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E. LANDESMAN

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SCREEN PRINTING MACHINE WITH OSCILLATING STENCIL FRAME

Filed Oct. 15, 1962

4 Sheets-Sheet 1

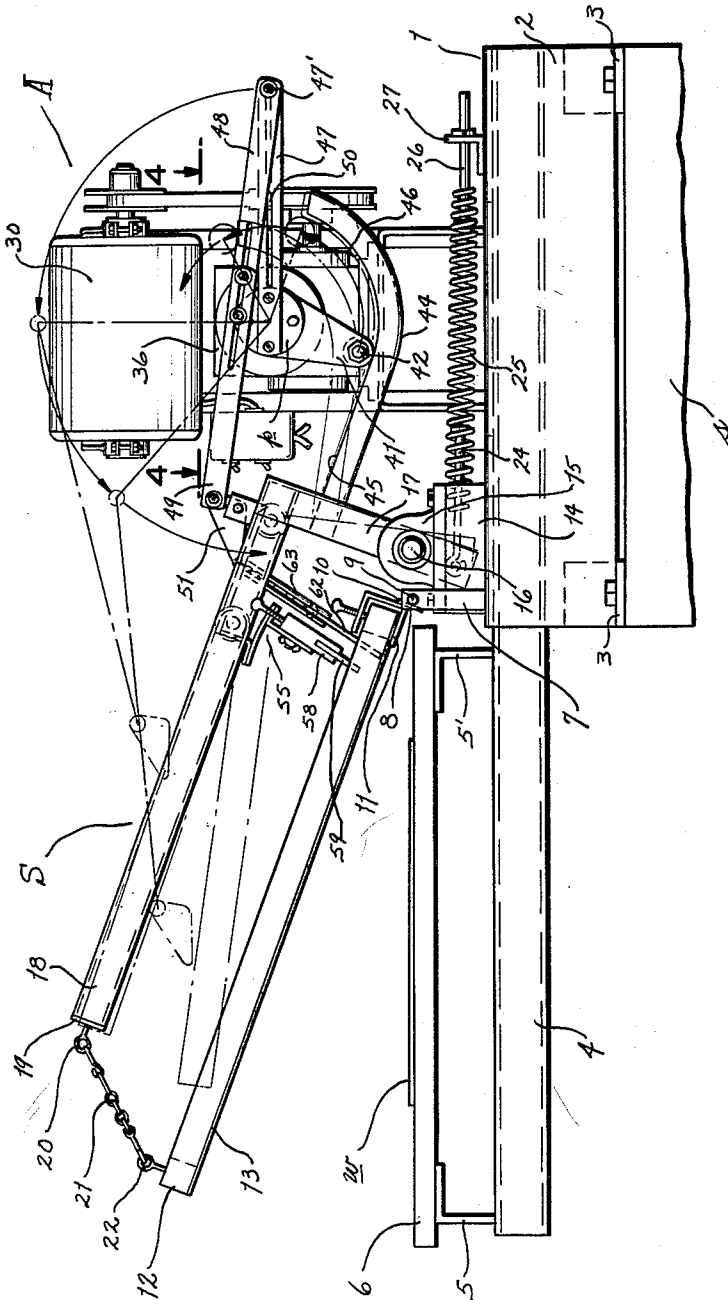


FIG. 1

INVENTOR.
EUGENE LANDESMAN
BY *Ralph W. Kalish*

ATTORNEY

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E. LANDESMAN

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4 Sheets-Sheet 2

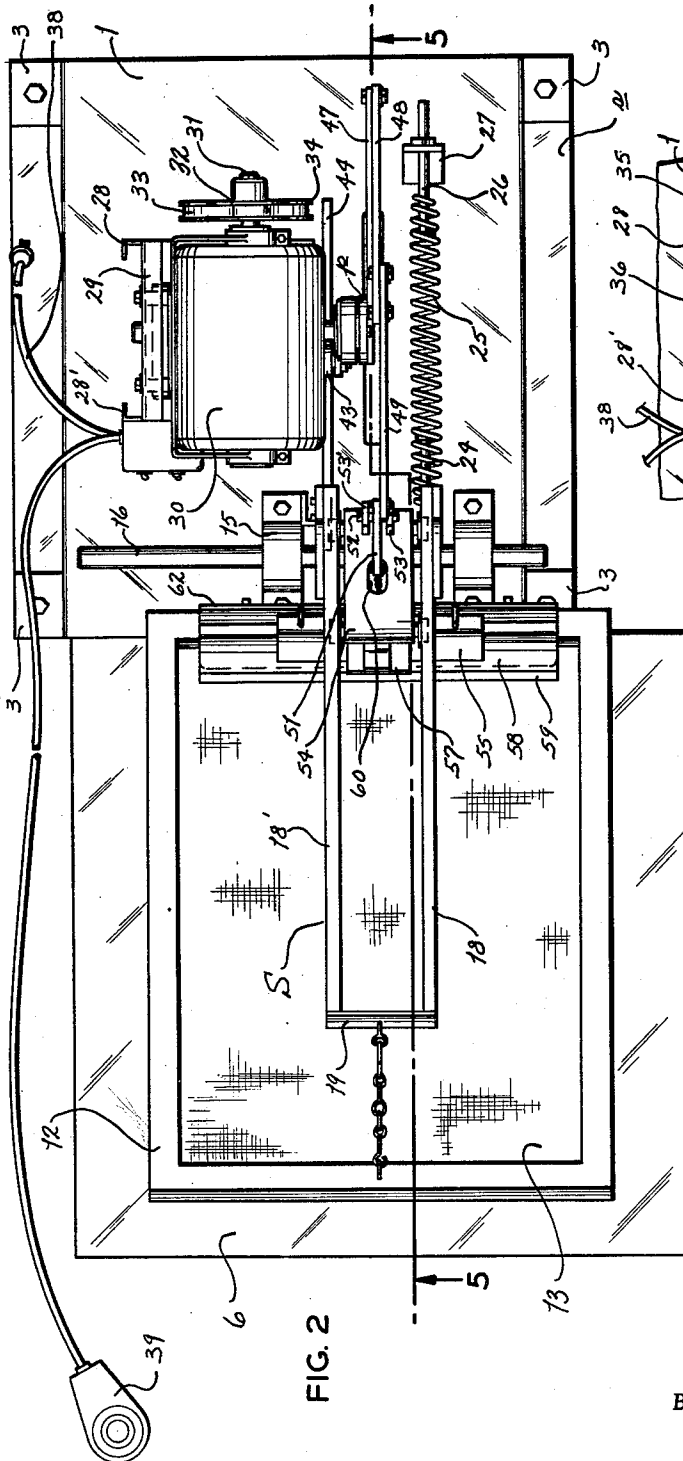


FIG. 2

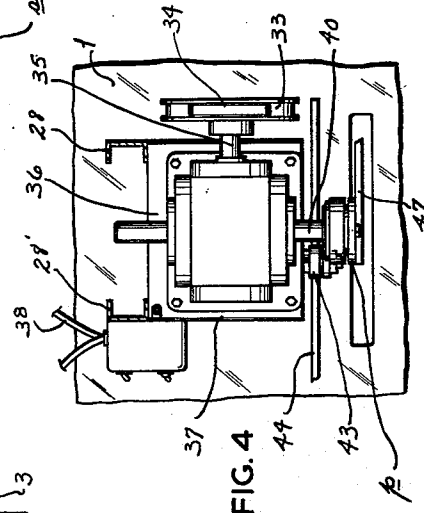


FIG. 4

INVENTOR.
EUGENE LANDESMAN
BY *Ralph W. Kahle*

ATTORNEY

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E. LANDESMAN

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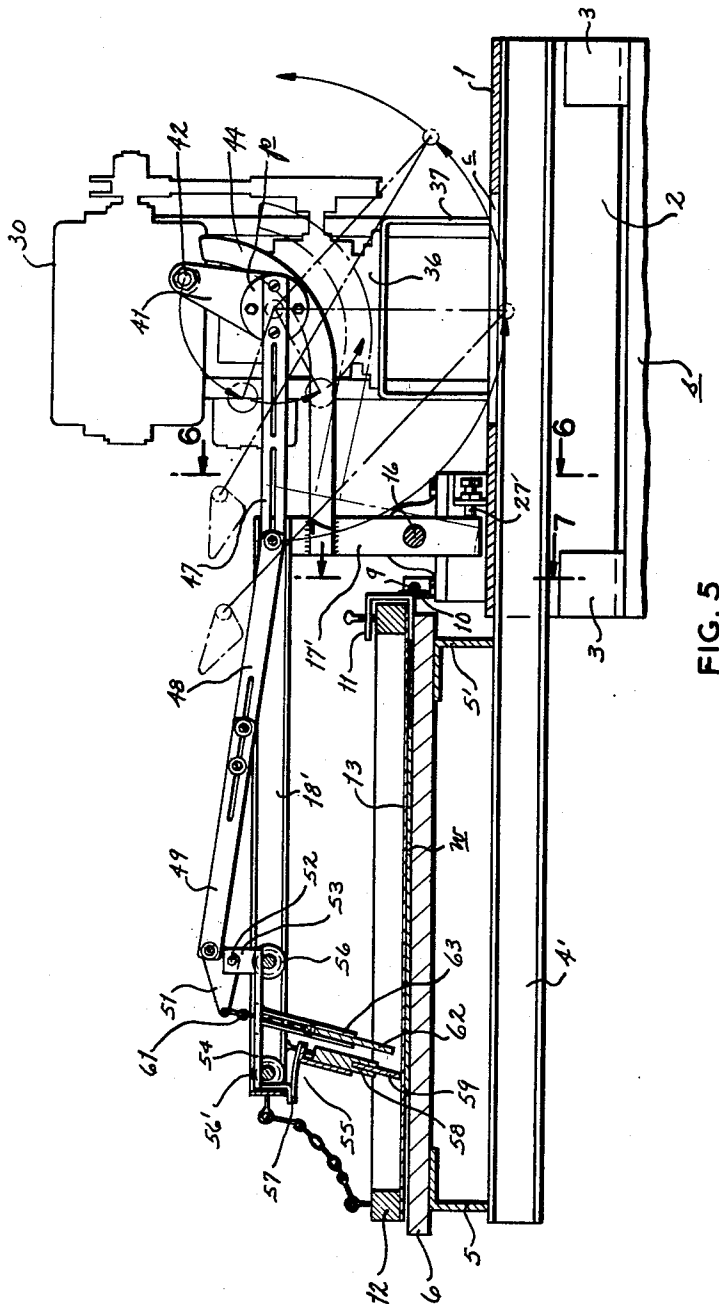


FIG. 5

INVENTOR
EUGENE LANDESMAN
BY *Ralph W. Kersh*

ATTORNEY

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SCREEN PRINTING MACHINE WITH OSCILLATING STENCIL FRAME

Eugene Landesman, 516 East Drive, University City, Mo.
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5 Claims. (Cl. 101-123)

This invention relates in general to printing machines and, more particularly, to certain new and useful improvements in screen printing machines.

