Aug. 15, 1933. E. A. OWENS 1,922,710

STENCIL PRINTING MACHINE

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Fig. 1.

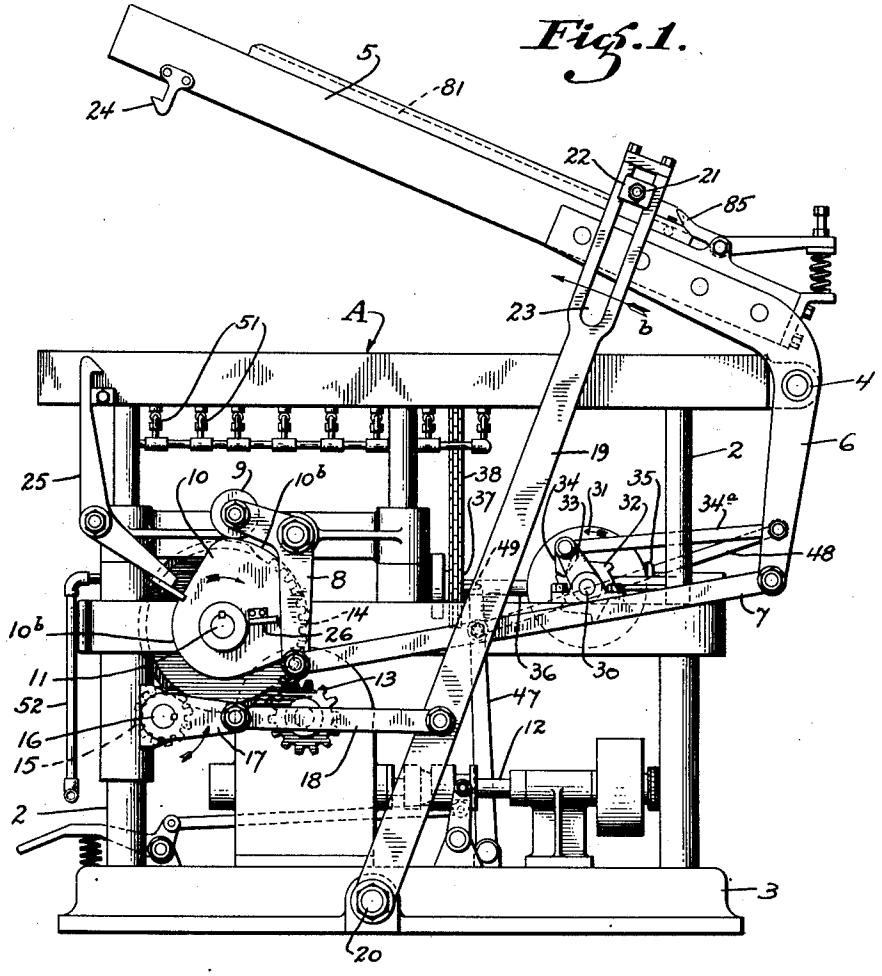
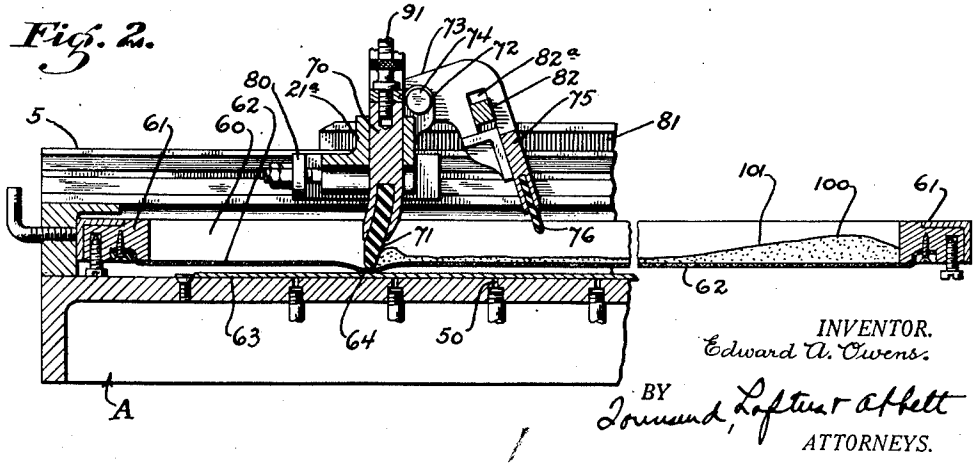


Fig. 2.



