

Jan. 17, 1961

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2,968,239

SCREEN PRINTING MACHINE

Filed Feb. 14, 1958

3 Sheets-Sheet 1

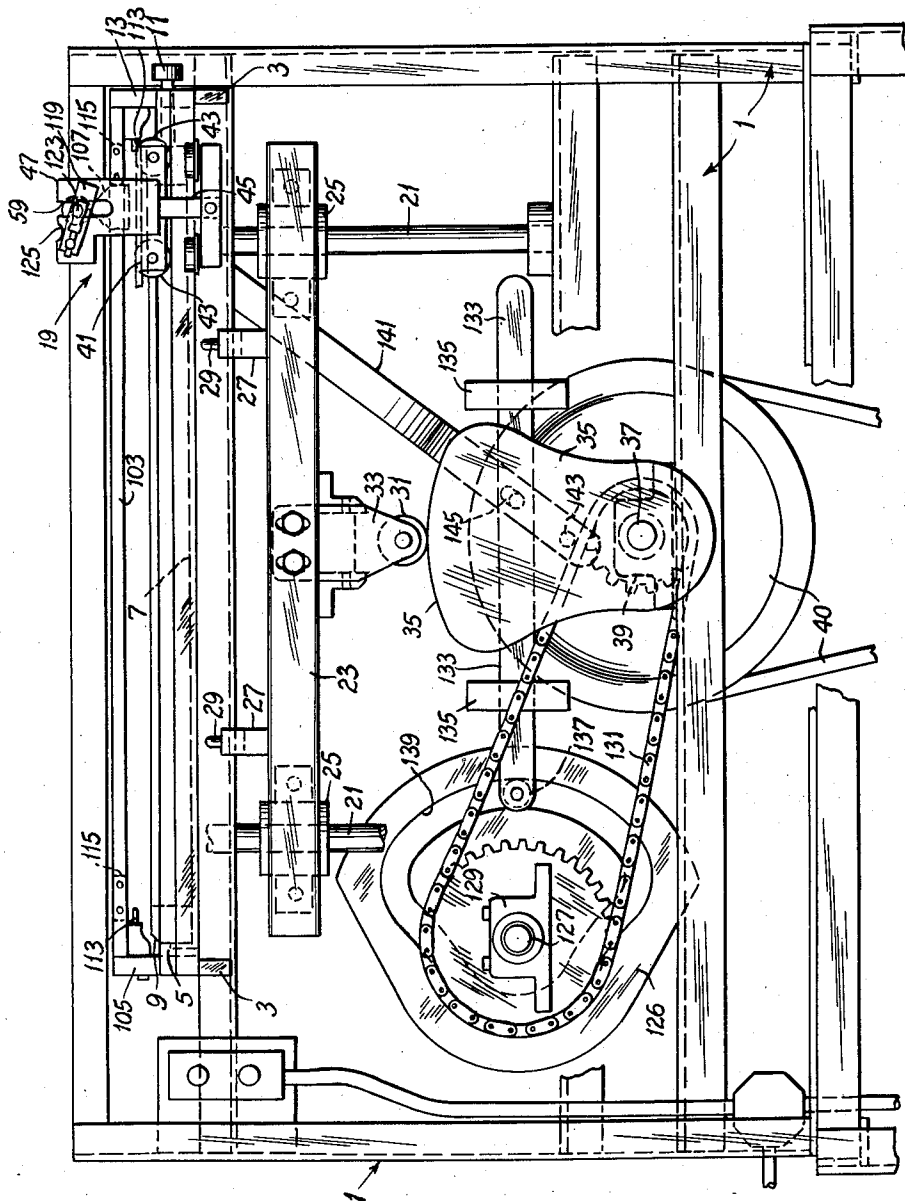


FIG. 1.

