997

Filed July 26, 1957

8 Sheets-Sheet 1



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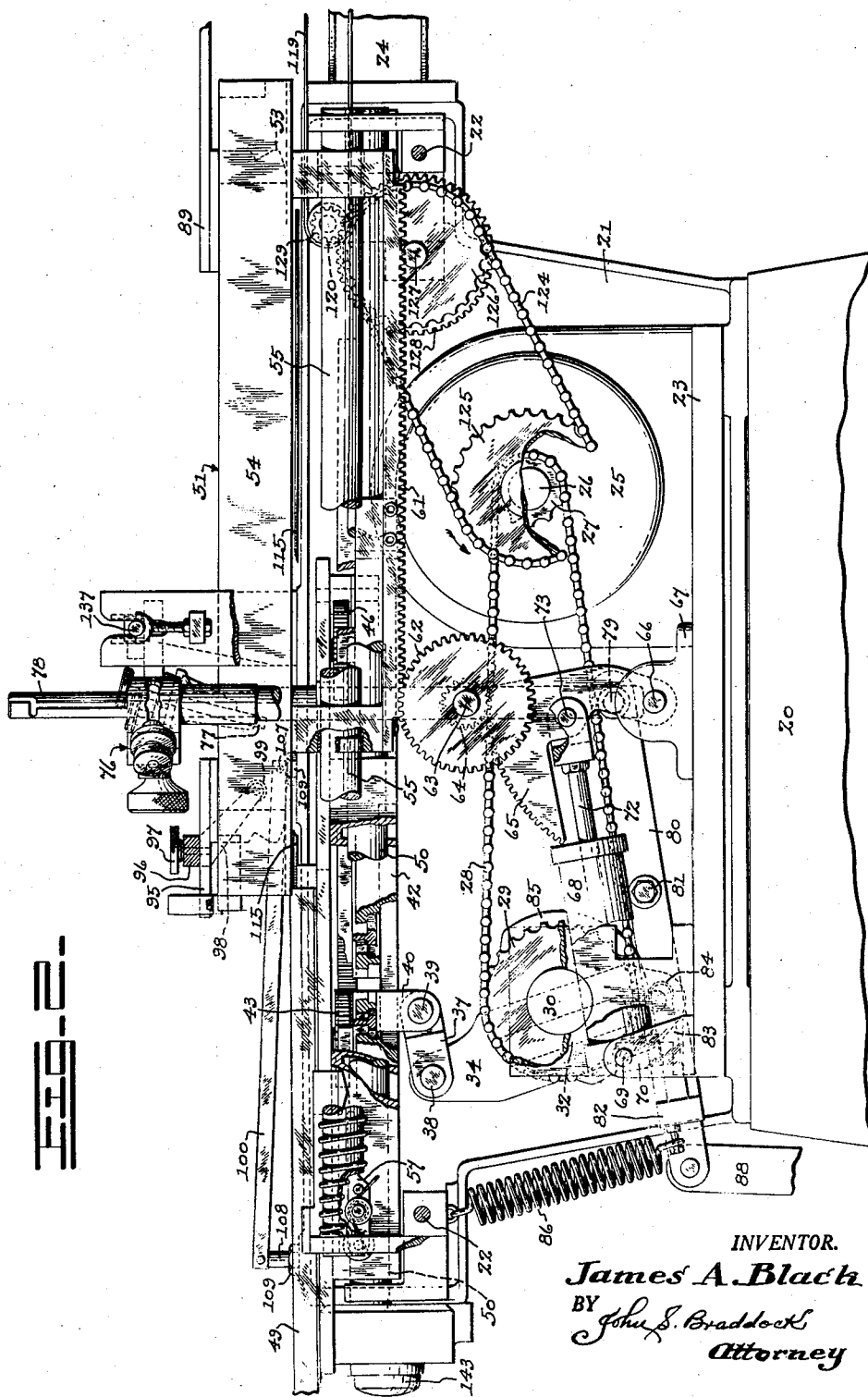
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8 Sheets-Sheet 2



