

July 16, 1940.

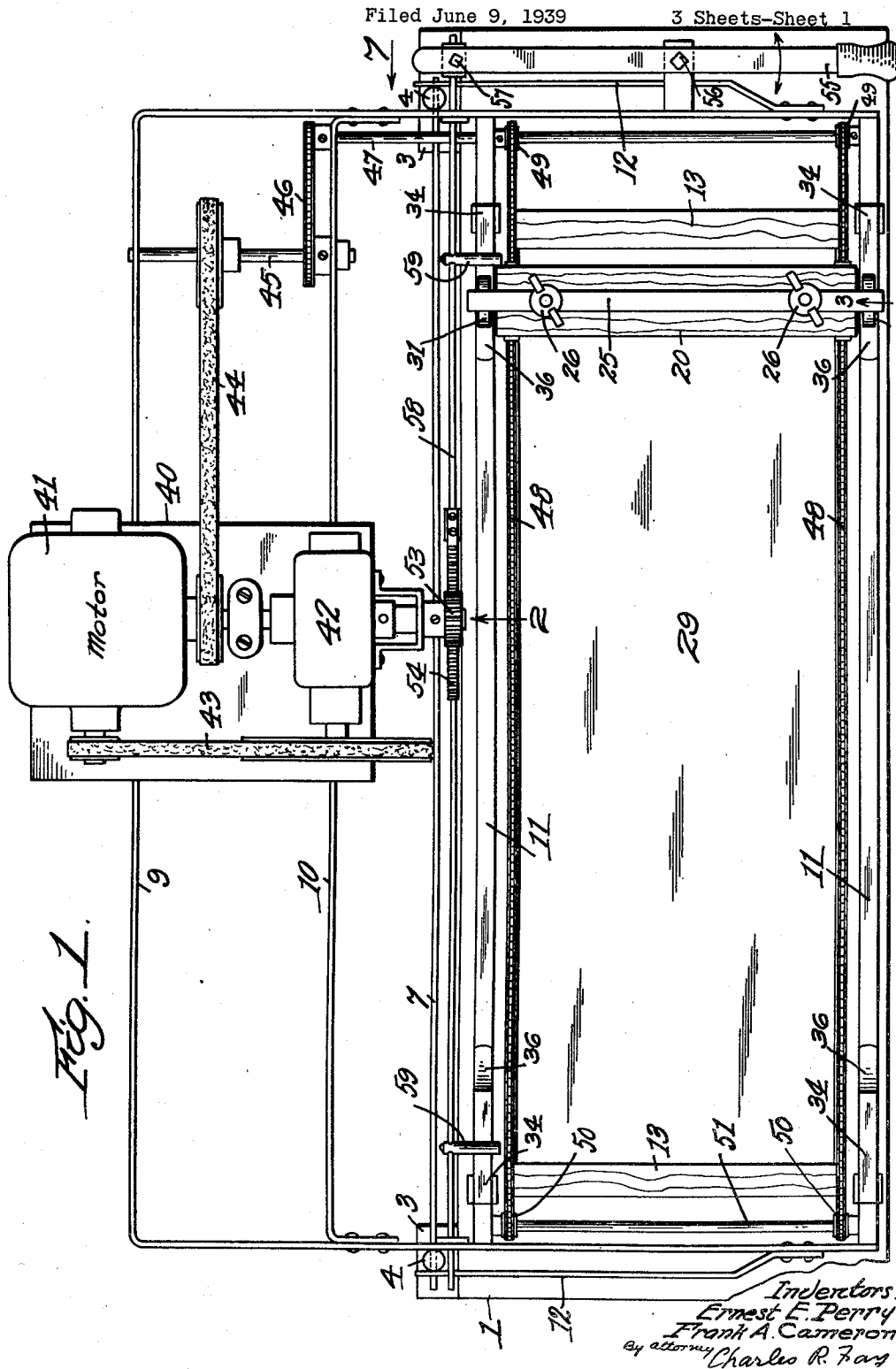
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2,207,818

SILK SCREEN PRINTING MACHINE

Filed June 9, 1939

3 Sheets-Sheet 1



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Fig. 6.

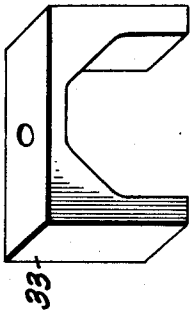


Fig. 5.