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Fig. 3.

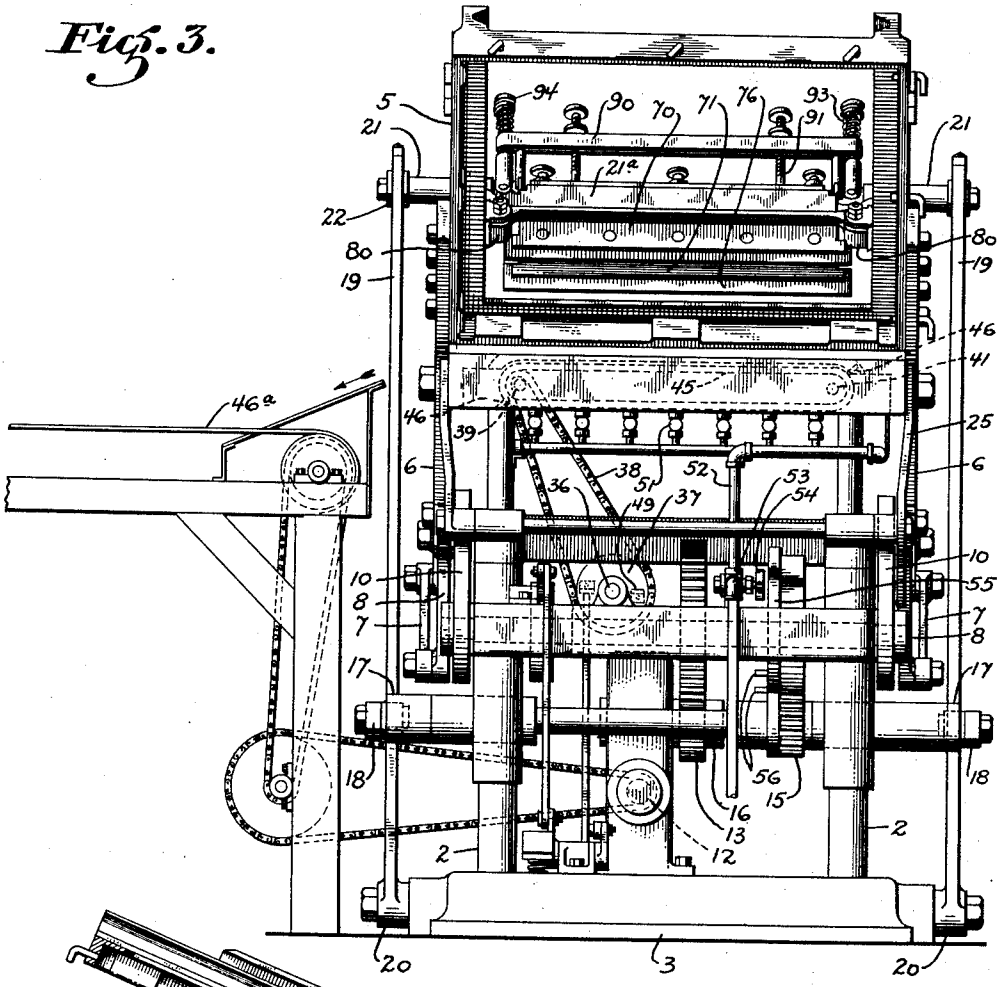
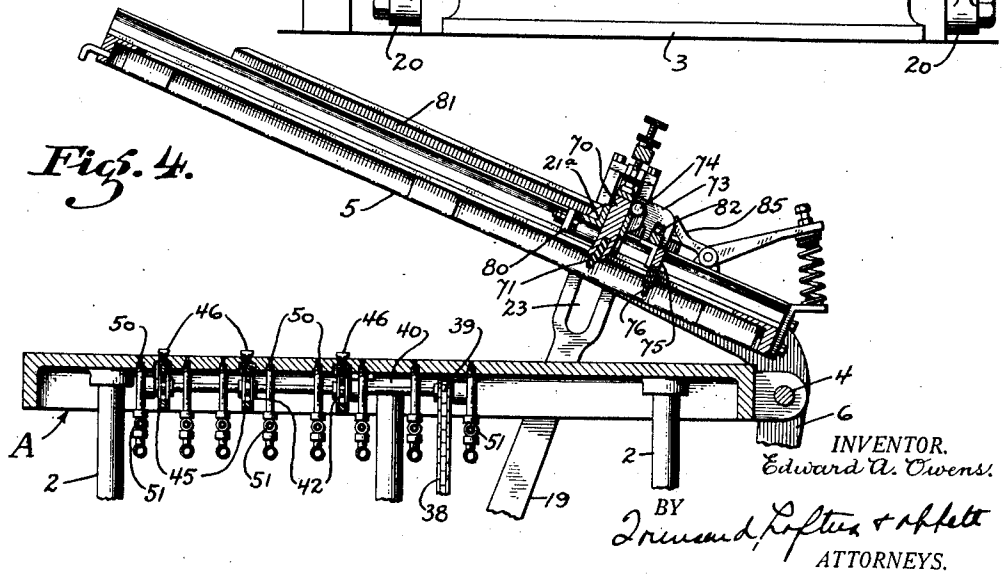