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8 Sheets-Sheet 5

FIG. 5-

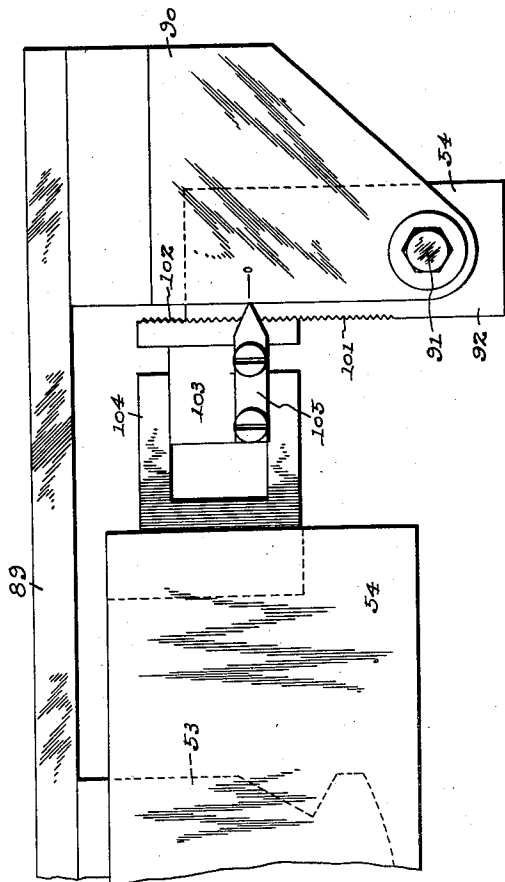
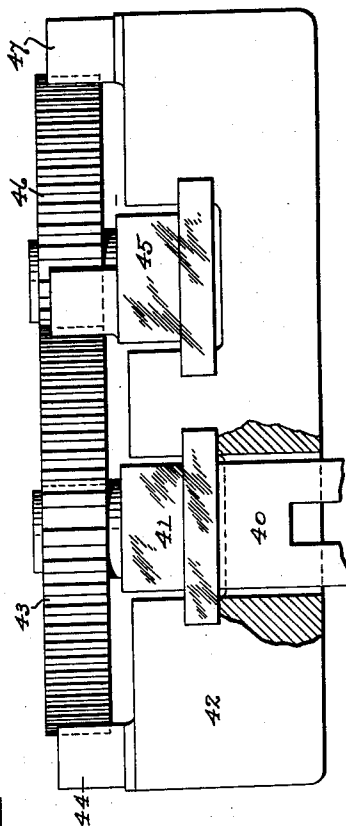


FIG. 6-



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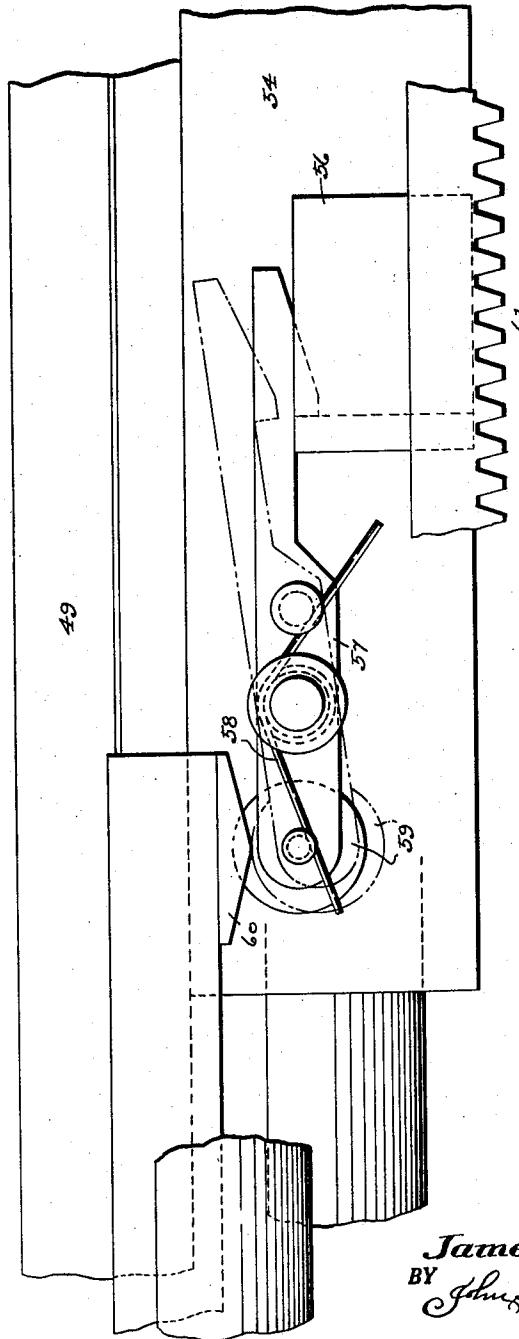
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8 Sheets-Sheet 6