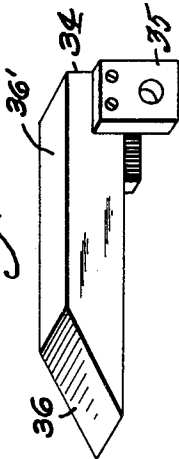
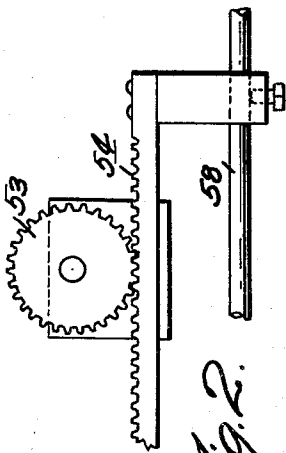


Fig. 2.



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Fig. 4.

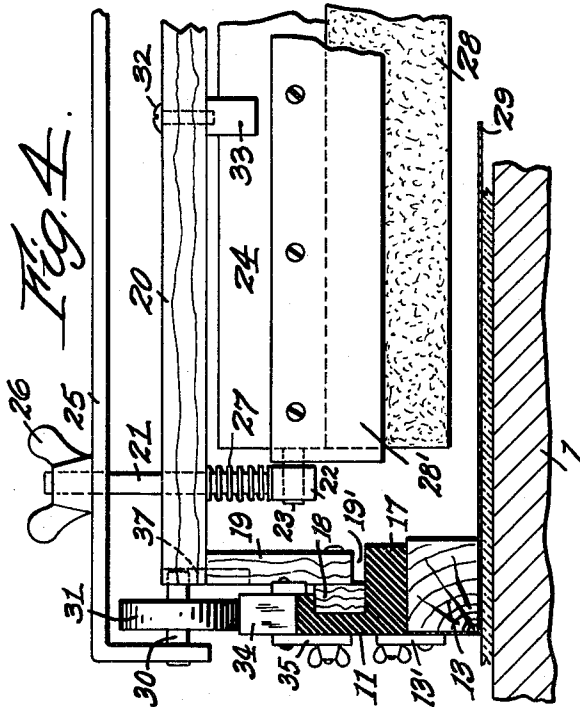
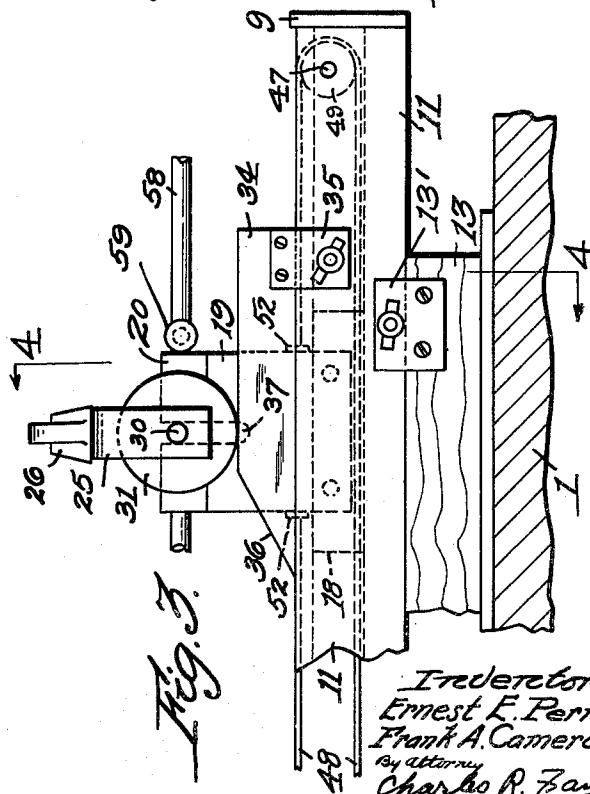


Fig. 3.



