Dec. 23, 1941. J. T. MONTAGUE ET AL 2,267,596

MACHINE FOR PRINTING TEXTILES

Filed Feb. 20, 1940 3 Sheets-Sheet 1

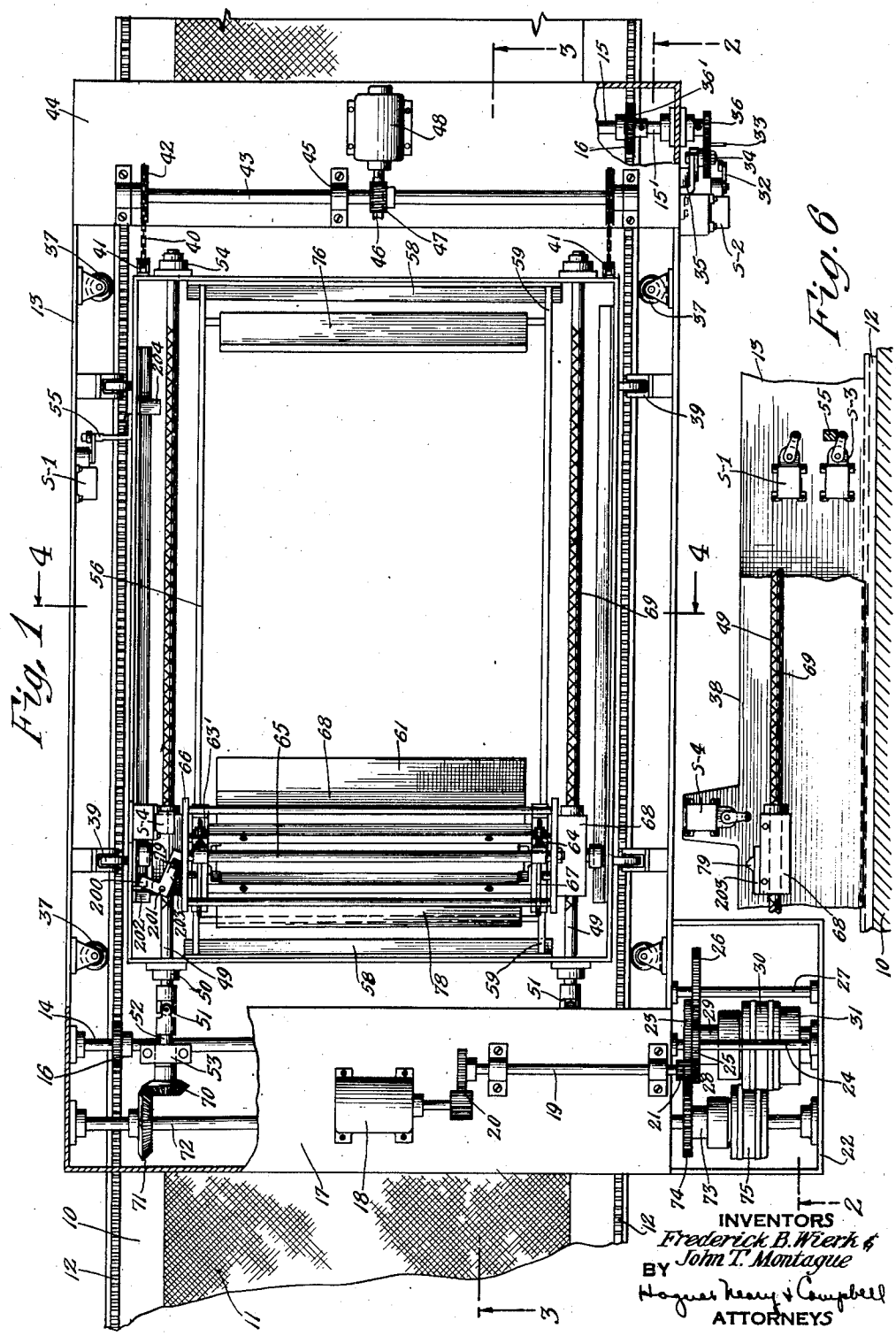

Fig. 1

Fig. 6

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Filed Feb. 20, 1940 3 Sheets-Sheet 2