FIG. 7-



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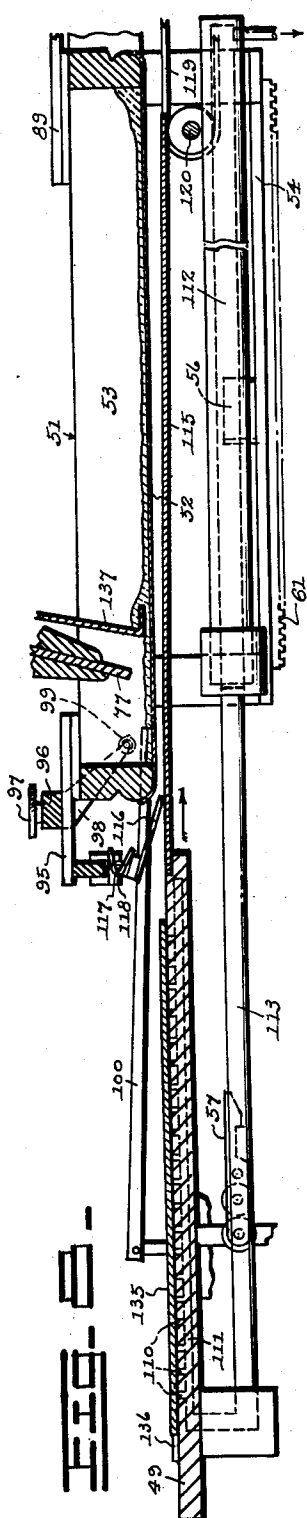
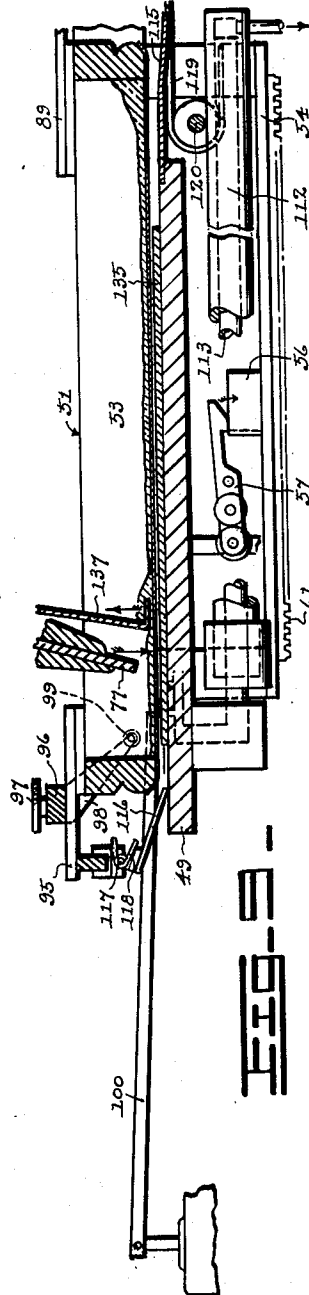
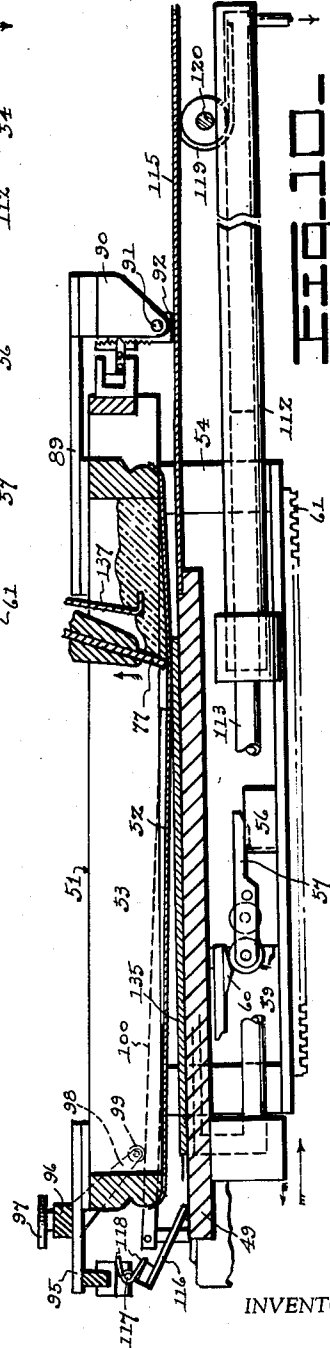
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8 Sheets-Sheet 7



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2,917,997

## STENCILLING MACHINE

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Application July 26, 1957, Serial No. 674,361

10 Claims. (Cl. 101—126)

The present invention relates to stencilling machines and more particularly to machines of the type wherein coating material is forced through a silk screen stencil for printing on various types of stock to produce posters, decalcomanias, metal tags, labels, etc.