It is an object of the present invention to provide a screen printing machine which comprises a marked simplicity of parts, being adapted for presentation as a compact, space-saving unit; which is highly reliable in operation; and which may be produced at relatively low cost.

It is a further object of the present invention to provide a screen printing machine having a low component count and incorporating novel motion transmitting means for effecting reciprocal squeegee travel with coordinated swinging movement of the associated screen or stencil.

It is a further object of the present invention to provide a screen printing machine which is especially durable in operation and which through its novel construction is resistant to breakdown obviating customary attendant costly down-time as encountered with currently used machines.

Other objects and details of the invention will be apparent from the following description, when read in connection with the accompanying drawing (four sheets) wherein—

FIGURE 1 is a side elevational view of a screen printing machine constructed in accordance with, and embodying, the present invention, illustrating the same at the termination of the operative stroke of the squeegee.

FIGURE 2 is a top plan view.

FIGURE 3 is a rear end view.

FIGURE 4 is a top plan view of the speed reducer taken on the line 4-4 of FIGURE 1.

FIGURE 5 is a vertical transverse sectional view taken on the line 5-5 of FIGURE 2, illustrating the squeegee in starting position for its operative stroke.

FIGURE 6 is a vertical transverse view taken on the line 6-6 of FIGURE 5.

FIGURE 7 is a vertical transverse sectional view taken on the line 7-7 of FIGURE 5.

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A generally designates a screen printing machine having a base plate 1 preferably formed with depending side skirts 2 which may be welded to mounting brackets 3 for securement to a suitable support member *s*. Rigidly fixed to the undersurface of plate 1 and extending forwardly therefrom is a pair of support arms 4, 4', as of channel shape, which in their extended portion, mount spaced transverse members 5, 5' upon which is carried a flat print table 6 for receiving work blanks *w* and supporting same during machine operation.