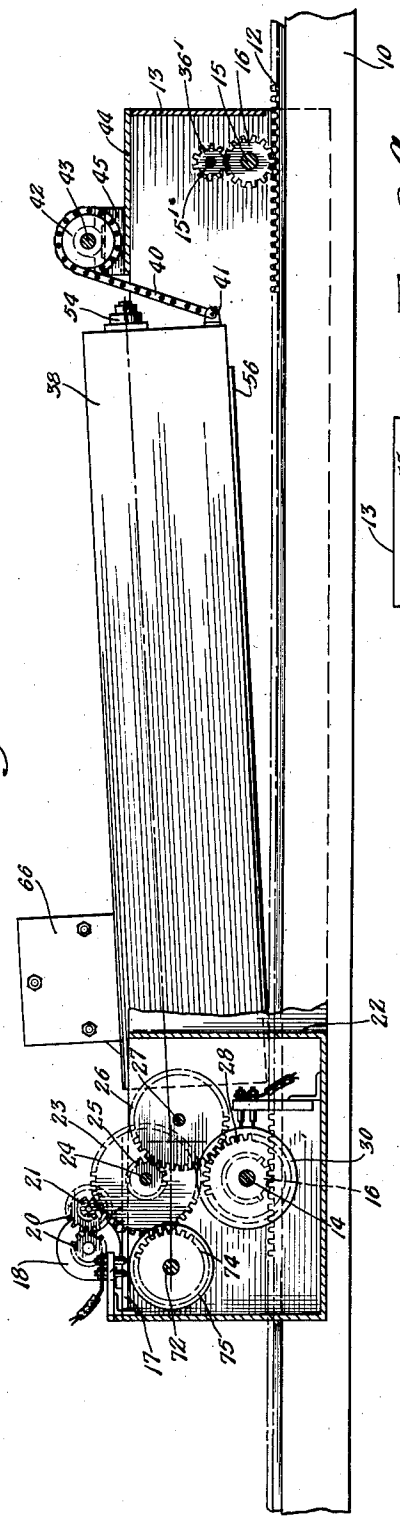

Fig. 2

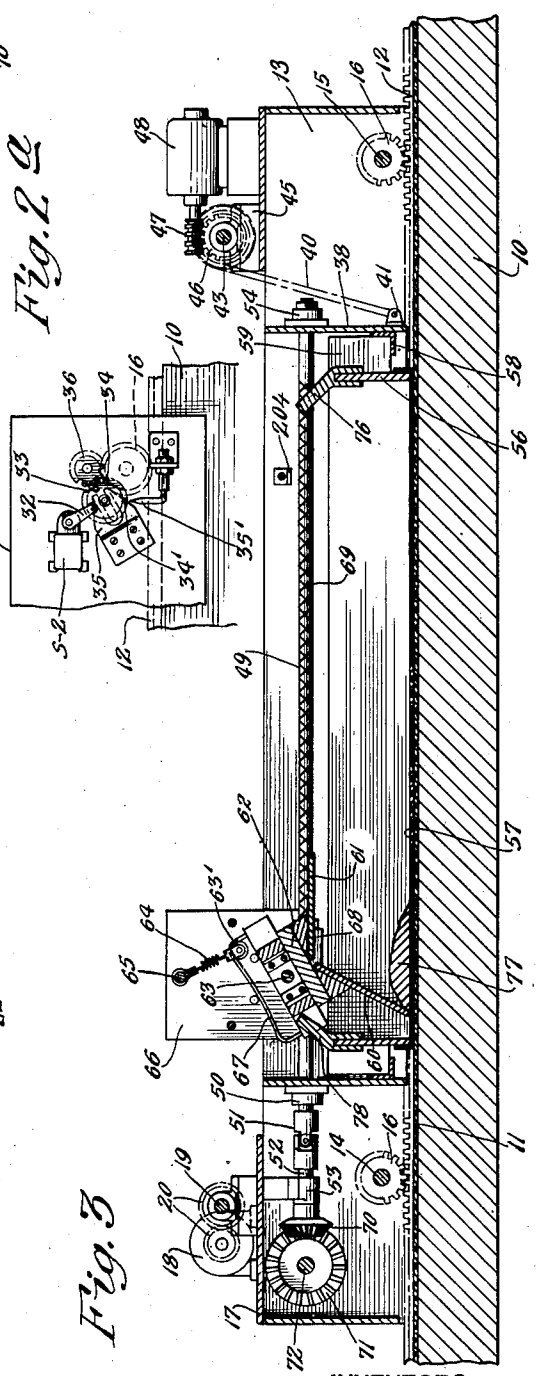

Fig. 2a

Fig. 3

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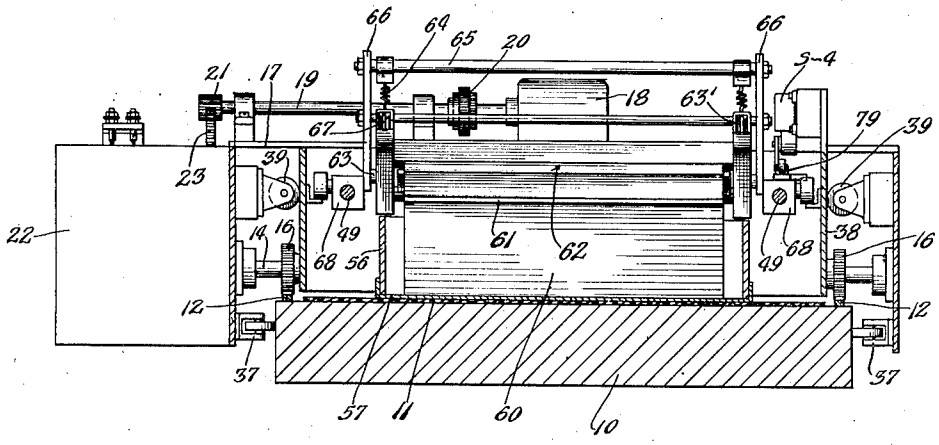
Fig. 4