The primary objects of the invention are to provide a silk screen stencilling machine which is adapted for processing either flexible stock such as paper or foil, or rigid and semi-rigid stock such as sheet metal and wall board; to provide such a stencilling machine which may be operated automatically and at relatively high speed; to provide such a machine in which, upon the completion of each print stroke, the parts are very quickly returned to their starting positions to begin a new cycle of operation, thus to shorten each cycle and provide for greater efficiency of operation; to provide such a machine which may be adjusted to accommodate sheet stock of various thicknesses; to provide such a machine in which the coating material is uniformly distributed over the stencil prior to the print stroke thus to produce uniform coating of the stock being run; to provide such a machine in which the silk screen stencil is progressively stripped from the stock during the printing operation thus to eliminate any possible smearing; to provide novel driving means whereby the operation of the various parts of the machine is accurately timed and coordinated; and in general to provide such a stencilling machine which is efficient in operation and reasonably economical in manufacture.

An illustrative embodiment of the machine is shown in the accompanying drawings, wherein:

Figure 1 is a side elevational view of the new stencilling machine;

Figure 2 is an enlarged fragmentary side elevational view thereof, numerous parts being broken away to better reveal other parts of the machine;

Figure 3 is a fragmentary end elevational view of the operator's end of the machine which is the left end thereof as viewed in Figures 1 and 2;

Figure 4 is a top plan view of the machine, certain parts being broken away to reveal certain other parts;

Figure 5 is an enlarged fragmentary side elevational view of the right hand end of the machine's stencil frame and mountings;

Figure 6 is an enlarged fragmentary end elevational view of certain parts of the machine's driving mechanism;

Figure 7 is an enlarged fragmentary side elevational view of latch means whereby the machine's platen and stencil are coupled and uncoupled during certain phases of the machine's operation;

Figures 8, 9, 10, and 11 are vertical sectional views, diagrammatic in character, illustrating the positions of various parts of the machine in different phases of one cycle of the machine's operation.

Referring now in detail to these drawings wherein like parts are designated by the same numerals in the several views, the stencilling machine there shown is mounted

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upon a frame comprising a base 20, spaced upright side castings 21 connected by upper tie-bars 22 and a lower platform 23 on which are mounted certain driving parts of the machine, and channel bar extensions 24 mounted on the side castings 21 at the delivery end of the machine seen at the right in Figures 1, 2 and 4.

The prime driving force of the machine is a motor 25 mounted on the platform 23 and having suitable electrical connections (not shown). The driving shaft 26 of the motor 25 carries a small sprocket wheel 27 around which passes a sprocket chain 28 which also passes around a larger sprocket wheel 29 mounted on a camshaft 30 which is journaled in spaced upright supports 31, 32 mounted on the platform 23 near the operator's end of the machine seen at the left in Figures 1, 2 and 4 and in end elevation in Figure 3. An eccentric crank pin 33 on the left hand end of the camshaft 30 as seen in Figure 3, imparts reciprocating rotary movement to a crank arm 34 pivotally mounted on a short shaft 35 extending between the upright support 31 and another support 36 on the platform 23.

A link 37 is pivotally connected at 38 (see Figure 2) to the upper end of the crank arm 34 and is pivotally connected at 39 to the lower end of an arm 40 depending from a bar 41 which is slidably mounted in a bed 42 mounted on the frame of the machine. The bar 41 carries a gear 43 (see Figures 3, 4 and 6) which meshes with a stationary rack 44 on the bed 42. Reciprocating movement of the crank arm 34 thus imparts forward-rearward sliding movement to the bar 41 and rotary movement to gear 43. Gear 43 in turn meshes with a rack bar 45 slidably mounted in the bed 42 thus to reciprocate the rack bar 45 forwardly and rearwardly, and the ratio of the gearing is such that rack bar 45 travels twice as far as the sliding bar 41. Rack bar 45 carries a gear 46 which meshes with another stationary rack 47 on the bed 42, so that rotary movement is imparted to gear 46 as the rack bar 45 is reciprocated. Gear 46 in turn meshes with a rack 48 (see Figure 4) mounted on the underside of the feedboard or platen 49 of the machine, which platen is forwardly-rearwardly reciprocally mounted on longitudinal rods 50 secured to the machine's frame. The platen moves through twice the travel of the rack bar 45 and four times the travel of the crank arm 34. The platen 49 is thus reciprocated between its starting position seen in Figures 1, 2, 4 and 8 and its position beneath the silk screen stencil 51 prior to printing of the stock, as herein-after more fully described.