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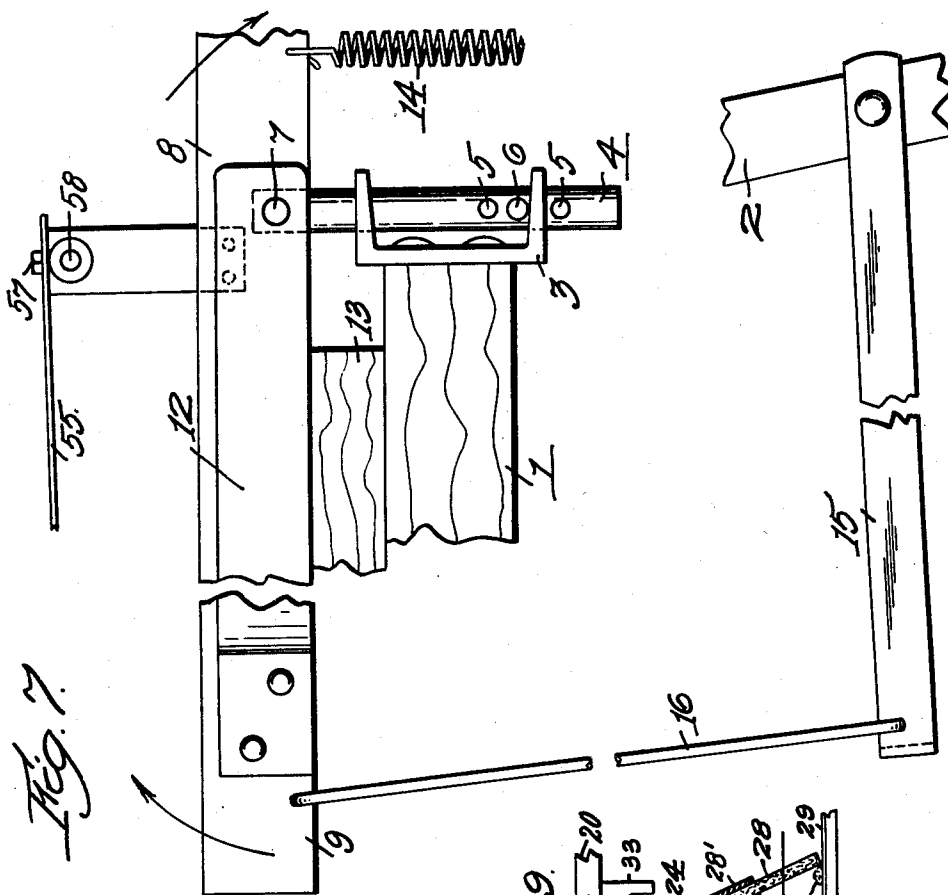
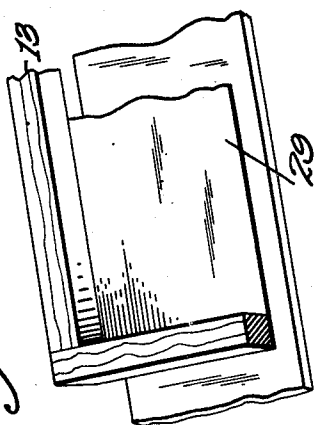
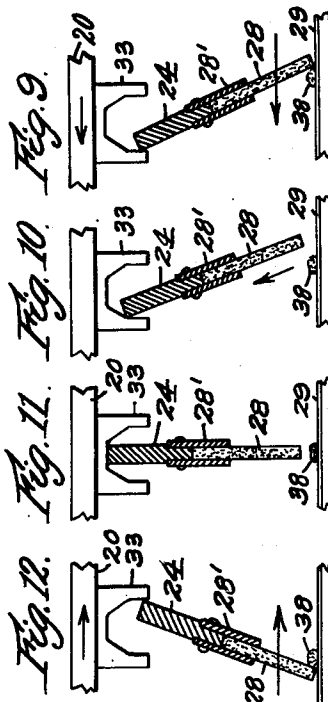
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SILK SCREEN PRINTING MACHINE

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Application June 9, 1939, Serial No. 278,370

15 Claims. (Cl. 101—123)

This invention relates to a silk screen printing machine, and more particularly to devices for the spreading of paint, lacquer, rubber, or any material capable of being spread.