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3 Sheets-Sheet 2

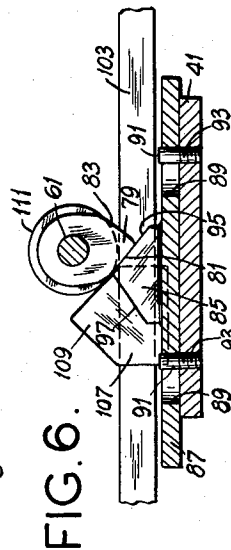
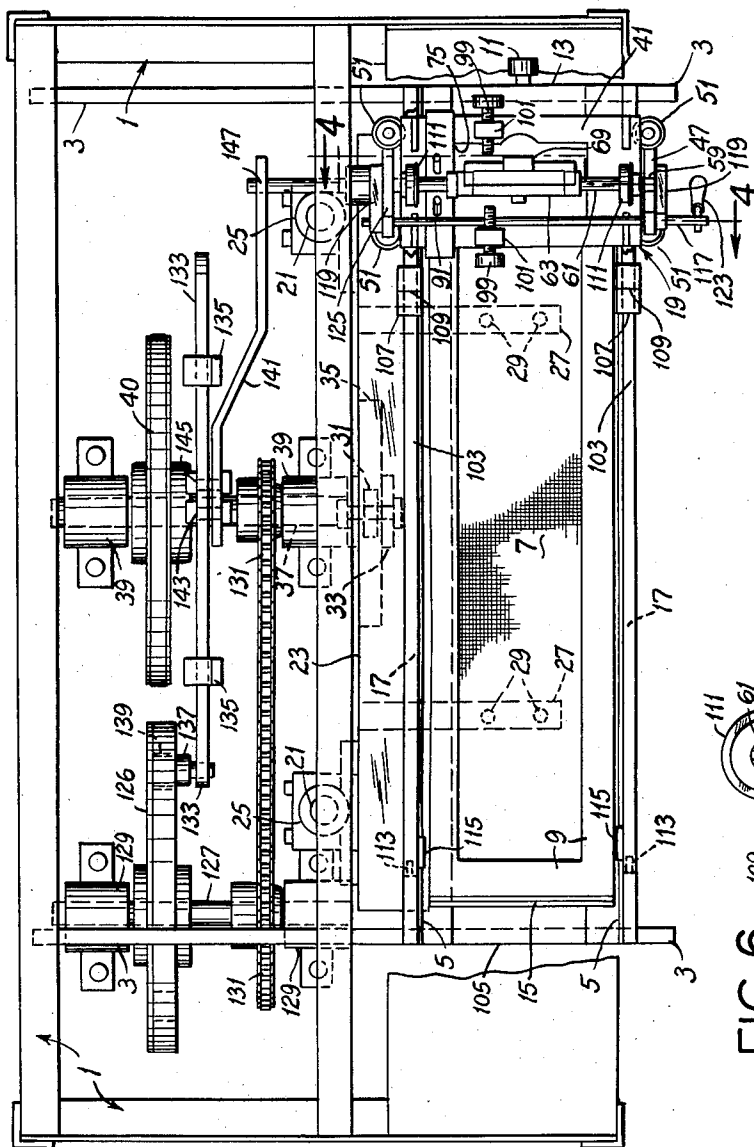


FIG. 2.

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FIG. 3.

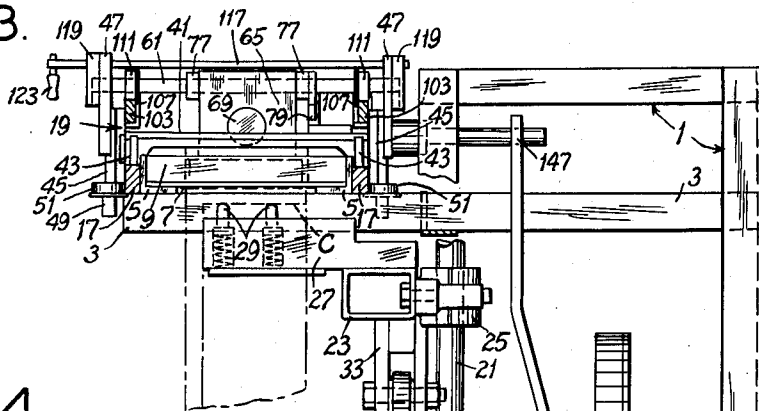


FIG. 4.