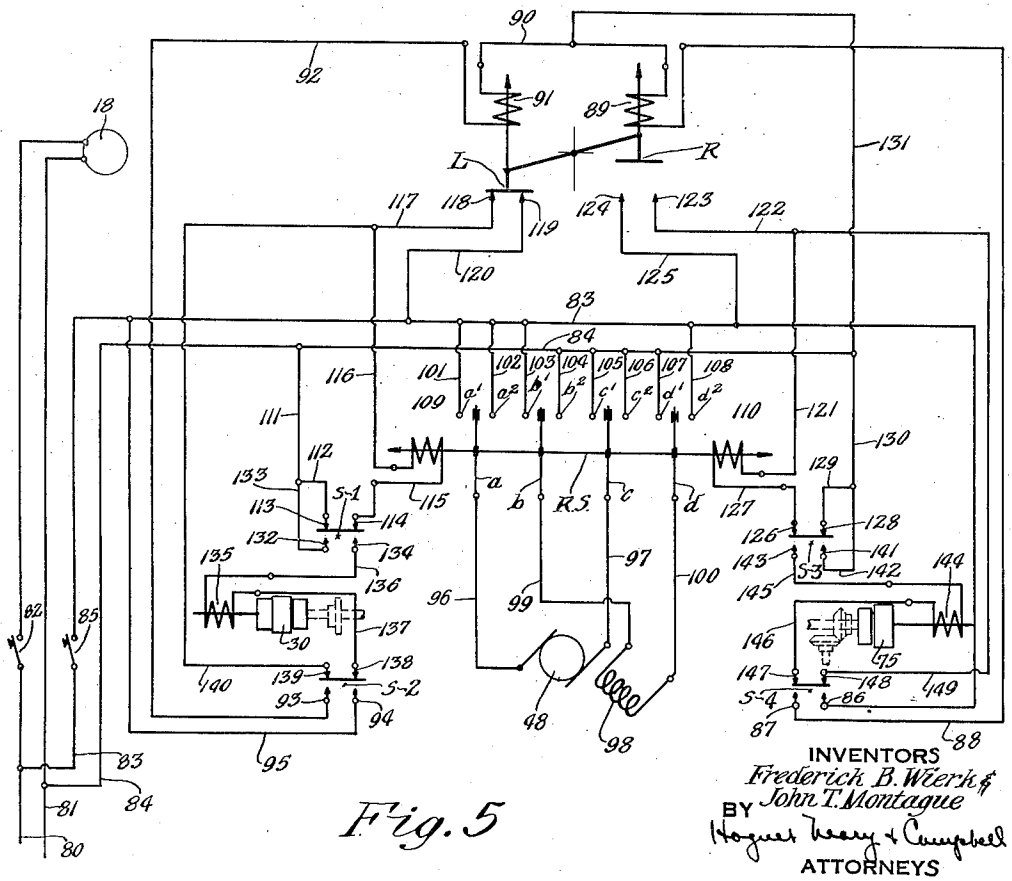


Fig. 5

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UNITED STATES PATENT OFFICE

2,267,596

MACHINE FOR PRINTING TEXTILES

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Application February 20, 1940, Serial No. 319,856

15 Claims. (Cl. 101—123)

The present invention relates to stencil printing machines and embodies, more specifically, a stencil printing machine by means of which a series of successively applied stencil printings may be made upon suitable material in a new and effective manner.

The invention is concerned particularly with mechanism by means of which a stencil is moved periodically with respect to the material to be printed, the stencil being located accurately in proper registration at each printing position and the printing being accomplished mechanically.

In accordance with the present practice, where materials such as cloth in considerable lengths is to be printed by means of a stencil, the material is secured to a long table and operators move along the table locating the stencil in the successive printing positions, and applying the ink to the stencil to effect printing at each position. This operation is time-consuming and also not conducive to the production of uniform printing. Moreover, the character of the result of such operations is not always sufficiently good to be acceptable.

Machines have been designed for applying the stencil mechanically to the material to be printed, the material being fed through the machine and located in successive printing positions. Various objections have characterized the operation of these machines among which is the difficulty of handling the material and locating it properly with respect to the stencil.

In order to correct the difficulties encountered in the prior art, as outlined above, the present invention has been designed an an object thereof is to provide a stencil printing machine in which the fabric is secured upon a long table and the stencil is automatically applied and the printing accomplished periodically and in properly located successive positions.

A further object of the invention is to provide, in a mechanism of the above character, a stencil carrying apparatus wherein the application of the stencil to the material to be printed is controlled by relative movement between the stencil carrying apparatus and the table.