The screen stencil 51 comprises a sheet of fine mesh silk or wire 52 (see Figures 4 and 8) into which the desired pattern for printing has been cut, mounted on the underside of a stencil frame 53 which is in turn mounted on a stencil carriage 54 reciprocally slidably mounted on longitudinal rods 55 secured to the machine's frame at opposite sides thereof. Angle brackets or keepers 56 secured to opposite sides of the stencil carriage 54 are adapted to be engaged by latches 57 pivotally mounted on opposite sides of the platen 49 to couple the platen and the stencil together for movement in unison when these parts are in registry for printing. The keepers 56 and latches 57 are shown in detail in Figure 7. The latches are normally urged clockwise as seen in this view, toward latching position, by springs 58, and a roller 59 on each latch 57 is adapted to contact a cam 60 on the machine's frame to turn the latches to their unlatching position indicated in broken lines, in one phase of the machine's operation.

Racks 61 on the underside of the stencil carriage 54 at opposite sides thereof, mesh with gears 62 on a horizontal center shaft 63 mounted on the frame of the machine. A smaller gear 64 on the shaft 63 meshes

with a sector 65 pivotally mounted at 66 on a bracket 67 secured to the platform 23. A cylinder 68 is pivotally mounted at 69 on a bracket 70 secured to the platform 23, and has a piston 71 (see Figure 11) therein and a piston rod 72 extending exteriorly of the cylinder and having its outer end pivotally connected at 73 to the sector 65. A compression spring 74 within the cylinder 68 normally urges the piston rod 72 and sector 65 toward the left as seen in Figure 11, and an air intake and exhaust vent 75 is provided in the left end of the cylinder 68. The functions of these parts will be hereinafter more fully described under the heading "Operation."

Means are provided for forcing coating material through the silk screen 52 and onto stock beneath the screen during the print stroke of the machine. These coating means comprise a squeegee assembly 76 having a squeegee blade 77, the assembly being vertically adjustably secured on the upper ends of rods 78 mounted on the frame of the machine for vertical reciprocating movement. The lower ends of rods 78 are pivotally mounted at 79 (see Figure 2) on the inner ends of bars 80 which are pivotally connected at 81 to the side castings 21 of the machine's frame. The outer ends of bars 80 are connected by a horizontal bar 82 which spans the space between the bars 80 (see Figures 2 and 3). An arm 83 secured to the center of the horizontal bar 82 carries a roller 84 which rides on the underside of a cam 85 on the camshaft 30. Bars 80 are thus reciprocated about their pivots 81 and this movement is transmitted to rods 78 and the squeegee assembly 76 in coordination with the movements of the other parts of the machine. Springs 86 connected to the frame and to the outer ends of the horizontal bar 82 normally urge the bar 82 upwardly and the squeegee assembly downwardly toward printing engagement with the stencil screen 52 so that the vertical reciprocation of the squeegee is positive in action. The squeegee assembly 76 may also be manually elevated out of contact with the stencil in case it is desired to cycle the machine through a "dry run," by depressing a foot lever 87 having a pivotal connection (not shown) with the machine's frame and connected to the horizontal bar 82 by means of a link 88.

Means are provided for progressively stripping or peeling the stencil from the printed stock during the print stroke of the machine thus to prevent any smearing of the coating material. To this end, the stencil frame 53 is pivotally mounted on the stencil carriage 54 by means of arms 89 secured to the stencil frame 53 and to depending brackets 90 which are pivotally connected at 91 to a cross bar 92 secured to the stencil carriage 54 by means of nuts 93 threaded on studs 94 on the carriage (see Figure 4). The other end of the stencil frame 53 is provided with arms 95 which rest on the stencil carriage. A cross bar 96 is secured to the arms 95 by means of handscrews 97. The outer ends of the cross bar 96 extend outwardly beyond the stencil carriage 54 and have depending arms 98 provided with rollers 99 on their lower ends. These rollers 99 are adapted to roll up ramps 100 secured to the machine's frame during the print stroke thus elevating this end of the stencil frame 53 relative to the stencil carriage 54 and thus progressively peeling the stencil screen 52 off the printed stock. The rollers 99 descend the ramps 100 during the returning movement of the stencil to its starting position seen in Figure 2.

The stencil frame 53 may also be adjusted in height relative to the stencil carriage 54 to accommodate various thicknesses of stock to be printed. As best seen in Figure 5, the cross bar 92 which pivotally supports one end of the stencil frame 53 has serrated surfaces 101 which are engaged with complementary serrated surfaces 102 on blocks 103 secured to brackets 104 on the stencil carriage 54. The blocks 103 are desirably mounted on the brackets 104 so as to be forwardly-rearwardly adjustable as indicated. The elevation of the cross bar 92

and the end of the stencil supported thereby can be adjusted by engaging the serrations 101 and 102 at the selected elevation prior to tightening nuts 93 on studs 94, and pointers 105 may be provided on the blocks 103 and associated with reference indicia on the brackets 90. The other end of the stencil frame 53 can be adjusted so as to level the frame at the selected height, by means of adjustment screws 106 (see Figure 3) threaded in the stencil carriage 54 and adapted to raise or lower the cross bar 96, arms 95, and this end of the stencil frame 53, relative to the stencil carriage. The elevation and slope of the ramps 100 may also be adjusted by means of adjustment screws 107 supporting the inner ends of the ramps and other screws 108 supporting the outer ends of the ramps, said screws 107 and 108 being threaded into the machine's frame and being provided with lock nuts 109 by means of which they may be locked in their adjusted positions.