Fig. 4.



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Fig. 5.

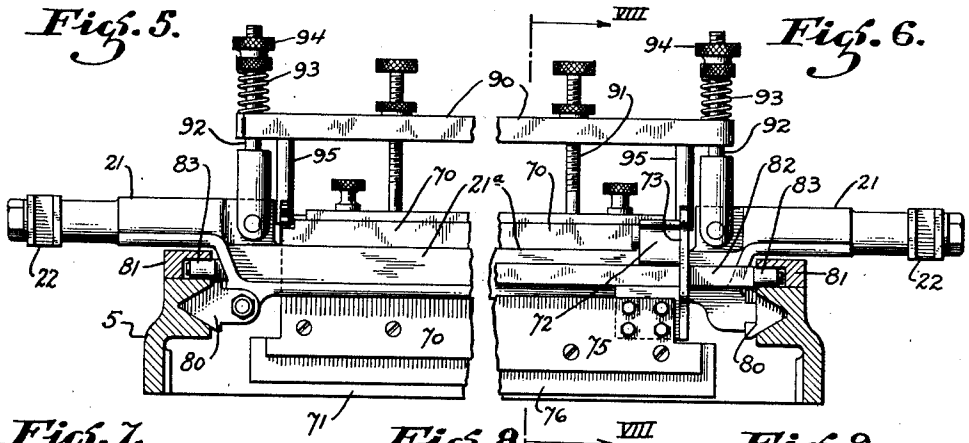


Fig. 6.

Fig. 7.

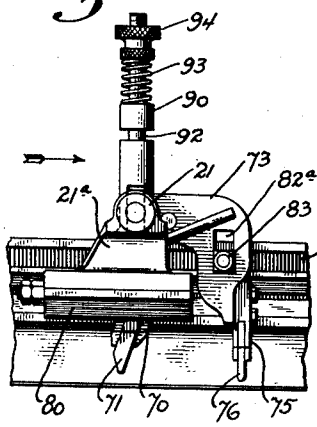


Fig. 8.

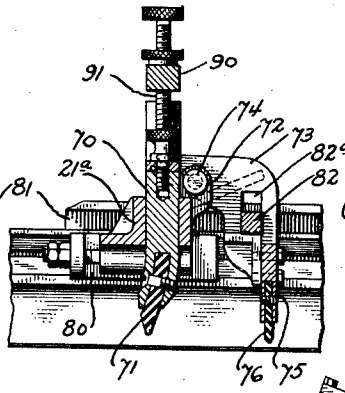


Fig. 9.