A further object of the invention is to provide, in a mechanism of the above character, stencil controlling means whereby the application of the stencil to the material to be printed and the removal thereof from the material is accomplished automatically upon the locating of the stencil carrying mechanism in each printing position.

A further object of the invention is to provide an effective mechanism by means of which the application of color to the stencil is accomplished automatically upon movement of the stencil into a printing position on the material to be printed.

Yet another object of the invention is to provide control mechanism by means of which the stencil carrying apparatus is advanced toward the next printing position upon removing the stencil from the material upon completion of a printing operation.

A further object of the invention is to provide an electrical control system by means of which the operation of the various elements of the printing machine may be effectively coordinated.

These and other objects are attained by a machine which embodies the present invention and which will now be described specifically with reference to the accompanying drawings, wherein:

Fig. 1 is a plan view partly broken away and in section, showing a stencil printing machine constructed in accordance with the present invention.

Fig. 2 is a view in longitudinal vertical section, taken through a plane indicated by the line 2—2 of Fig. 1 and looking in the direction of the arrows.

Fig. 2—A is a detailed fragmentary view showing the mechanism by means of which the stencil carrying device is brought to rest in a desired printing position.

Fig. 3 is a view in vertical longitudinal section, taken in the plane indicated by the line 3—3 in Fig. 1 and looking in the direction of the arrows.

Fig. 4 is a view in transverse vertical section taken in a plane indicated by the line 4—4 of Fig. 1 and looking in the direction of the arrows.

Fig. 5 is a diagrammatic illustration of the electrical circuits by means of which the machine is controlled.

Fig. 6 is a fragmental view showing details of the switch mechanism by means of which certain of the circuits shown in Fig. 5 are controlled.