The upper surface of the stock-supporting platen 49 has apertures 110 therein (see Figures 4 and 8), and conduits 111 through the platen communicate with the apertures 110 for applying suction at the surface of the platen to maintain stock sheets in position thereon during the printing operation. The vacuum is created by a compressor (not shown) and communicated through a cylinder 112 (see Figures 8-11) mounted on the frame of the machine, and a tube 113 connected to the platen 49 and to the conduits 111 moves in and out of the cylinder 112 during operation to apply suction to the platen as required. The platen 49 is also provided with spaced arms 115 which extend beneath the stencil when the parts are in their starting positions. Stripper fingers 116 (seen only in Figures 8-11) are pivotally mounted at 117 on the carriage and urged downwardly by springs 118. After the print stroke of the machine has been completed, these stripper fingers 116 move the printed stock onto the platen's arms 115, and the arms 115 subsequently carry the printed stock onto endless take-off conveyor tapes 119 as hereinafter more fully described.

The take-off conveyor tapes 119 pass around a pulley shaft 120 and a pulley shaft 121, the shafts 120 and 121 being journaled in the machine's frame and its channel bar extensions 24. The conveyor tapes 119 are driven by a sprocket chain 124 (see Figures 2 and 3) which passes around a large sprocket wheel 125 on the motor's drive shaft 26 and around a sprocket wheel 126 on a shaft 127 journaled on the frame. Gears 128 on shaft 127 mesh with gears 129 on the pulley shaft 120 thus to drive this pulley shaft and the tapes 119.

The camshaft 30 (see Figure 3) carries, in addition to the eccentric crank-pin 33 which reciprocates the platen and the cam 85 which reciprocates the squeegee, an adjustable squeegee cam 130 and electric switch-operating cams 131, 132 and 133 the functions of which are hereinafter described.

#### Operation

The machine comprises certain "functional" parts which accomplish the actual printing of stock fed thereto, and certain other "control" parts which govern the movements of the functional parts. The relative movements of the functional parts through one cycle of the machine's operation will first be described with particular reference to Figures 8 through 11 of the drawings.

In Figure 8 the various parts are shown in their starting positions. A stock sheet 135 is placed by the operator on the platen 49 in a position predetermined by the proper location of suitable stops indicated by the numeral 136. Suction is now applied at the platen's surface apertures 110 to hold the stock in proper position during the printing portion of the cycle. The platen 49 and stock sheet 135 are now moved to the right as seen in these views to their positions seen in Figure 9, with the platen and the stock sheet beneath and in registry with the silk screen stencil 51. Latches 57 on the platen

now engage keepers 56 on the stencil, thus coupling the stencil to the platen, and the squeegee blade 77 is lowered onto the stencil for commencement of the print stroke of the machine which is in the opposite direction or to the left as seen in these views. The platen, the stock and the stencil thus move in unison during the print stroke, so that coating material is forced by the squeegee through the stencil onto the stock in perfect registry. The stock may thus be printed several times for different color impressions, and perfect registry of all colors may be obtained. As indicated in Figure 9, rollers 99 travel up the ramps 100 during the print stroke to elevate the left end of the stencil, thus progressively peeling the stencil screen 52 off the printed stock and preventing any smearing of the coating material thereon.

When the platen, the stock and the stencil near the end of the print stroke moving to the left as seen in Figure 10, rollers 59 on latches 57 contact cams 60 on the machine's frame thus disengaging the latches 57 from the keepers 56 on the stencil. When the stencil is thus freed from the platen, it is quickly returned to its starting position by spring 74 in cylinder 68, the spring 74 having been compressed during the print stroke of the machine. The spring 74 quickly moves sector 65 to the left, gears 64 and 62 on shaft 63 clockwise, and rack 61 on stencil carriage 54 to the right. This quick returning of the stencil—with a snap action—to its starting position appreciably shortens the time required to complete one cycle of the machine's operation.