The principal objects of the invention include: providing a machine for spreading a substance over a certain area, the device being easily adjustable to spread the substance over any predetermined area up to the capacity of the machine; providing a pivoted spring-held reciprocable spreader or squeegee, the length of its path being variable according to the size of work to be spread; means for restricting the tilt of the squeegee to the desired angle; means for lifting the squeegee from the screen at the ends of its path, up over the residue of the substance being spread and then down to the screen again behind the substance, to return the latter while spreading on the return stroke; a hinged squeegee and stencil carrier mounting all the operative parts of the machine, including a power source, the hinge being entirely at one side of the work area and automatically adjustable to easily accommodate various sizes of stencil frames without manual attention, and a power operated, automatically reversible means to travel the squeegee a desired distance within the limits of the machine.

Further objects are the provision of an improved stencil machine which is superior in point of simplicity and inexpensiveness, with a wider range of usefulness and variation of the working area.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a plan view of the entire machine;

Fig. 2 is a detail view of the transmission reversing rack and pinion, looking in the direction of the arrow 2 in Fig. 1;

Fig. 3 is a side elevation of a part of the device, looking in the direction of the arrow 3 in Fig. 1;

Fig. 4 is an end view, partly in section, on the line 4—4 of Fig. 3, some parts being broken away;

Fig. 5 is a perspective view of the adjustable cam used to lift the squeegee carrier;

Fig. 6 is a perspective view of the cam used to limit the tilt of the squeegee;

Fig. 7 is an end elevation showing the adjustable hinge, looking in the direction of the arrow 7 in Fig. 1, parts being broken for clarity;

Fig. 8 is a fragmentary view of the stencil frame and the material to be printed; and

Figs. 9, 10, 11 and 12 are diagrammatic illustrations of the tilting and lifting operation of the squeegee.

The frame 1 of the machine is rectangular and may be of wood or metal or any desired material and supported on legs 2 at appropriate locations. At each end of one long side of the frame there is attached by any appropriate means a U-shaped angle iron 3, having the legs thereof extending away from the frame, as shown in Fig. 7. The legs of each angle iron are provided with vertically aligned holes to slidably accommodate the pins 4, and each pin 4 is provided with a series of holes 5 for the reception of a stop pin 6, the latter being insertable in any hole to vertically position the pin 4 downwardly with respect to the frame 1. Adjacent the top of each pin 4 there is journaled a transverse rock shaft 7, supporting the frame 8 for swinging movement. The swinging frame 8 is rectangular and comprises U-shaped bars 9, 10, bolted or riveted together, as shown in Fig. 1, spaced side bars 11 attached at their ends within the U-shaped bar 9, one bar 11 closing the U and the other bar 11 being spaced therefrom and located on the side of the shaft 7 away from the bar 10. Attached to the legs of the U-shaped bar 9 are offset members 12 which locate the frame 8 with respect to the pins 4 and restrain the frame from endwise movement. The stencil frame 13 depends from, and is detachably secured to, the bars 11, by the connection 13', as shown in Fig. 4.

A spring 14 is attached at one end to the frame 8 on the opposite side of the rock shaft 7 from the stencil frame and the spring is attached at its other end to some convenient fixed point, as the floor or leg 2. This spring normally holds the stencil frame and associated parts in elevated position, the frame being swung down to operative position by the foot of the operator stepping on a treadle 15, which is connected to the frame 8 on the side of the rock shaft 7 opposite to the spring 14, by a link 16.

Both ends of the spreader carrier are the same and one end has been shown in detail, as in Fig. 4.

The side bars 11 are grooved on their inside surfaces so that the grooves face each other and the bars 11 are provided with laterally extending feet 17 on which are slidably supported blocks 18. The blocks 18 are attached to the ends of the right angled legs 19 of a bar 20, spaces 19' 55

being provided between the ends of the legs 19 and the feet 17. The blocks 18 are guided by the grooves in the bars 11 on their sliding movement, but, if desired, these blocks may be replaced by rollers or other bearings.

Adjacent the ends of the bar 20 there are provided borings for the reception of bolts 21. On the lower ends of these bolts there are provided bored blocks 22 for the reception of pivot pins 23 attached to the ends of the squeegee carrier 24. The upper ends of the bolts 21 extend through appropriate holes in a bridge member 25, and wing nuts 26 are screwed onto these bolt ends to support the bolts on the bridge member and thereby support the squeegee carrier. A compression spring 27 is located between the blocks 22 and the bar 20 to normally hold the squeegee 28 against the stencil 29, bearing in mind that the bar 20 is restrained against vertical movement by the attached blocks 18 in the grooves in the bars 11, while the bolts 21 are slidable in the bores in the bar 20.