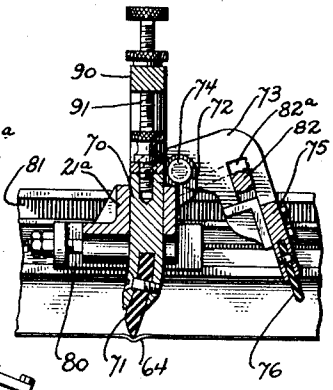
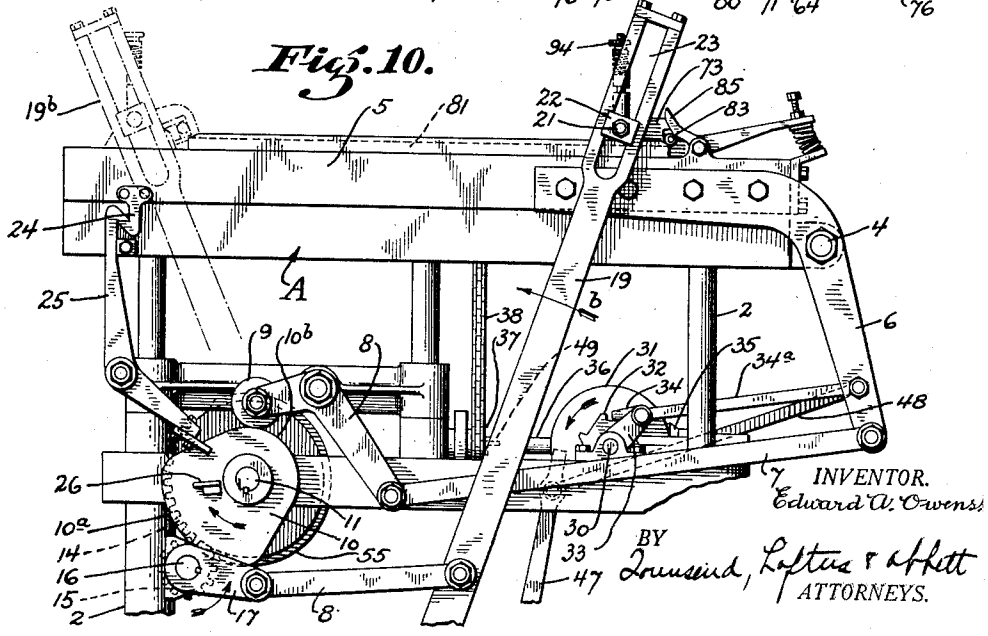


Fig. 10.



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UNITED STATES PATENT OFFICE

1,922,710

STENCIL PRINTING MACHINE

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Application April 29, 1929. Serial No. 358,775

8 Claims. (Cl. 101—123)

This invention relates to a stencil printing machine of the type shown in Patent Number 1,687,080, entitled "Method of and apparatus for stenciling" issued October 9, 1928.

A stencil printing machine of the type disclosed in the patent referred to is capable of printing on a great variety of materials, such as paper, cardboard, leather etc., in fact, almost any material which is flexible may be printed on, as the material is supported by and bent around the curved surface of a drum during the printing or stenciling operation. Sheets of material such as glass, metal, heavy cardboard etc., cannot be handled in a machine of this character however, as they are not sufficiently flexible to permit them to be bent around a drum or curved surface.

The present invention relates to a machine which is not only capable of handling flexible materials, but also rigid materials, the object being to generally improve and simplify the construction and operation of machines of the character described; to provide a stenciling machine which is particularly adapted to handle flat and rigid sheets of material; to provide a stenciling machine whereby smudging during the printing operation is entirely eliminated; and further to provide an improved mechanism whereby the paint or color is spread over the stencil and transferred therethrough.

The stenciling machine is shown by way of illustration in the accompanying drawings in which:

Fig. 1 is a side elevation of the machine showing the stencil in elevated position,

Fig. 2 is a detailed longitudinal sectional view showing the position assumed by the stencil during the printing or transferring operation,

Fig. 3 is an end view of the machine,

Fig. 4 is a longitudinal sectional view of the table and the stencil frame, showing the stencil frame in raised position.

Fig. 5 is a partial side elevation of the color spreading and transferring mechanism looking in the direction of arrow *a*, Fig. 7,

Fig. 6 is a similar view looking in the opposite direction,

Fig. 7 is an end view of the color spreading and transferring mechanism,

Fig. 8 is a cross section taken on line VIII—VIII of Fig. 5, showing the color spreading mechanism in operating position,

Fig. 9 is a similar section showing the color spreading mechanism in inoperative position and the color transferring mechanism in operating position,

Fig. 10 is a side elevation similar to Fig. 1, but showing the stencil in lowered or printing position.

Referring to the drawings in detail, and particularly Figs. 1 and 3 A indicates a table, supported by standards 2, which in turn are secured in a base plate 3. Pivotally mounted at one end of the table, as at 4, is a rectangular shaped frame 5, which will hereinafter be referred to as the stencil supporting frame.