In the above drawings, a stationary table is shown at 10 upon which material 11 to be printed is secured. In practice, the table 10 is sufficiently long to accommodate the length of the material to be printed and, in the form shown herein, is provided with toothed tracks 12 upon opposite sides thereof.

A carriage 13 is adapted to be moved along the table and supported thereon by shafts 14

and 15, each of which shafts is provided with two gear wheels 16 which engage the respective tracks 12.

The carriage 13 is advanced along the table by a drive mechanism that supplies power to the shaft 14 in the following manner. At one end of the carriage 13 there is provided a platform 17 upon which a motor 18 is secured. The motor 18 drives a shaft 19 through gears 20, and shaft 19 drives pinion 21 which may be located within a control box 22, mounted at one side of the carriage. In Fig. 2, the driving pinion 21 is shown as engaging a gear 23 mounted upon a shaft 24 that is journaled in the control box and also provided with a gear 25.

Gear 25 engages a second gear 26, carried by a counter shaft 27 for supplying power to a gear 28, secured to a sleeve 29, journaled on the shaft 14. A magnetic clutch 30 is carried by the shaft 14 and is adapted to clutch the sleeve 29 thereto for supplying power to the gear 16 carried by the shaft 14.

In order that the carriage may be locked in the successive printing positions, the magnetic clutch 30 is provided with a brake 31, that locks the shaft 14 with respect to the carriage 13 when the clutch 30 is not in driving engagement with the shaft 14. The control of the driving clutch 30 is effected by means of electrical circuits which may be described hereinafter.

As will be seen in Figs. 1 and 2—A, the carriage 13 is indexed at successive printing positions by means of a control mechanism including a switch S—2 that is operated by a pin 33 carried upon a gear wheel 34, journaled in a bracket 35. The gear wheel 34 is driven by means of a gear 36 that is mounted on a counter shaft 15' and driven by gear 36' engaging gear 16 on the shaft 15. In this fashion, when the carriage has advanced along the tracks 12 to a desired printing position, determined by the diameter of gear 34, the pin 33 engages an actuating arm 32 of the switch S—2 to disengage the magnetic clutch 30, as will be described hereinafter in connection with the circuit diagram shown in Fig. 5. By selecting the proper size of gear 34, the travel of the carriage 13 between successive printing positions may be accurately controlled and the bracket 35 will be seen to be formed to actuate gears of varying sizes.

The carriage 13 is located or guided properly with respect to the table 10 by means of a plurality of guide rollers 37 and, within the carriage, a frame 38 is movably received. Frame 38 is guided so that it will only move in a vertical plane by means of guide rollers 39 which are mounted upon the inner side of the side walls of the carriage 13. The frame 38 is moved vertically by means of chains 40 that are secured to lugs 41, adjacent the lower portion of the frame 38, and are received over sprocket wheels 42. The sprocket wheels 42 are secured to a drive shaft 43 that is mounted upon a platform 44 formed on the carriage 13. An intermediate bearing 45 may be provided, and power is supplied to the shaft by means of a worm wheel 46 and worm 47, driven by a motor 48 that is mounted upon the platform 44. The control of motor 48 will be described in greater detail presently.

The other end of the frame 38 is supported by means of spaced shafts 49 that are journaled in bushings 50 formed in the other end wall of the frame 38. Shafts 49 are secured to universal joints 51 which are driven by shaft sections 52, journaled at 53 on the carriage 13. Shafts 49 extend across the frame 38 and are journaled in bushings 54, carried by such other end of the frame, and it will thus be seen that the left-hand end of the frame 38, as viewed in Fig. 1, is supported pivotally about the axis of universal joints 51. In this manner, the frame 38 can be moved from the printing position as shown in Fig. 3 to the non-printing position, shown in Fig. 2, in which position the carriage 13 may be advanced along the table. The motor 48 serves to move the frame from either of these positions. The motor 48 is controlled by the switch S—2, previously described, as well as a switch S—3 (Fig. 6), mounted upon the inside of the carriage 13, and a switch S—4, mounted on the side of the frame 38. The frame 38 is provided with an arm 55 that is adapted to actuate the switch S—3 in the manner illustrated in Fig. 6, causing the circuit of motor 48 to be de-energized when the frame 38 has been lowered into the printing position shown in Fig. 3. Switch S—4 serves to close the circuit of motor 48 after the inking operation has been completed (as will be described presently), so that the frame 38 may be elevated into the position shown in Fig. 2. When the frame is so elevated, a switch S—1, also mounted on the inner side of the carriage 13 is actuated by the arm 55 to close the circuit of the clutch 30 so that the carriage may be advanced along the table in a manner already described.