The squeegee 28 may be made of soft rubber or any other material desired, and is compressed between two slide plates 28' that are screwed into the carrier 24. By this means a larger or smaller squeegee may be secured to the carrier.

The ends of the bridge member 25 are bent over, as shown in Fig. 4, and are provided with pins 30 supporting wheels 31 for rotary motion. The wheels 31 run along on the top of the rails 11.

Attached to the underside of the bar 20 by a screw 32 is an inverted U-shaped cam member 33, which is in general shaped in the form of a half of an octagon, as clearly shown in Fig. 6. The upper end of the squeegee carrier 24 is always located within the legs of the cam member 33. The corners between the interior sides of this cam are rounded, as shown in Fig. 6, to enable easy sliding of the carrier 24 in a vertical direction, while in contact with said interior sides.

On the tops of the rails 11 there are located several cam elements 34, longitudinally adjustable on the rails 11 and detachably secured thereto by means of connections 35. The wheels 31 on the bridge member 25 ride on the rails and up cam surfaces 36 on the adjustable elements 34, at each end of the stroke of the squeegee carrier. In order to allow the bridge 25 to rise under influence of the cams, while the bar 20 remains at a constant level, slots 37 are provided in the outer faces of the leg members 19, and the wheel journals 30 ride up and down in these slots, while maintaining a constant lateral relation of the wheels 31, bridge 25 and bar 20.

From the foregoing description it will be clear that as the squeegee carrier is reciprocated on rails 11, the springs 27 maintain the squeegee pressed against the stencil and the drag of the latter on the squeegee carrier pivots it to the position shown in Fig. 9 when the carrier is traveled to the left, and to the position of Fig. 12 when returning to the right. One leg of the octagon cam 33 limits the degree of tilt of the squeegee, as clearly shown in these figures. As the carrier 24 approaches the end of its stroke in either direction, the wheels 31 ride up on the cam surfaces 36, thus forcing the bridge 25, and with it, the bolts 21, upwardly. As the bolts are connected to the carrier 24, the latter is also forced up against the action of springs 27, and due to the inclination of the octagon surfaces, the carrier 24 is slid upwardly into vertical position, the

squeegee leaving the stencil, and thus the drag of the latter on the former disappears. A slight further travel of the bar 20 and associated parts in the same direction carries the squeegee somewhat beyond the heaped up paint or other spreading material indicated at 38, the wheels 31 now riding on the horizontal part 36' of the cam 34.

Upon reversal of the travel of the carrier, the wheels 31 ride down the cam surfaces 36, the squeegee contacting the stencil which sets up a drag, and the squeegee is tilted in the opposite direction, being limited in such tilt by the other leg of the octagon shaped cam 33. Thus, it is seen that the squeegee is traveled to spread the paint, or the like; automatically lifted over the heaped up paint, and also automatically brought down, tilted in the opposite direction again contacting and spreading the paint, etc. in the reverse direction, without attention from the operator, so far as the squeegee is concerned.

The squeegee carrier is traveled by means of power, which is entirely located on and supported by the swinging frame 8. A platform 40 is mounted in any desired manner on the bars 9, 10, as indicated in Fig. 1, and a motor 41 and a conventional reversing transmission 42 are supported on the platform. The motor and transmission are connected by the usual pulleys and belt 43, and the output end of the transmission is connected by a belt 44, shaft 45 and belt or chain 46 to the shaft 47. The shaft 47 is journaled in the bar 10 and rails 11, and is operatively connected to spaced chains 48 through sprockets 49. Of course, it is understood that any or all of these driving connections may be replaced by other desired means.

The chains 48 are spaced approximately the width of the squeegee carrier 24 and extend the full length of the rails 11, being traversed over sprockets 50 on a shaft 51 at the rear of the device. The top of each chain is connected to the adjacent leg 19 of the bar 20 by any desired connection 52, and the bottom runs of the chains travel below the legs 19 in the space 19'.