As will be seen from Figures 9 and 10, stripper fingers 116 which are pivotally mounted on the stencil fall behind the printed stock sheet 135 upon completion of the print stroke. When the stencil is suddenly returned to its starting position, these stripper fingers 116 engage the printed sheet of stock and move it off the platen 49 and onto the platen's arms 115. In the next succeeding cycle of the machine's operation, when the platen 49 advances to the right, arms 115 carry the previously printed sheet onto the take-off conveyor tapes 119 and the printed sheet is thus discharged from the machine.

A "flow-coater," generally designated 137, is provided for uniformly distributing coating material over the upper surface of the stencil screen during the returning movement of the stencil to its starting position. During the print stroke of the machine, coating material is piled up in the right end of the stencil frame 53 as seen in Figure 10. During the returning movement of the stencil this coating material is spread evenly over the screen, to insure an even coating of the next sheet of stock to be printed. Mechanism is desirably provided for elevating the flow-coater at the start of the print stroke as indicated in Figure 9, and for lowering the flow-coater upon completion of the print stroke as indicated in Figure 10.

The control parts of the machine consist of various mechanical elements shown in Figures 2 and 3, and certain electrical timing devices which are well-known and, since they are not in themselves a part of the present invention, are not shown in the drawings.

The machine is started for automatic operation by closing an electric switch to energize the motor 25 thus driving sprocket chain 28 and camshaft 30 in a counter-clockwise direction as seen in Figure 2. This sets the various parts of the machine in motion for one cycle of operation as hereinbefore described, and starts the compressor to supply a vacuum to the platen 49. As the machine nears the completion of the print stroke, cam 132 on camshaft 30 (see Figure 3) operates a switch 138 to stop the compressor and thus relieve the vacuum on the platen so that the stripper fingers 116 can remove the printed sheet. Cam 133 on camshaft 30 operates a switch 139 which by-passes switch 138 so as to keep the moving parts of the machine in operation until the cycle of operation has been completed, whereupon cam 131 on camshaft 30 operates switch 140 to stop the motor

26 and the moving parts long enough to give the operator time to position a new sheet on the platen. An automatic timing device (not shown) then operates, after a pre-selected time interval of several seconds, to again close the electric circuits to the motor and the compressor and start a new cycle of operation.

The adjustable squeegee cam 130 on camshaft 30 is provided for use in place of the squeegee cam 85 in instances wherein the stock sheets being printed are considerably smaller than the area of the stencil screen. In such instances cam 85 can be moved on camshaft 30 to a position out of contact with roller 84 on arm 83 of horizontal bar 82, and cam 130 after being adjusted to provide the desired period of time in which the squeegee is lowered to printing position, is moved into contact with a roller 141 on an arm 142 on horizontal bar 82, thus to operate the squeegee in place of the cam 85.

There is also desirably provided an auxiliary starting switch 143 by which the parts may be manually operated, and an emergency stop switch 144. These switches are in locations convenient to the operator of the machine, and are included in appropriate electrical circuits.

It will thus be seen that the invention provides a fully automatic and efficient stencil machine for printing on diversified types and sizes of stock, and while but one specific embodiment of the invention has been herein shown and described, it will be understood that numerous details thereof may be altered or omitted without departing from the spirit of the invention as the same is defined by the following claims.

I claim:

1. In a stencilling machine: a stock-supporting platen and a stencil mounted for relative movement to non-registering starting positions wherein stock may be positioned on the platen; coating means for forcing coating material through the stencil onto the stock during the print stroke of the machine; means for moving the platen and the stock into registry with the stencil; means for coupling the stencil to the platen when so registered; means for oppositely moving the platen, the stock and the stencil in unison past said coating means to effect the print stroke of the machine; means for uncoupling the stencil from the platen when the platen returns to its starting position upon completion of the print stroke; and means for returning the stencil to its starting position of non-registry with the platen upon completion of said print stroke.

2. A stencilling machine according to claim 1 in which movement of the platen, the stock and the stencil in unison during the print stroke is relatively slow, and in which the returning of the stencil to its non-registering starting position is relatively fast.

3. In a stencilling machine: a frame; a stencil mounted on the frame for reciprocating horizontal movement; a stock-supporting platen mounted on the frame for reciprocating horizontal movement beneath the stencil, said stencil and said platen occupying non-registering starting positions on the frame wherein stock may be positioned on the platen; means for advancing the platen and the stock to registering position beneath the stencil; means for coupling the stencil to the platen when so registered; means for oppositely moving the platen, the stock and the stencil in unison for effecting the print stroke of the machine; a squeegee mounted on the frame above the stencil for vertical reciprocating movement; means for lowering the squeegee onto the stencil for printing during the print stroke of the machine and for elevating the squeegee off the stencil between print strokes; means for uncoupling the stencil from the platen when the platen returns to its starting position upon completion of the print stroke; and means for returning the stencil to its starting position between print strokes of the machine.