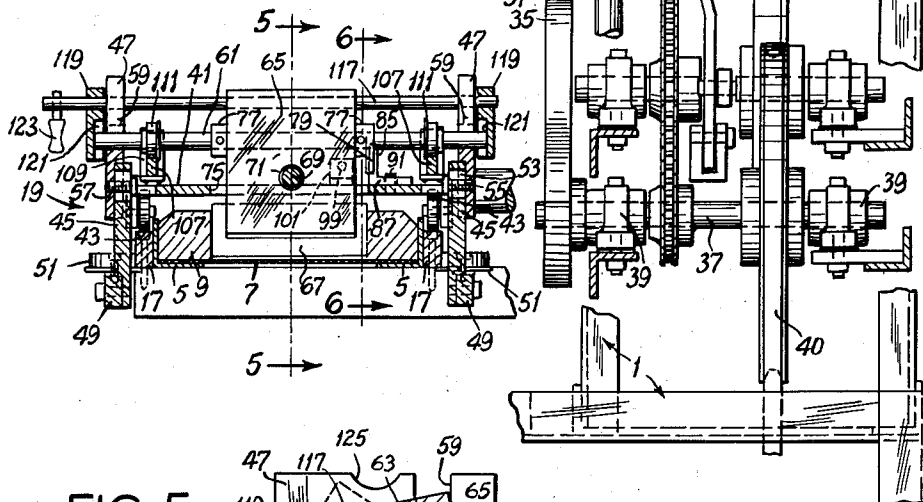
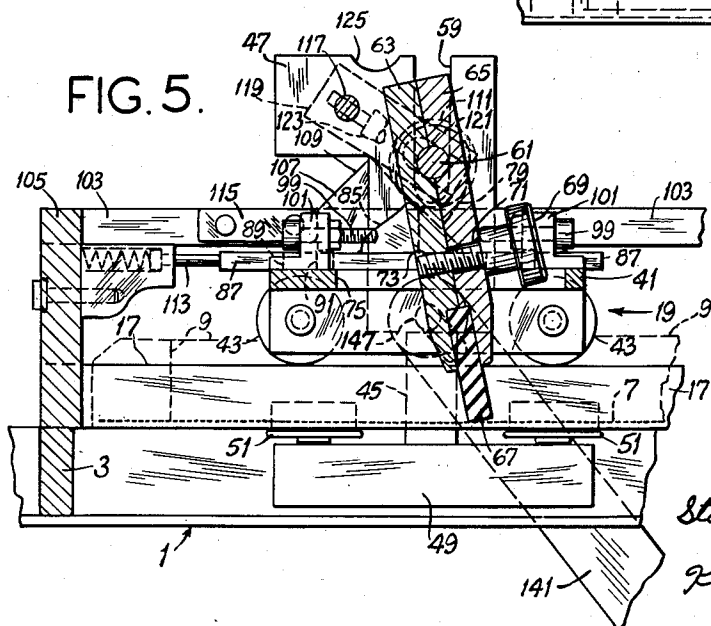


FIG. 5.



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2,968,239

SCREEN PRINTING MACHINE

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14 Claims. (Cl. 101-123)

This invention relates to screen printing machines, and more particularly to a machine for applying markings by means of a paint screen to the sides and ends of wood soda bottle cases.

Among the several objects of the invention may be noted the provision of an improved continuously operable screen printing machine of the type having a squeegee for sweeping over a paint screen provided with improved mechanism adapted, as the squeegee nears one end or the other of its stroke, positively to lift and then lower the squeegee and to reverse the angle of the squeegee, the squeegee being angled to drag the paint over the screen on movement one way or the other; the provision of a machine such as described wherein the operating mechanism for the squeegee is such as to permit the squeegee to be raised and maintained raised so that, if there is no work in place for printing, paint will not be squeezed through the screen; the provision of a machine of this class especially for printing on the sides and ends of wood soda bottle cases; and the provision of a machine of the class described which is adapted for printing cases with warped or otherwise uneven sides or ends. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated:

Fig. 1 is a view in front elevation, with parts broken away, of a paint screening machine of this invention;

Fig. 2 is a plan of Fig. 1;

Fig. 3 is an end view of the machine, with parts broken away and shown in section;

Fig. 4 is an enlarged section taken on line 4-4 of Fig. 2;

Fig. 5 is an enlarged section taken on line 5-5 of Fig. 4, and illustrating parts in a moved position in relation to Figs. 1 and 2; and,

Fig. 6 is an enlarged section taken on line 6-6 of Fig. 4.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a paint screening machine of this invention is shown to comprise a support constituted by a frame 1 made up in general of structural steel angle bars. Extending forward at the top of the frame are cantilever bars 3. These bars carry angle irons 5 for supporting a paint screen 7 of a well known type which functions as a stencil for printing brand markings, for example. The angle irons 5 extend horizontally from end-to-end of the frame. The paint screen, which is a conventional item, has a wood frame 9. It is simply dropped in between the angle irons to rest on their bottom legs. A clamping screw 11 threaded in a bracket 13 at one end of the frame 1 is adapted to clamp the screen endwise against an angle iron 15 at the other end of

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the frame 1. Extending lengthwise on the outside of the angle irons 5 are bars 17 which serve as tracks for a carriage 19 to be later described.