The frame 5 is adapted to be raised or lowered with relation to the table as shown in Figs. 1 and 10, by means of a pair of downwardly extending arms 6, which are connected through means of links 7 with bell cranks 8. These cranks are disposed one on each side of the main frame, and each crank carries a roller 9, which is engaged by cams 10, cams 10 being secured on a cross shaft 11 which is continuously driven from a drive shaft 12 through a reduction gear mechanism generally indicated at 13.

The cams 10 are secured at opposite ends of the shaft 11 and the shaft also carries a mutilated gear 14 which is adapted to intermesh with the gear 15. This gear is secured on a cross shaft 16, on opposite ends of which are secured crank arms 17, these crank arms being connected through links 18 with a pair of main operating levers 19 disposed one on each side of the machine.

The lower ends of the levers 19 are pivotally attached to the base, as at 20, while the upper ends are connected to a cross bar 21 through means of shoes 22.

The upper ends of the levers are slotted as at 23 so as to permit backward and forward movement of the levers during the lowered position of the stencil supporting frame 5, as shown in Fig. 10.

The cross bar 21 supports a color spreading and transferring mechanism which will hereinafter be described. The material to be printed is placed on the upper surface of the table A, when the stencil frame assumes the raised position shown in Fig. 1. The frame is lowered the moment the material has been placed in position, and when it is lowered it is secured by means of a pair of latches, such as shown at 24 and 25. Thereafter arms 19 move in the direction of arrow *b* due to the fact that gear 15 is engaged by the mutilated gear 14. The moment this engagement takes place cranks 17 are rotated one revolution, and during this revolution movement is transmitted through the links 18 to swing the levers 19 from the full line position shown in Fig.

10 to the dotted line position shown at 19*a*, and then back again to the full line position.

During movement of the levers in the direction of arrow *b* color is spread over the stencil, and during the return movement the transferring or printing operation takes place. Latches 25 and 24 are automatically released the moment the printing operation is completed, by means of a trip lug such as shown at 26 (see Fig. 10), and the moment the latches are released frame 4 is raised to the position shown in Fig. 1, as the rollers 9 on the bell cranks 8 will then be engaged by the cams 10 and oscillating movement is thereby transmitted to the bell cranks, and this movement is transmitted through the links 7 to the arms 6.

At the same time that the stencil frame is raised the material printed upon is automatically ejected, and a new sheet of material is placed on the table. The automatic ejection of the printed sheet takes place in the following manner:

Extending crosswise of the machine is a shaft 30, on one end of which is secured a bevel gear 31 and a ratchet gear 32. Pivotally secured on the shaft is a crank arm 33 carrying a pawl 34. Crank arm 33 is connected through a link 34*a* with one of the arms 6, hence during lowering movement of the stencil frame crank arm 33 and pawl 34 swing in a direction which permits the pawl to ride freely over the teeth of the ratchet gear 32. Conversely, during raising movement of the stencil frame pawl 34 engages the teeth of the ratchet gear 32, and as this is secured to the shaft 30, shaft 30 will be rotated, and so will the bevel gear 31. This gear meshes with a second bevel gear indicated at 35. This second gear is secured on a longitudinally extending shaft 36. Shaft 36 carries a sprocket gear 37, and this is connected through a chain 38 with a second sprocket gear 39 (see Fig. 3).

Sprocket gear 39 is secured on a shaft 40 secured to the under side of the table and extending longitudinally thereof. The second shaft 41 is also journalled on the under side of the table. The shafts 40 and 41 are provided with a series of interspaced sprocket gears 42, see Fig. 4, and endless chains 45 connect these gears. The chains 45 are provided with lugs 46 which move through slots formed in the surface of the table and crosswise thereof. Hence, when the stencil frame is raised and the ratchet gear 32 is rotated, the movement is transmitted through the bevel gears to shaft 36, which in turn transmits movement through the chain 38 to the shafts 39 and 41. The several sprocket gears 42 secured on these shafts will accordingly be rotated and the lugs 46 on the chains 45 will move from end to end of the slots through which they project. During this movement one edge of the sheet which has been printed is engaged and the sheet is thus ejected and delivered to a conveyor belt such as shown at 46*a*, which carries it away from the machine.