In order that the printing operation may be accomplished, the frame 38 is provided with a stencil box 56, carrying a stencil 57 and being suitably mounted within the frame 38 by means, for example, such as angle irons 58 upon which arms 59, secured to the stencil box, rest. When the printing operation is to be accomplished, the color must be applied to the stencil so that it will pass therethrough and onto the material 11. This is done by means of paddles 60 and 61 that are carried by a frame 62, journaled on a transverse shaft 63. The frame is normally held in a position such that either paddle engages the stencil 5 by means of a roller 63' mounted on a spring 64, secured to a shaft 65, carried on a bracket 66 that is mounted upon a head 68. A curved tract 67 is mounted on the paddle frame 62 for engagement by the roller 63' and thus holds the paddle frame in position such that either paddle engages the stencil, as will be readily apparent.

The heads 68 and paddle frame are advanced along the stencil by means of the shafts 49 that are formed with forward and reverse threads 69. Heads 68 are provided with a pin to engage the threads 69 so that rotation of the shafts 59 causes the threads 69 to move the heads along the shafts. When the heads reach the limit of the threads in one direction, the reverse threads carry the heads back in the opposite direction, thus causing the paddle frame to be moved back and forth across the stencil. Rotation of the shafts 49 through the universal joints 50 is effected by means of bevel gears 70 that are secured to the shaft sections 52 and engage bevel gears 71, secured to a drive shaft 72. The drive shaft 72 is provided with a sleeve 73, rotatable thereon and formed with a gear 74 that engages the driving gear 23. An electro-magnetic clutch 75 serves to set up a driving connection between the sleeve 73 and the shaft 72, the clutch 75 being controlled by circuits that will be described presently in connection with switches S—3 and S—4. When the paddle frame 62 moves from the position shown in Fig. 3 toward the right and

reaches the end of the thread 69, the paddle 61 will engage a flange 76 and be deflected downwardly into engagement with the stencil, being held in that position by the roller 63' which will then engage the left-hand end of the track 67, as viewed in Fig. 3. The color 77 will thus be moved back toward the left, as viewed in Fig. 3, with the corresponding movement of the paddle frame 62, until the paddle 60 engages a left-hand guide flange 78 and is moved into the position shown in Fig. 3.

As the paddle frame reaches the extreme left-hand position shown in Fig. 3, a cam 79 actuates the control switch S—4 to disengage the clutch 75 and close the circuit of the motor 48, to raise the stencil from the table in a manner to be described presently. In order that the cam 79 may not again actuate the switch S—4 in its movement to the right as viewed in Fig. 1, it is mounted on an L-shaped lever 200, pivoted at 201 on the paddle assembly. A lug 202 on the frame 38 is engaged in the final movement of the paddles to the left as viewed in Fig. 1 to move the cam 79 in the position shown in Fig. 1 and indicated by reference character 203. A lug 204, also on the frame 38, serves to restore the lever 200 to a position in which the cam 79 will engage the arm of switch S—4.

Referring to Fig. 5, the operation of the machine will be described in connection with the electrical circuits by means of which the motor 48 and electro-magnetic clutches are controlled. At the left, in Fig. 5, is illustrated a power line consisting of wires 80 and 81. A switch 82 may be provided in this line to control motor 18 and wires 83 and 84 may be connected thereto to supply current to the system now to be described. A switch 85 may be provided in either of the wires 83 or 84 to control the operation of the mechanism, the wire 83 being connected to one back contact 86 of the switch S—4. The other back contact 87 of this switch is connected, by means of a wire 88, to the coil 89 of a relay R. The other terminal of the coil 89 is connected by means of a wire 90 to the coil 91 of a relay L, the other terminal of this coil 91 being connected, by means of a wire 92, to the back contact 93 of switch S—2. The other back contact 94 of switch S—2 is connected to the wire 83 by means of a wire 95.