4. A stencilling machine according to claim 3 in which the platen is provided with stock-supporting arms extending beneath the stencil when the platen and the

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stencil are in their non-registering starting positions; and means on the stencil for engaging the printed stock upon completion of the print stroke and moving the stock onto said arms during returning movement of the stencil to its starting position.

5. A stencilling machine according to claim 4 in which the stock-supporting arms carry the printed stock onto a take-off conveyor during the next succeeding advancing movement of the platen.

6. In a stencilling machine: an apertured stock-supporting platen and a stencil mounted for relative movement to non-registering starting positions wherein stock may be positioned on the platen; coating means for forcing coating material through the stencil onto the stock during the print stroke of the machine; means for advancing the platen and the stock into registry with the stencil for printing; means for coupling the stencil to the platen when so registered; means for oppositely moving the platen, the stock and the stencil in unison past said coating means to effect the print stroke of the machine; means for uncoupling the stencil from the platen when the platen returns to its starting position upon completion of the print stroke; means for returning the stencil to its starting position of non-registry with the platen upon completion of said print stroke; means for applying suction to said apertured stock-supporting platen to maintain stock in position thereon during advancement of the platen to position of registry with the stencil and during the print stroke of the machine; and means for relieving said suction to release the printed stock from the platen during the returning movement of the stencil.

7. In a stencilling machine: an apertured stock-supporting platen and a stencil mounted for relative movement to non-registering starting positions wherein stock may be positioned on the platen; coating means for forcing coating material through the stencil onto the stock during the print stroke of the machine; means for advancing the platen and the stock into registry with the stencil for printing; means for oppositely moving the platen, the stock and the stencil in unison past said coating means to effect the print stroke of the machine and return the platen to its starting position; means for returning the stencil to its starting position of non-registry with the platen upon completion of said print stroke; means for applying suction to said apertured stock-supporting platen to maintain stock in position thereon during advancement of the platen to position of registry with the stencil and during the print stroke of the machine; and means for relieving said suction to release the printed stock from the platen during the returning movement of the stencil; the platen being provided with stock-supporting arms extending beneath the stencil when the platen and the stencil are in their non-registering starting positions; and stripper fingers on the stencil for engaging the printed stock when said suction is relieved upon completion of the print stroke and moving the stock onto said arms during returning movement of the stencil to its starting position.

8. In a stencilling machine: an apertured stock-sup-

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porting platen and a stencil mounted for relative movement to non-registering starting positions wherein stock may be positioned on the platen; coating means for forcing coating material through the stencil onto the stock during the print stroke of the machine; means for advancing the platen and the stock into registry with the stencil for printing; means for oppositely moving the platen, the stock and the stencil in unison past said coating means to effect the print stroke of the machine and return the platen to its starting position; means for returning the stencil to its starting position of non-registry with the platen upon completion of said print stroke; means for applying suction to said apertured stock-supporting platen to maintain stock in position thereon during advancement of the platen to position of registry with the stencil and during the print stroke of the machine; and means for relieving said suction to release the printed stock from the platen during the returning movement of the stencil; the stripper fingers being pivotally mounted on the stencil so that unprinted stock may pass freely thereunder during advancing movement of the platen, said fingers being turnable to stock-engaging position upon completion of the machine's print stroke.

9. In a stencilling machine: a frame; a stock-supporting platen and a stencil carriage mounted on the frame for movement in unison during the print stroke of the machine; a stencil pivotally mounted on the end of the carriage which trails during the print stroke and freely supported on the carriage's leading end; coating means for forcing coating material through the stencil onto stock supported by the platen during the print stroke; ramps on the frame extending upwardly in the direction of the print stroke; and means on the stencil bearing on said ramps whereby the freely-supported leading end of the stencil is progressively elevated to peel the stencil off the stock while the stock is being printed.

10. In a stencilling machine: a frame; a stencil mounted on the frame for reciprocating horizontal movement; a stock-supporting platen mounted on the frame for reciprocating horizontal movement beneath the stencil, said stencil and said platen occupying non-registering starting positions on the frame wherein stock may be positioned on the platen; means for advancing the platen and the stock to registering position beneath the stencil; means for coupling the stencil to the platen when so registered; means for oppositely moving the platen, the stock and the stencil in unison for effecting the print stroke of the machine; coating means actuated during the print stroke for forcing coating material through said stencil onto the stock; means for uncoupling the stencil from the platen when the platen returns to its starting position upon completion of the print stroke; and means for returning the stencil to its starting position between print strokes of the machine.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |         |                |
|-----------|---------|----------------|
| 1,861,610 | Respass | June 7, 1932   |
| 2,610,579 | Wing    | Sept. 16, 1932 |