By referring to Fig. 1 it will be noted that one of the arms 6 is connected with a lever 47 through means of a link 48. The lever 47 moves in unison with the crank arm 33 and as such moves into or out of engagement with a stop-lug 49 secured on the chain 38, the stop-lug together with the lever 47 serving the function of preventing overrunning of the chain, or in other words, stopping it in a predetermined position after movement has been imparted thereto, this being essential as the ejecting lugs 46 might otherwise advance so far as to assume a position in under the next sheet to be printed on.

By referring to Fig. 4 it will be noted that the table is provided with a series of perforations, such as shown at 50, and these perforations are connected through valves 51 with a pipe 52. This pipe is connected with a suction pump not here shown, a valve 53 is mounted on the pipe and the handle thereof is provided with a star wheel 54. A disc 55 is secured on one side of the mutilated gear 14, and this disc carries a pair of pins 56. Hence, during each revolution of the mutilated gear and the discs 55 the pins 56 will intermittently engage the star wheel and turn the valve 53 on and off, the valve being turned on or open when the stencil frame is lowered and while the sheet is being printed, so as to hold the sheet rigidly by suction during the printing operation, and the valve is turned off or closed the moment the stencil frame is raised, as it is then necessary to release the sheet so that it may be ejected by the lugs 46 when these are operated.

The stencil frame is rectangular. It consists of connected side and end sections, such as shown at 60 and 61. A fabric stencil, such as shown at 62 is secured to the frame and it is through this stencil that the color or paint is transferred during the printing operation.

It will be noted by referring to Fig. 2 that the stencil fabric is maintained in a slightly raised or elevated position with relation to the material or sheet shown at 63, which is to be printed on. This is important as it is desirable to maintain the stencil out of contact with the sheet at all times except during the printing operation, and at that time a gradually advancing line of contact is maintained. At no time is the entire surface of the stencil permitted to engage the material to be printed on, as smudging might occur,

The color spreading and transferring mechanism is best shown in Figs. 2, 5, 6, 7, 8 and 9. It consists of a cross bar 21, on the outer ends of which are mounted shoes 22. The center portion of the cross bar is slotted to receive an elongated bar 70 which is adapted to be raised or lowered with relation to the stencil surface. The lower edge of the cross bar carries a rubber strip 71 whereby the color is transferred through the fabric stencil. The rubber strip will hereinafter be referred to as a squeegee.

The cross bar 21 is provided with bearing lugs 72 at opposite ends. A pair of arms 73 are pivotally secured to the bearing lugs, as at 74, and these arms are adapted to be automatically raised or lowered as shown in Figs. 8 and 9, through means hereinafter to be described.

The arms 73 are connected by a bar 75, and this bar carries a rubber strip 76 which functions as a color spreader. During movement of the levers 19 in the direction of arrow *b*, arms 73 are depressed to assume the position shown in Fig. 8 and the color or paint applied to the stencil will, during this movement, be spread out over the surface of the stencil. During the return movement of the levers 19 arms 73 are raised, and cross bar 70 carrying the squeegee 71 is lowered to assume the position shown in Fig. 9. The squeegee will, in the lowered position, slightly depress the fabric stencil as indicated at 64, see Fig. 2, so as to maintain a line of contact between the stencil and the material 63 to be printed on during the return stroke. This is important as the advancing line of contact prevents smudging of the printed surface, due to the fact that the fabric material is first depressed into

engagement with the printed surface, and secondly as the squeegee advances it lifts up or peels away from the printed surface, thus preventing smudging which would otherwise occur due to stretching of the fabric material as the squeegee advances.

The squeegee performs three functions during its return stroke—first that of depressing the fabric material so as to maintain a gradually advancing line of contact between the stencil and the material to be printed on; secondly, it returns the paint or color material which has been spread over the surface by the spreader 76; and third it transfers the color through the fabric material onto the surface of the material to be printed.

The cross bar 21 is in the form of a bar at each end, but the center portion thereof is in the form of a frame, such as shown at 21*a* (see Figs. 5, 6, 8 and 9). It is this frame that forms a guide for the cross bar 70 which suports the squeegee, and it is the intermediate frame which also forms a support for the arms 73 whereby the spreader 76 is carried. The intermediate frame 21*a* of the cross bar 21 is guided at opposite ends by means of V-shaped shoes, such as shown at 80, these shoes riding in V-shaped grooves formed on opposite sides of the stencil supporting frame 5, the shoes 80 and the guideways causing the squeegee and spreader bar to travel in a true horizontal plane with relation to the stencil.