In order that the motor 48 may be reversed, its armature is connected to the movable contacts a and c of a reversing switch R. S., by means of wires 96 and 97, respectively. The field 98 of motor 48 is connected to switch contacts b and d by means of wires 99 and 100, respectively.

Stationary contacts a^1 and a^2 of contact a are each connected to the wire 83 by means of wires 101 and 102, respectively. Stationary contacts b^1 and b^2 of contact b are connected to wires 83 and 84, respectively by means of wires 103 and 104. Stationary contacts c^1 and c^2 of contact c are connected to the wire 84 by means of wires 105 and 106, respectively. Stationary contacts d^1 and d^2 of contact d are connected to wires 84 and 83 by wires 107 and 108, respectively. The reversing switch R. S. is moved into either left or right hand closed positions by means of coils 109 and 110, respectively. When the coil 109 is energized, the contacts a, b, c and d are connected to the respective contacts a^1, b^1, c^1, and d^1, and the motor operates in one direction. When the coil 110 is energized, the contacts a, b, c and d engage the respective contacts a^2, b^2, c^2, and d^2. It will be seen that the polarity of the armature of motor 48 will be the same in either of the positions of the reversing switch R. S. However, the polarity of the field 98 will be reversed when the switch R. S. is moved from one closed position to the other.

The coils 109 and 110 are controlled by the relays L. and R. and the switches S^1 and S^3 in the following manner. Current from the wire 84 is supplied through wires 111 and 112 to the front contact 113 of switch S^1. The other front contact 114 of the switch S^1 is connected to the coil 109 by means of a wire 115. The other terminal of coil 109 is connected by means of a wire 116 to a wire 117 that is connected to contact 118 of the relay L. The other contact 119 of the relay L is connected to a wire 120 that is connected to the other supply wire 83.

One terminal of the coil 110 is connected by means of a wire 121 to a wire 122 that is connected to one contact 123 of the relay R. The other contact 124 of relay R is connected to the wire 83 by means of a wire 125. The other terminal of coil 110 is connected to the front contact 126 of switch S^3 by means of a wire 127, while the other front contact 128 of switch S^3 is connected, by means of a wire 129, to a wire 130 that is connected to the supply wire 84. A wire 131 also connects the supply wire 84 to the wire 90.

Back contact 132 of switch S^1 is connected to the wire 111 by means of a wire 133, while the other back contact 134 of switch S^1 is connected to the coil 135 that actuates the electro-magnetic clutch 30, by means of a wire 136. The other terminal of coil 135 is connected by means of a wire 137 to the front contact 138 of switch S^2. The other front contact 139 of switch S^2 is connected to wire 117 by means of a wire 140.

Back contact 141 of switch S^3 is connected to wire 130 by means of a wire 142, while the other back contact 143 of switch S^3 is connected to coil 144 by means of wire 145. The coil 144 actuates the electro-magnetic clutch 75 in a manner to be presently described. The other terminal of coil 144 is connected by means of a wire 146 to the front contact 147 of switch S^4, while the other front contact 148 of switch S^4 is connected to wire 122 by means of a wire 149.

The operation of the device will now be described. Assuming that the carriage 13 is moving toward a printing position, the pin 33, when the carriage reaches the printing position, will actuate the switch S^2 to open contacts 138 and 139 and close contacts 93 and 94. This will cause current to flow from wire 83 through wire 95, across contacts 93 and 94, through wire 92, through coil 91 and wires 90 and 131, to the supply wire 84. This will energize the coil 91, breaking contacts 118, 119, and closing contacts 123 and 124. The carriage 13 having stopped when the switch S^2 breaks contacts 138, 139, will remain in the printing position and, by reason of the closing of relay R, current will flow from supply wire 83 through wire 125 and contacts 123, 124, through wires 122 and 121, to the coil 110, then through wire 127, across contacts 126 and 128, and through wires 129 and 130 to the supply wire 84. Coil 110 being energized closes the reversing switch R. S. in the right-hand position and the motor 48 is operated to lower the stencil into the printing position as shown in Fig. 3. When the stencil reaches this position, the arm 55 actuates switch S^3 to open contacts 126 and 128 and close contacts 141, 143. This stops the stencil in printing position by opening the