At its forward or print-table proximate and portion, base plate 1 mounts a pair of upstanding spaced apart arms 7, 7', each of which at its upper end is apertured, as at 8, to form a journal for a hinge rod 9 extending transversely therebetween. Fixed to rod 9, as by welding, for rocking therewith, is an elongated plate 10 rigidly secured to the rearwardly directed faces of a pair of spaced apart adjustable clamps 11, 11' which latter engage the rearward end of a rectangular screen frame 12, to which is attached a stencil or screen 13 of customary construction. Screen frame 12 extends forwardly in overlying relationship to print table 6, and by virtue of the connection to pivot rod 9, is adapted for swingable

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movement about the axis thereof between lowered or operative position wherein it will be presented for disposition of screen 13 upon a work blank *w* (see FIGURE 5), and upper or inoperative position, as shown in FIGURE 1, for permitting withdrawal of the now printed blank and the successive insertion of another blank *w*.

Rearwardly of arms 7, 7' there is provided a pair of aligned mounts 14 for pillow blocks 15 for journaling of a shaft 16, which is axially parallel to hinge rod 9. Carried on shaft 16 for rockable movement therewith is a squeegee frame indicated S and comprising a pair of aligned support arms 17, 17' fixed in their lower portions on said shaft 16 and each being secured at its upper end to the rearward ends of forwardly extending parallel side rails 18, 18' respectively; said latter being formed preferably of channels which open toward each other. Side rails 18, 18' progress forwardly above screen frame 12 and are rigidly interconnected at their outer, forward ends by a transverse end piece 19 on the outer face of which is fixed an eyelet 20, through which extends the upper end of a relatively short, flexible connector or chain 21. The lower end of chain 21 is secured, as by means of an eyelet 22, to the central portion of the forward end of screen frame 12. By means of said chain connection, screen frame 12 and squeegee frame S will be simultaneously rockable about their respective pivots for joint movement. Adjacent its lower end, beneath shaft 16, support arm 17 mounts a pin 23 which is engaged to the forward end of the forward rod 24 of an extension spring 25 which, at its rearward end, is engaged to a companion rod 26 for connection to a bracket 27 located proximate the rearward edge of base plate 1. Thus, spring 25 directly urges said support arm 17 rearwardly at its lower end and hence thereby biases squeegee frame S into downwardly swung position (FIGURE 5); the limit of such movement being determined by abutment of the lower end of support arm 17' against a detent or stop 27' so that in full down position said frame S will be in substantially horizontal disposition, planarwise parallel to print table 6.

Disposed upon base 1 by means of a pair of uprights 28, 28' to which are affixed cross members 29 is a prime mover 30, having a drive shaft 31 on the outer end of which is mounted a pulley 32, preferably of the variable pitch variety, engaging the upper portion of an endless drive belt 33; which latter in its lower portion is trained about a relatively enlarged pulley 34 carried on the end of the input shaft 35 of a speed reducing unit indicated generally at 36. Speed reducer 36 is secured upon a mounting 37 in elevated relation to base 1. Prime mover 30 is connected, as by a conductor 38 to a convenient source of electricity, and may be suitably provided with a foot control element 39 for operation of machine A by an individual positioned at the front end of said machine and engaged in withdrawing printed forms and insertion of blanks *w*.

Speed reducer 36 incorporates an output shaft 40 mounting a crank 41, on the outer end of which is secured a pin 42 carrying a cam follower 43 for engaging the upper surface of an arm-like cam 44. Cam 44 is fixed at its forward end to support arm 17' and extends rearwardly therefrom, as may best be seen in FIGURE 1. Said cam 44 comprises a forward linear portion 45 substantially axially normal to support arm 17', and a rearward arcuate portion 46 curving upwardly from said forward portion 45; the said arcuate portion 46 terminates at a point slightly above rails 18, 18'. Output shaft 40 is adapted to rotate so that crank 41 will be swung through a preferably counter-clockwise path as viewed in FIGURE 1 and as indicated by arrows. As will be described more fully hereinbelow, cam follower 43 engages cam 44

so as to cause a depressing effect thereon as it travels upwardly along the arcuate portion 46, overcoming the bias of spring 25 whereby squeegee frame S together with the connected screen frame will swing upwardly at their outer forward ends about their respective pivot axes.