A second pair of guideways, such as shown at 81, is also formed. A cross rod 82 having rollers 83 at opposite ends travels in the guideways during movement of the levers 19 in the direction of arrow *b*, but the rod 82, together with the rollers 83 travel on the upper surface of the guideway during the return movement. The guideway 81 is clearly shown in Figs. 1, 5, 6 and 10.

The rod 82 extends through slots 82*a* formed in the arms 73. The rollers 83 on the ends of the rod engage a pair of spring actuated latches 85, when the levers 19 reach their innermost position, and the rollers, together with the rod, are forced downwardly into the guideways 81. During movement of the levers 19 in the direction of arrow *b* towards the opposite end of the stencil frame rollers 83 pass out of the end of the guideways 81 and they are then raised so as to return along the upper surface of the guideways during the return movement of the levers 19. This automatic transfer of the rod 82 from the guideways 81 to the upper surface thereof during the return stroke transmits a rocking movement to the arms 73, hence causing depression of the spreader 76 when the levers 19 travel in the direction of arrow *b*, and elevation thereof during return movement of the levers.

The inner ends of the arms 73 engage the upper surface of the bar 70 which supports the squeegee. A second bar 90 is adjustably secured to the bar 70 through means of screws 91. The outer ends of the bar 90 are slidable on posts 92. Springs 93 engage the bar 90 and the tension of the springs is adjusted by nuts 94. The springs exert their pressure on the bar 90, the bar in turn exerts pressure through rods 95 which engage the inner ends of the arms 73, and as these in turn engage the bar 70 it will be understood that the pressure of the springs 93 normally tends to raise the arms 73, and to depress the bar 70. The pressure exerted by the spring is, however, overcome when rollers 83 engage the spring actuated latches 85, as such engagement forces the rod 82 downwardly into alignment with the guideways 81. Bar 83 will, at the same time, swing the arms 73 and the spreader bar 76 downwardly and springs 93 will thus be further compressed, while bar 70 together with the squeegee is raised.

On the other hand, when the rollers run out of the guideways 81 at the opposite end of movement of levers 19, springs 93 will exert sufficient pressure to raise the bar 82, the arm 73 and the spreader bar 76 and simultaneously depress bar 70 together with the squeegee which remains depressed during the return movement of the levers 19.

In actual operation it should be noted that the machine shown in the present instance is not only adapted to handle thin flexible sheets to be printed on, as they are supported on a flat table and rigidly secured when in printing position by the suction action through the perforations indicated at 50, but it should also be noted that rigid sheets of material, such as glass, metal, heavy cardboard and the like may also be handled as the material is maintained in a flat position during the printing or stenciling operation. This is an advantage when comparison is made with the structure shown in Patent Number 1,687,080 heretofore referred to.

Another important feature obtained by the structure shown in the present application is the elimination of all tendency to smudge the printed surface, this being due to the fact that the stencil fabric 62 is maintained in a slightly elevated position with relation to the surface to be printed on. It is also due to the fact that only a portion of the stencil fabric comes in contact with the surface to be printed upon. That is, the squeegee when depressed as shown in Fig. 2, merely depresses the fabric immediately below it, thereby maintaining a gradually advancing line of contact as the squeegee moves over the fabric stencil. It is due to this action that smudging is eliminated.

Another important feature is the construction, arrangement and operation of the squeegee and spreader. When the machine is started a certain amount of color or paint is placed on the stencil fabric at one end of the stencil frame, as indicated at 100 (see Fig. 2). The color or paint deposited at this point tends to remain there as the stencil frame maintains the raised, inclined position shown in Fig. 1, during the major portion of the time the printing or stenciling is taking place. This is due to the shape of the cam 10, the raised or inclined position being assumed while the colors 9 are in engagement with the cam surface indicated at 10*a*, and the lowered or printing position being assumed when the rollers contact with the cam face indicated at 10*b*. It is for this reason that it is necessary to employ the spreader indicated at 76, as a portion of the paint deposited at 100 must be removed by the spreader 76 and spread over the surface of the fabric.