Mounted in the frame 1 are two vertical guide rods 21.

At 23 is indicated a lift beam (which, as shown, may be a length of rectangular metal tubing) having guides 25 slidable on the rods 21, thereby guiding the lift beam for up-and-down movement. Extending forward from the lift beam are cantilever arms 27 having depressible spring-biased plungers 29 projecting from its top for supporting a wood case C to be printed. A cam follower roll 31 is mounted at the bottom of the lift beam as indicated at 33. This roll engages a plate cam 35 fixed on a shaft 37 which extends in front-to-rear direction, being journaled in bearings 39 carried by the frame 1. Shaft 37 is driven from an electric motor (not shown) via a speed reducer (not shown) and a belt and pulley drive 40. Cam 35 is developed to lift the lift beam from a lowered position (wherein a case may be applied to the arms 27) to the raised position shown in Figs. 1 and 3 wherein the side or end of the case C which is uppermost engages the paint screen 7, and then to lower the beam after printing has been completed in a manner to be described, with a dwell in the lowered position and a dwell in the raised position. The follower roll 31 is preferably made vertically adjustable relative to the lift beam to take care of case sides and ends of different thickness.

The carriage 19 comprises a horizontal plate 41 on rollers 43 which ride on top of the tracks 17. Plate 41 spans the paint screen 7. To the sides of the plate 41 are secured vertical bars 45 carrying vertical side plates 47 at their upper ends and carrying horizontal bars 49 at their lower ends. Bars 49 carry rollers 51 engaging the bottoms of the tracks 17 to hold the carriage against shifting sidewise. The side plates 47 are vertically adjustable on the vertical bars 45, each bar 45 having a vertical slot 53 receiving a cap screw 55 threaded in a tapped hole 57 in the respective side plate (see Fig. 4).

Each side plate 47 has a vertical slot 59 extending down from its upper edge. The slots 59 of the two side plates 47 are transversely aligned for reception of the ends of a squeegee rod 61. Rod 61 carries a pair of jaws 63 and 65 for clamping a rubber squeegee 67. The jaws are clamped to the rod 61 and clamped together for holding the squeegee by means of a clamp screw 69 extending through a hole 71 in the jaw 65 and threaded in a tapped hole 73 in the jaw 63 (see Fig. 5). The jaws 63 and 65 extend down from the rod through an opening 75 in the horizontal carriage plate 41. Collars 77 are provided on the rod at the sides of the jaws. Secured to one of these collars is a squeegee positioning arm 79 which extends down from the rod, and has tapering lower end edges 81 and 83 at 90° to one another (see Fig. 6). The squeegee is located in a plane intersecting the juncture of these edges.

The arm 79 is cooperable with a squeegee positioning block or overcentering means 85 on a slide 87 on the horizontal carriage plate 41. This slide 87 consists of an elongate plate having elongate lengthwise slots 89 receiving screws 91 threaded in tapped holes 93 in plate 41 whereby the slide is mounted for sliding movement relative to the carriage in longitudinal direction. The block 85 is fixed on the slide and has tapering upper edges 95 and 97 at 90° to one another and at 45° to the horizontal. The arrangement is such that with edge 81 of arm 79 bearing against edge 95 of cam 85, the squeegee is angled toward the right as viewed from the front of the apparatus, and with edge 83 of arm 79 bearing against edge 97 of cam 85, the squeegee is angled toward the left. The angle of the squeegee

is determined by its engagement with stop screws 99 adjustably threaded in brackets 101 on plate 41.

Extending above the tracks 17 are upper tracks 103. These are supported by end members 105 and 13. Slid- 5 able on each upper track is a squeegee lifter 107 having a tapered upper end 109. The rod 61 carries rollers 111 riding on the tracks 103 engageable with the upper ends 109 of lifters 107. Under the rearward track 103 at each end thereof is a spring-biased stop 113 for en- 10 gagement by the slide 87. Fixed to each track 103 adjacent its ends are stops 115 for the slidable lifters 107.