Also engaged to the outer end of speed reducer output shaft 40, as by securement to an end plate *p*, is one end of an crank arm 47, the other or outer end of which is pivotally engaged, as by an adjustable bolt 47', to the rearward end of a link 48 which at its forward end is adjustably connected to the rearward end of a companion link 49. Said links 48, 49 thus constitute, in effect, a single link but are adapted for relative extension and contraction for controlling their combined length. It will be noted that the axis of crank arm 47 forms an obtuse angle with the longitudinal axis of crank 41 so that the respective actions brought about by the same will be in a predetermined timed sequence. Crank arm 47 may be provided with elongated slots as at 50 to allow selection of the point of attachment to link 43 so as to control the length of the operative stroke. For example, with crank arm 47 engaged to link 48 at the former's outer end, the stroke of the combined links 48, 49 will be of maximum extent, as indicated diagrammatically in FIGURE 1; while, conversely, securement of link 48 at a point spacedly from the outer end of crank arm 47 will result in relative diminution of the combined stroke length of links 48, 49. Obviously, links 48, 49 may, if desired, be of unitary construction. Accordingly, as output shaft 40 rotates, links 48, 49 will be moved forwardly and then rearwardly in a reciprocating manner for purposes to be described below. Base plate 1 may be provided with an opening *c* to allow for clearance of crank arm 47 and links 48, 49, as indicated in FIGURE 5.

At its forward end, link 49 is rigidly secured to an end extension member 51 which in its rearward portion, beneath link 49, is engaged to a pivot pin 52 journaled in ears 53, 53' mounted on the upper face of the top plate 54 of a squeegee carrier, designated broadly 55. Plate 54 is mounted on two pair of rollers 56, 56' disposed in tandem and engaged upon rails 18, 18' for traversing movement therealong of squeegee carrier 55. Supported dependently from the forward end of plate 54 is a support bracket 57 for mounting, through conventional adjustable means, a squeegee bar 58, fabricated as of wood or the like; and being grooved in its downwardly directed edge for receiving a flexible squeegee 59 which latter is presented to engage screen 13 for forcing ink or paint there-through for imprinting of the work blank *w*.

Formed in carriage plate 54, substantially centrally thereof, is an opening 60 through which passes a flexible connector, as a chain, 61, the upper end of which is engaged to the forward end of end extension member 51 and the lower end of which is secured to the central, upper marginal portion of a coating blade 62, as made of wood, metal, etc. Said blade 62, being located rearwardly of squeegee bar 58 extends substantially the width of screen 13 and is vertically slideably received within a plurality of guide members 63, such as spaced-apart rods welded or otherwise fixed at their upper ends to the under face of plate 54 for directly restraining the movement of said blade 62 between upper and downward positions, consequent to a lifting or lowering through pivoting of the links 48, 49 at the forward end of the former through action of crank 41 and crank arm 47. In lowered position, as shown in FIGURE 1, coating blade 62 will engage screen 13 for effecting paint coating and "pushing" action as squeegee carrier 55 moves forwardly to present the paint for the succeeding operative squeegee stroke. In elevated position, as shown in FIGURE 5, coating blade 62 will be out of contact with screen 13 to prevent interference with the printing operation.

The operation of machine A is as follows: With the said machine in the condition shown in full lines in FIGURE 1, said squeegee frame S and the connected squeegee

frame 12 in upwardly swung relation so that a blank work piece *w* may be positioned upon print table 6, crank arm 47 and companion links 48, 49 will be in such relation that squeegee carrier 55 will be in rearward position with squeegee 59, being out of contact with screen 13 and with coating blade 62 engaging said screen 13 for paint "pushing" purposes. It will be seen that cam follower 43 engages cam 44 in the rearward region of the linear portion 45 thereof and thus exerts a downward or depressing effect thereon, overcoming bias of spring 25. As output shaft 40 of speed reducer 36 moves counter clockwise from the position shown in FIGURE 1, cam follower 43 will be caused to move along the arcuate portion 46 of cam 45 causing the maintenance of squeegee frame S together with attached screen frame 12 in elevated relation while simultaneously crank arm 47 and links 48, 49 will coast so as to cause squeegee carrier 55 to be moved forwardly to the outer end of squeegee frame S. During this forward movement of squeegee carrier 55, the paint or ink, as the case may be, on screen 13 will be moved or "pushed" toward the forward end thereof so that thus the forward stroke of links 48, 49 constitute the operative movement of coating blade 62.