During commencement of movement of the spreader in the direction of arrow *b* the spreader dips into the body paint indicated at 100 at the point indicated at 101 and thus removes only a portion thereof. This small portion of paint is disposed forwardly of the spreader and as the spreader moves over the stencil the paint is spread and thinly distributed over the surface of the stencil. During the return stroke the spreader is raised and the squeegee is depressed. The paint previously spread over the surface will, during this return movement, be partially scraped off and returned to the body of paint indicated at 100 and a portion will, at the same time be forced

through the fabric and as such will be deposited on the surface of the material indicated at 63. A small portion of the main body of paint is thus at all times maintained between the squeegee and the spreader and moved back and forth, thus eliminating the handling of a large amount of paint or material during any one printing operation.

Furthermore, by moving the squeegee and the spreader vertically to and away from the stencil surface and the paint, a clean cut transfer to and from the main body of paint is obtained thereby eliminating smearing of the squeegee and transfer members during continuous operation.

While certain features of the present invention are more or less specifically described, I wish it understood that various changes may be resorted to within the scope of the appended claims. Similarly that the materials and finishes of the several parts employed may be such as the manufacturer may decide or varying conditions or uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a machine of the character described a table to receive and support material to be printed, a color transferring stencil adapted to be disposed above the material and slightly spaced therefrom, means for spreading color over the upper surface of the stencil, and a squeegee extending crosswise of the stencil and movable from end to end thereof, said squeegee applying sufficient pressure to transfer the color through the stencil to the material to be printed, and to depress the stencil surface immediately below the squeegee into engagement with the material whereby a gradually advancing line of contact is maintained between the stencil and the material to be printed during the transfer of color.

2. In a machine of the character described a stencil supporting frame, a stencil mounted therein, a squeegee and a color spreading bar slidably mounted on the frame and movable from end to end thereof, and means for automatically raising and lowering the squeegee and the color spreading bar with relation to the surface of the stencil so that the color spreading bar is lowered and the squeegee raised when they move longitudinally on the stencil in one direction, and so that the color spreading bar is raised and the squeegee lowered when moved longitudinally over the stencil in the opposite direction.

3. In a machine of the character described, the combination with a color transferring stencil of a squeegee longitudinally movable over the surface of the stencil, a color spreading bar movable in unison with the squeegee and means maintaining the spreader bar in engagement with the stencil when moving in one direction, said means automatically raising the spreader bar and lowering the squeegee into engagement with the stencil during reverse movement.

4. In a machine of the character described a fabric stencil through which color is adapted to be transferred, said stencil adapted to receive and support a supply of color at one end thereof, color spreading and transferring means reciprocally movable longitudinally of the stencil, and means whereby the color spreading means is caused to dip into the color supply once during each reciprocal movement and remove sufficient color to be spread over and transferred through the stencil.

5. In a machine of the character described a fabric stencil through which color may be transferred, said stencil being adapted to receive and support a supply of color at one end thereof, color spreading and transferring means reciprocally movable longitudinally of the stencil, means for causing the color spreading means to dip into the color supply and spread a portion thereof over the stencil upon one direction of the reciprocal movement, and means for bringing the transferring means into contact with the stencil upon motion in the opposite direction.

6. In a machine of the character described a table to receive and support flat material to be printed, a color transferring stencil adapted to be disposed above the material parallel to and slightly spaced from the material to be printed, a squeegee, means to advance the squeegee longitudinally with relation to the stencil, and means to move said squeegee vertically to depress the stencil surface immediately below itself into contact with the material to be printed, whereby an advancing line of contact between the stencil and the material to be printed will be caused upon advancing movement of the squeegee.

7. In combination with a support for material to be printed, a stencil spaced from said material, a squeegee mounted for sliding movement over the stencil, and means for moving the squeegee toward the material as it slides over the stencil so that the stencil will be pressed against the material by the squeegee.

8. In a machine of the character described a support for material to be printed, a stencil normally spaced from said material, a trackway adjacent the stencil, a squeegee mounted for movement along said trackway in a plane parallel to the surface of the stencil, a spreader bar mounted for movement along said trackway with the squeegee, means for moving the squeegee toward and away from the stencil, and means actuated by movement of the squeegee away from the stencil to move the spreader bar toward the stencil.

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