Means is provided for manually lifting the squeegee rod 61 to lift the squeegee out of the paint screen. As shown, this means comprises a shaft 117 extending be- 15 tween the side plates 47, having its end portions jour- nalled in holes in the side plates. Fixed on this shaft outward of the side plates are radial arms 119, each having a radial recess 121 receiving the respective end of the squeegee rod 61. At the forward end of the shaft 117 is a handle 123 for manually rotating the shaft. The squeegee rod 61, when in operative position, bears on the bottom ends of the slots 59 in side plates 47 and arms 119 are angled as shown in Figs. 1 and 5. By ro- 20 tating the shaft 117 and arms 119 counterclockwise, the rod 61 may be lifted up and out of the slots 59 and shifted to the left as viewed in Figs. 1 and 5 to rest in notches 125 in the top edges of the side plates 47 ad- jacent the upper open ends of the slots 59.

Means is provided for reciprocating the carriage back and forth from one end of the tracks 17 to the other to move the squeegee back and forth. As shown, this means comprises a face cam 126 fixed on a shaft 127 30 journaled in bearings 129 carried by the frame 1, and driven from shaft 37 by a chain drive 131. A slide 133, guided by guides 135, has a follower 137 received in the groove 139 in the face cam 126. A lever 141 piv- oted at 143 to the frame 1 has a pin and slot connec- tion at 145 to the slide 133, and a pin and slot connec- tion at 147 to the carriage. The arrangement is such that rotation of cam 125 causes reciprocation of slide 133, the latter causes oscillation of the lever 141, and the lever causes reciprocation of the carriage. The 35 groove 139 in cam 126 is developed to provide a dwell at each end of the stroke of the carriage 19. The re- lative phasing and development of cams 37 and 126 are such that the lift beam 23 is down at the ends of the stroke of the carriage 19, and is raised just before the carriage starts moving.

Operation is as follows:

It will be understood that screening paint is provided in the paint screen 7. It will be assumed that the car- 40 riage 19 is at the right end of its stroke as shown in Figs. 1 and 2, that the squeegee is angled toward the right (arm 79 being on the right of the overcentering means or block 85), that the slide 87 is at the left end of its stroke on carriage plate 41 (having bumped the right-hand stop 113), that the lifters 107 are at the left of the rollers 111, and that the lift beam 23 is down. A case C is slipped over arms 27, the uppermost part of the case (which may be a side or end of the case) bearing on the spring-biased plungers 29. This is done during the dwell of the lift beam 23 in its lowered po- 45 sition and during the dwell of the carriage at the right- hand end of its stroke. It will be understood that cams 35 and 126 are rotating continuously. Cam 35 acts to lift the lift beam and raise the case C to printing po- sition wherein the upper face of the uppermost part of the case engages the bottom of the paint screen 7. If this part of the case should be warped or otherwise un- even, plungers 29 may yield to accommodate for this. After the lift beam has raised the case into the stated printing position, the cam 126 acts to drive the carriage 19 to the left. The squeegee 67 sweeps over the screen 7 (its lower edge engages the screen) and causes paint to exude through the permeable portions of the screen 50

to print the brand marking on the upper part of the case C.

The lift beam 23 stays up throughout the sweep of the squeegee from right to left. As the carriage 19 5 moves to the left, rollers 111 slide the lifters 107 along on tracks 103 to the left. Ultimately, the lifters 107 strike the left-hand stops 115 and are thereby arrested. The carriage 19, however, continues to move toward the left to some extent and, during this final phase of the movement of the carriage to the left, the rollers 111 10 climb up and over the tapered upper ends 109 of lifters 107, thereby raising and then lowering the squeegee rod 61 and the squeegee 67. As the squeegee is raised, it swings to vertical position, and arm 79 comes into a centered position. Also, during this final phase of the movement of the carriage to the left, the slide 87 on the carriage plate 41 strikes the left-hand stop 113, and the slide 87 is driven to the right relative to the carriage plate 41. Accordingly, when the rollers 111 ride over 20 the tapered upper ends 109 of the lifters 107, and the squeegee rod 61 and squeegee drop down, the arm 79 comes down on the left side of the block 85 on slide 87 positively to swing the squeegee to its position angled to the left.