As cam follower 43 reaches the upper end of cam 44, its depressing effect upon the latter is terminated so that the same is, in effect, restored to influence of spring 25. However, as cam follower 43 is moved into the position shown in full lines in FIGURE 5, cam 44 will maintain contact therewith so that the former provides a restraint preventing a jarring downward rocking of squeegee frame S under spring bias so that said squeegee frame S will swing downwardly into a horizontal or lowered position, as shown in FIGURE 5, in a relatively slow descent. As the distance between rails 18, 18' and screen 13, when in lowered position (FIGURE 5) is less than the vertical distance between same when in elevated position by virtue of the length of connecting chain utilized, squeegee bar 59 will be disposed in operative position upon said screen 13 when frame S is lowered. By reason of the concurrent action of crank arm 47 and links 48, 49, the forward end of said engaged links will be upwardly pivoted so as to remove coating blade 62 from engagement with screen 13. Whereby, upon continued rotation of output shaft 40 from the condition shown in full lines in FIGURE 5, squeegee carrier 59 will be moved rearwardly for effecting the printing or operative stroke and will arrive at the end of such stroke substantially simultaneously with the engagement of cam follower 43 with cam 44, so that the immediate successive increment of travel of cam follower 43 will cause the rocking of squeegee frame S, as shown in FIGURE 1.

Thus, in view of the foregoing, machine A incorporates a novel yet structurally simple means for bringing about the necessary but timed sequence of operation, so that squeegee 59 effects its printing stroke with squeegee frame S maintained in lowered position and at completion of its stroke is removed from operative relation with screen 13 as squeegee frame S is upwardly rocked to allow for the action of coating blade 62 which occurs while said squeegee frame is in upward position. Thus, cam follower 43 and cam 44 coast to bring about reciprocal rocking movement of squeegee frame S while crank arm 47, links 48, 49 and the related structure concurrently cause the desired alternating printing and paint scraping strokes.

It is quite obvious that through adjustment of the relative links of crank arm 47 and links 48, 49, the printing stroke may be so controlled as to render same adaptable for work blanks *w* of varying dimensions.

Machine A is a highly compact unit readily operable by a single individual and being of durable construction resistant to breakdown. Said machine A may be relatively economically produced and thus within the range of more modest users.

It should be understood that changes and modifications

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in the formation, construction, arrangement, and combination of the several parts of the screen printing machine may be made and substituted for these herein shown and described without departing from the nature and principle of my invention.

I claim:

1. A screen printing machine comprising a base having a fixed work-receiving table, a screen-bearing frame disposed above said table, means for pivotally mounting said screen-bearing frame in its rearward portion for swingable movement between lowered, operative position and elevated inoperative position, a squeegee-support frame disposed above said screen-bearing frame, support arms integral with the rearward end of said squeegee-support frame and extending perpendicularly downwardly therefrom, means pivotally mounting said support arms for swingable movement of said squeegee-support frame between elevated and lowered positions, means connecting said screen-bearing frame and said squeegee-support frame for joint swingable movement, a squeegee carrier mounted on said squeegee frame for reciprocal movement forwardly and rearwardly therealong, a prime mover mounted on said base rearwardly of said squeegee-support frame, a crank operatively engaged to, and driven by, said prime mover, and having an axis of rotation parallel to the pivot axis of said squeegee-support frame, said axis of rotation of said crank being aligned with or above the path of rearward movement of said squeegee carrier, a cam follower carried on said crank, a cam mounted on one of said support arms and projecting perpendicularly rearwardly therefrom, said cam having an upwardly curved end portion extending beyond the axis of rotation of said crank, said cam being disposed for engagement by said cam follower for effecting reciprocal raising and lowering of said squeegee-support frame together with

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said screen-bearing frame, means biasing said squeegee-support frame in downwardly swung position, and means driven by said crank for effecting reciprocal travel of said squeegee carrier.

2. A screen printing machine as defined in claim 1 and further characterized by said means effecting travel of said squeegee carrier comprising a crank arm engaged to said crank, a link engaged to said crank at one end, an extension fixed on the other end of said link, and means pivotally engaging said extension to said squeegee carrier.

3. A screen printing machine as defined in claim 1 and further characterized by means adapting said link and said crank arm for mutual relative adjustment for controlling the stroke of said squeegee carrier, and pivotal means interengaging said link and said crank arm.

4. A screen printing machine as defined in claim 1 and further characterized by an arm having a linear portion between its upwardly curved end portion and the proximate support arm.

5. A screen printing machine as defined in claim 4 and further characterized by the upwardly curved portion of the cam being presented at the rearward end thereof.

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EUGENE R. CAPOZIO, *Primary Examiner*.

ROBERT E. PULFREY, *Examiner*.