The transmission 42 is provided with a reversing operator consisting of the pinion 53, and a rack 54. When the rack 54 is moved to either right or left from its central position, the transmission is thrown into neutral and the chains 48 stop, but when the rack is moved back to the central position by, for instance, a leftward motion of the rack 54, the power is again engaged and the carrier moves to the left. If the carrier is at the left end of the machine, as shown in Fig. 1, and the transmission is in neutral, a rightward pull on the rack will engage the power and the carrier will travel to the right. The rack may be operated in its sliding movement by the lever 55, pivoted to the frame 8 at 56, and connected at 57 through a lost motion connection to the rod 58 which is secured to the rack by a set screw. In order to automatically throw the transmission into neutral, the rod 58 is provided with adjustable stops 59, which are engaged by the bar 20 at each end of its path, and these stops are traveled by the carrier until the transmission is thrown into neutral thereby. The details of the mechanism contained in the transmission housing 42 are well known and it is not thought necessary to show them in the present case.

In the operation of the machine, the card or other material to be printed is placed on the frame 1, the screen 29 is secured by any con-

venient means to the underside of the stencil frame 13, as shown in Fig. 8, and the latter is then secured to the rails 11. The operator then steps on the treadle 15, bringing the stencil and its frame down on the material to be printed, and the paint, etc. is placed in position on the top of the stencil. The operator then manipulates the lever 55 as above explained to start the squeegee carrier along its path of travel which is horizontal, and due to the cam elements 34, the squeegee will rise over or jump the paint, or the like, near the end of the travel, assume a vertical position, and be ready to start back at any time desired, to reverse the spreading operation. In case a small size card is to be printed, the cams 34 and stop pins 59 are adjusted on their respective supports to the desired position corresponding to the size of the card and the squeegee will be traveled only over the desired length, thus saving time and paint, etc. It is therefore clear that this device will accommodate all sizes of material up to the capacity of the stencil frame easily and economically. The springs 27 maintain the squeegee against the stencil in such a manner that the paint, etc. can only go in front of or under the squeegee.

The adjustable hinge at 4 and 7 is provided so that any size of stencil frame or other device may be used. That is, if a larger member than that shown at 13 in the drawings is to be used, the sliding pins 4 will automatically compensate for the consequent increased space between the frames 8 and 1. Thus, practically any size of frame 13 can be used without manual adjustment of the frame 8. A further advantage of the swinging frame is that all the work, and the stencil and its frame, may be placed in the machine from one side only, thus simplifying the operation.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what we claim is:

1. In a device of the character described, means for spreading a printing substance on a surface, means for traveling the spreading means over the surface, resilient means normally holding said spreading means in contact with said surface, cam means for raising the spreading means from the surface at the end of its travel, and means to stop the traveling means at the point where the spreading means is in raised position, said rising means and said stopping means being adjustable along the path of travel of said spreading means, whereby the latter may be stopped and raised at any desirable point.

2. In a device of the class described, a printing substance spreader, a carrier therefor pivotally mounted in a traveling frame, means to limit the pivoting of the carrier, a surface over which the spreader carrier travels in contact therewith, the spreader carrier being tilted in the direction of travel by the friction created between the spreader and the surface, means to raise the carrier at a predetermined point, whereby the spreader is removed from said surface, and means to place the spreader yieldingly in vertical position upon the raising thereof.

3. In a device of the class described, a printing substance spreader, a carrier therefor pivotally mounted in a traveling frame, means to limit the pivoting of the carrier, a surface over which the spreader carrier travels in contact therewith, the spreader carrier being tilted in the direction of travel by the friction created between the

spreader and the surface, means to raise and lower the carrier at a predetermined point, and means yieldingly placing the carrier in vertical position when raised, whereby it is reversely tilted by contact with said surface upon being lowered and reversely traveled.

4. In a device of the class described, a spreader, means pivotally mounting said spreader, means to travel said mounting means with the spreader in contact with a surface, by which the spreader is tilted, means to yieldingly press the spreader against the surface, means to lift the spreader against the pressing means at a predetermined point, and means to place said spreader in a generally vertical position when lifted.

5. In a device of the class described, a spreader, means pivotally mounting said spreader, means to travel said mounting means with the spreader in contact with a surface, whereby the spreader is tilted, means to limit the tilt, means pressing the spreader downwardly, means to lift the spreader against the pressing means at a predetermined point, means to position the spreader in vertical position upon the lifting thereof, said surface tilting the spreader reversely upon a reverse travel of the latter.