When the carriage 19 has reached the left end of its stroke, it dwells there, and the lift beam 23 is lowered. Then, the case is taken off the arms 27, and turned to present another side uppermost, and reapplied, or an- 25 other case may be applied. This is done during the dwell of the lift beam in lowered position and during the dwell of the carriage at the left end of its stroke. Then, cam 35 again acts to lift the lift beam and raise the case C so that the upper face of the uppermost part of the case engages the bottom of the paint screen 7. After the lift beam has raised the case into the stated printing po- 30 sition, the cam 126 acts to drive the carriage 19 to the right. The squeegee 67 sweeps over the screen 7 (its lower edge engages the screen) and causes paint to exude through the permeable portions of the screen to print the brand marking on the upper part of the case C.

The lift beam 23 stays up throughout the sweep of the squeegee from left to right. As the carriage 19 35 moves to the right, rollers 111 slide the lifters 107 along on tracks 103 to the right. Ultimately, the lifters 107 strike the right-hand stops 115 and are thereby arrested. The carriage 19, however, continues to move toward the right to some extent and, during this final phase of the movement of the carriage to the right, the rollers 111 40 climb up and over the tapered upper ends 109 of lifters 107, thereby raising and then lowering the squeegee rod 61 and the squeegee 67. As the squeegee is raised, it swings to vertical position, and arm 79 comes into its centered position. Also, during this final phase of the movement of the carriage to the left, the slide 87 on the carriage plate 41 strikes the right-hand stop 113, and the slide 87 is driven to the left relative to the carriage plate 41. Accordingly, when the rollers 111 ride over 45 the tapered upper ends 109 of the lifters 107, and the squeegee rod 61 and squeegee drop down, the arm 79 comes down on the right side of the block 85 on slide 87 positively to swing the squeegee to its position angled to the right. Thus, the parts are repositioned for the next sweep to the left.

In view of the above, it will be seen that the several 50 objects of the invention are achieved and other advan- tageous results attained.

As various changes could be made in the above con- 55 structions without departing from the scope of the in- vention, it is intended that all matter contained in the above description or shown in the accompanying draw- ings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A paint screening machine comprising a paint screen 60 adapted to hold paint, a carriage movable back and forth

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above the screen, means for moving the carriage back and forth through a predetermined stroke, a shaft carried by the carriage extending transversely thereof and mounted for rotation on its axis and for vertical movement in a vertical plane transverse to the carriage, a squeegee carried by the shaft for sweeping over the screen and being swingable and vertically movable with the shaft, means operable to raise and then lower the shaft and the squeegee as the carriage nears one end or the other of its stroke, means operable as the shaft descends to cause it to rotate to swing the squeegee from one angled position to an oppositely angled position, and means for lifting the shaft and holding it lifted operable independently of the stated shaft raising and lowering means.

2. A paint screening machine as set forth in claim 1, wherein the carriage comprises side plates each having a vertical slot extending down from an upper edge thereof, the shaft being mounted in these slots, and wherein the means for lifting the shaft is adapted to raise it out of the slots and position it on the upper edges of the side plates.

3. A screen printing machine comprising a screen adapted to hold paint or the like, a carriage movable back and forth above the screen, a shaft extending across the carriage mounted for rotation on its axis and for up and down movement on the carriage, a squeegee fixed to the shaft adapted to sweep over the screen and being swingable and movable up and down with the shaft, said squeegee being swingable between a first angled position for being pulled over the screen to drag the paint or the like over the screen on movement of the carriage in one direction and a second and oppositely angled position for being pulled over the screen to drag the paint or the like over the screen on movement of the carriage in the opposite direction, lifter means movable back and forth by the carriage, means for arresting the movement of the lifter means adjacent the ends of the stroke of the carriage, said shaft being adapted to ride up, over and down behind said lifter means as the carriage completes its movement at either end of its stroke, said squeegee swinging to vertical position as the shaft is lifted in riding up the lifter means, an arm on said shaft having a centered position corresponding to the vertical position of the squeegee, overcentering means for said arm carried by the carriage for movement therewith and for movement relative thereto between first and second positions, means engageable by said overcentering means as the carriage nears one end of its stroke for moving said overcentering means from its first to its second position and engageable by said overcentering means as the carriage nears the other end of its stroke for moving said means from its second to its first position, said overcentering means when in its first position being engageable by the arm as the arm in its centered position moves down with the shaft after riding over the lifter means at one end of the stroke of the carriage positively to swing the squeegee from its vertical position to its first angled position, and said overcentering means when in its second position being engageable by the arm as the arm in its centered position moves down with the shaft after riding over the lifter means at the other end of the stroke of the carriage positively to swing the squeegee from its vertical position to its second angled position.