6. In a device of the class described, a spreader, means pivotally mounting said spreader on a horizontal axis intermediate its side edges, means to travel the mounting means horizontally, with one longitudinal edge of the spreader in contact with a surface, means at either side of the other longitudinal edge of the spreader to retain the spreader in vertical position when stationary, and in tilted position under influence of the friction of the surface when traveling.

7. In a device of the class described, a support, a horizontal rock shaft located at one side of the support, and journaled in a vertically slidable support, a frame mounted on the rock shaft to be pivoted thereon, whereby the vertical position of the frame may be varied, a stencil frame detachably secured to the underside of the pivoted frame to be clamped between the latter and the first named support, a traveling printing substance spreader, and means to travel the same mounted on the pivoted frame to spread a substance on the stencil, the spreader and the means to travel it being on opposite sides of the rock shaft.

8. In a device of the class described, a support, a horizontal rock shaft located at one side of the support, and journaled in a vertically slidable support, a frame mounted on the rock shaft to be pivoted thereon, whereby the vertical position of the frame may be varied, a stencil frame detachably secured to the underside of the pivoted frame to be clamped between the latter and the first named support, a traveling printing substance spreader, means to travel the same mounted on the pivoted frame to spread a substance on the stencil, the spreader and the means to travel it being on opposite sides of the rock shaft, means to retain the pivoted frame with the stencil frame and spreader normally in raised position, and means to depress the same.

9. In a device of the class described, a reciprocable frame supporting a paint spreader, power-operated means to reciprocate said frame, adjustable stop means in the path of the frame to be engaged thereby at any desired point in the path of travel of the frame, the stop means being operatively connected to a power interdicting device, whereby the reciprocating means is stopped upon engagement of the frame with the

stop, manually operatable means associated with the connection between the stop and the power interdicting device, to reverse the operation of the power means, and adjustable cam means in the path of said spreader set to raise the same upon said engagement of the frame and the stop.

10. In a device of the class described, a traveling carriage having a bridge-like element restricted to rectilinear movement, a member overlying said bridge and capable of motion at an angle to the path of said rectilinear movement, a movable support associated with said member and said bridge and having means to prevent movement of the same in one direction with respect to said member, a resilient element tending to urge said support in said direction, and a spreader attached to said support.

11. In a device of the class described, a traveling carriage having a bridge-like element restricted to rectilinear movement, a member overlying said bridge and capable of motion at an angle to the path of said rectilinear movement, a movable support associated with said member and said bridge and having means to prevent movement of the same in one direction with respect to said member, a resilient element tending to urge said support in said direction, a spreader attached to said support, and means in the path of said member to move the same against the action of the resilient element, with respect to said bridge, thus also moving said spreader.

12. In a device of the class described, the combination of a traveling carriage having a transverse support, a member above said support and mounted for vertical movement with respect thereto, an element depending from said member and resiliently urged downwardly, and a spreader attached to said element; with a cam means in the path of said member, adapted to urge the same upwardly against said resilient action, thus raising the spreader.

13. In a device of the class described, the combination of a traveling carriage having a trans-

verse support, a member above said support and mounted for vertical movement with respect thereto, an element depending from said member and resiliently urged downwardly, and a spreader attached to said element; with a cam means in the path of said member, adapted to urge the same upwardly against said resilient action, thus raising the spreader, said cam means being adjustable to any desired point in the path of the member.

14. In a device of the class described, a carriage, means to reciprocate said carriage, a member connected to said carriage and mounted for movement with respect thereto, an element slidably mounted with respect to said carriage and said member and pivotally carrying a spreader, stop means on said element to restrict its movement in one direction relative to said member, resilient means urging said spreader in said direction, a cam in the path of said carriage, means on said member to engage said cam to thereby move said member and spreader with respect to said carriage against the action of said resilient means, and cooperating guide means on said carriage and said member to restrict the latter to a movement at an angle to the path of reciprocation of the carriage.

15. In a device of the class described, a spreader, means pivotally mounting said spreader, means to travel said mounting frame, resilient means urging said spreader with respect to said mounting means, positive means to urge said spreader in the opposite direction at a predetermined point in the travel of said mounting means, and cam means to place said spreader in desired relation to said mounting means upon action of said positive means, said cam means comprising a generally U-shaped element having slanting surfaces on the inner sides of its legs, between which a portion of said spreader is located.

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