4. A screen printing machine as set forth in claim 3 wherein the carriage has side members provided with generally vertical slots open at their upper ends, said shaft being slidable up and down in said slots and rotatable on its axis.

5. A screen printing machine as set forth in claim 4 further comprising means for lifting the shaft out of the slots through the upper ends of the slots and positioning the shaft on the upper edges of the side members.

6. A screen printing machine as set forth in claim 5

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wherein the squeegee is clamped between a pair of jaws and said jaws are clamped to said shaft.

7. A screen printing machine as set forth in claim 3 further comprising work-supporting means located under the screen movable between a lowered retracted position for placing a work piece thereon and a raised position in which the work piece engages the screen, and means for raising and lowering said work-supporting means and adapted to hold it in raised position during the movement of the squeegee in either direction.

8. A screen printing machine as set forth in claim 7 wherein the work supporting means includes downwardly yieldable members on which the work piece rests.

9. A screen printing machine as set forth in claim 7 wherein the means for moving the carriage back and forth is operable continuously with a dwell at each end of the stroke of the carriage, and wherein the means for raising and lowering the work-supporting means is operable continuously with a dwell in its lowered position and a dwell in its raised position, said carriage-moving means and the means for raising and lowering the work-supporting means being phased so that movement of the carriage follows the raising of the work-supporting means.

10. A screen printing machine comprising a screen adapted to hold paint or the like, a carriage movable back and forth above the screen, a shaft extending across the carriage mounted for rotation on its axis and for up and down movement of the carriage, a squeegee fixed to the shaft adapted to sweep over the screen and being swingable and movable up and down with the shaft, said squeegee being swingable between a first angled position for being pulled over the screen to drag the paint or the like over the screen on movement of the carriage in one direction and a second and oppositely angled position for being pulled over the screen to drag the paint or the like over the screen on movement of the carriage in the opposite direction, lifter means movable back and forth by the carriage, means for arresting the movement of the lifter means adjacent the ends of the stroke of the carriage, said shaft being adapted to ride up, over and down behind said lifter means as the carriage completes its movement at either end of its stroke, said squeegee swinging to vertical position as the shaft is lifted in riding up the lifter means, an arm on said shaft having a centered position corresponding to the vertical position of the squeegee, overcentering means for said arm comprising a slide carried by the carriage for movement therewith and for sliding movement relative thereto in longitudinal direction between first and second positions, a positioning block on the slide engageable by the arm, means engageable by said slide as the carriage nears one end of its stroke for moving said slide from its first to its second position and engageable by said slide as the carriage nears the other end of its stroke for moving said slide from its second to its first position, said positioning block having a first inclined edge engageable by the arm when the slide is in its first position as the arm in its centered position moves down with the shaft after riding over the lifter means at one end of the stroke of the carriage positively to swing the squeegee from its vertical position to its first angled position, and said positioning block having a second oppositely inclined edge engageable by the arm when the slide is in its second position as the arm in its centered position moves down with the shaft after riding over the lifter means at the other end of the stroke of the carriage positively to swing the squeegee from its vertical position to its second angled position.

11. A screen printing machine as set forth in claim 10 wherein said lifter means is slidable back and forth on track means above the screen, said shaft having roller means thereon engageable with said lifter means adapted to push said lifter means ahead in one direction or the other on movement of the carriage.

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12. A screen printing machine as set forth in claim 10 further comprising a lift beam having arms extending under the screen for supporting a work-piece and movable between a lowered retracted position for placing a work piece on the arms and a raised position in which the work piece engages the screen, and means for raising and lowering the beam and adapted to hold it in raised position during the movement of the carriage in either direction.

13. A screen printing machine as set forth in claim 12 wherein there are downwardly yieldable members on the lift beam arms on which the work piece rests.

14. A screen printing machine as set forth in claim 12 wherein the means for moving the carriage back and forth includes a continuously rotatable cam adapted to cause the carriage to dwell at each end of its stroke, and wherein the means for raising and lowering the lift beam includes

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a continuously rotatable cam adapted to cause the lift beam to dwell in its lowered and raised positions, and wherein the cams are phased so that movement of the carriage follows the raising of the lift beam.

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