circuit of motor 48 inasmuch as the reversing switch R. S. is normally held in the open position illustrated in Fig. 5, and current will then flow from supply wire 84 through wires 130 and 142, across contacts 141 and 143, through wire 145 and coil 144, through wire 146 and across contacts 147, 148 of S^4, through the wires 149 and 122, to the relay R, across contacts 123 and 124 and through wire 125 to the supply wire 83. This energizes the coil 144 and actuates the clutch 75 to cause the paddles to move back and return across the stencil.

Upon the return movement of the paddles, the switch S^4 is actuated by the cam 79 to open the contacts 147 and 148, thus releasing clutch 75, and close contacts 86, 87. This causes current to flow from the supply wire 83 across the contacts 86, 87, through the wire 88 and relay coil 89, and through wires 90 and 131 to the supply line 84. The result is that relay R is open and relay L is closed, causing the motor 48 to be operated in the reverse direction to raise the stencil from the table. This is done by current that flows from supply wire 83 through the wire 120, across contacts 118, 119, through wires 117 and 116, through coil 109, wire 115, across contacts 113 and 114, and through wires 112 and 111 to the supply wire 84. Coil 109 is thus energized to close the reversing switch in the left-hand position and effect the operation just referred to.

When the stencil is raised to the position shown in Fig. 2, the arm 55 actuates switch S^1 to open the circuit of coil 109 through contacts 113 and 114, thus stopping the stencil in the raised position, and close the contacts 132 and 134. This supplies current from supply wire 84 through wires 111 and 133, across contacts 132 and 134, through wire 136 and coil 135, through wire 137 and across contacts 138, 139, through wires 140 and 117, across contacts 118 and 119, and through wire 120 to the supply wire 83. The clutch 30 is thus engaged and the carriage moves to the next printing position, causing the complete cycle just described to be repeated.

It is to be observed that switches S^2 and S^4 and the pin 33 and cam 79 are so formed that, in operation, there is sufficient over-travel of the pin and cam to permit the switches to return to their normal position, which is the "up" position, as illustrated in Fig. 5.

In multi-color printing, where a second color is to be applied to the material to be printed, it is essential that accurate registration be had between the successive colors. This is accomplished by an indexing finger 35' that coacts with a mark 34' on gear 34. The mark 34' is applied to the gear where it comes to rest at the index finger after the over-travel of the gear has taken place. This enables the additional colors to be applied in register by starting the subsequent printing operations with mark at the index finger.

From the foregoing, it will be seen that a completely automatic mechanism has been provided by means of which the stencil may be applied in correct register in successive printing positions, and the application of the color accomplished uniformly and with a high degree of efficiency.

While the invention has been described with reference to the specific structure and electrical connection shown in the accompanying drawings, it is not to be limited save as defined in the appended claims.

We claim:

1. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, means to move the carriage with respect to the table, and means to interrupt the movement of the carriage in predetermined positions.

2. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, means to move the carriage with respect to the table, and means operated by movement of the carriage to interrupt the movement of the carriage in predetermined positions.

3. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, means to move the carriage with respect to the table, means operated upon movement of the carriage to interrupt the movement of the carriage in predetermined positions, and means to lock the carriage against movement.

4. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, a paddle frame and paddle adapted to move color over the stencil, means to move the carriage with respect to the table, and means operated upon movement of the stencil to the table to move the paddle frame with respect to the stencil.

5. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, a paddle frame and paddle adapted to move color over the stencil, means to move the carriage with respect to the table, means actuated upon a predetermined movement of the carriage along the table to interrupt the movement of the carriage, and means operated while the movement of the carriage is interrupted to move the paddle frame with respect to the stencil.

6. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil carrying frame on the carriage, a stencil on the frame, means to move the frame with respect to the carriage, a paddle frame and paddle adapted to move the color over the stencil, means to move the carriage with respect to the table, means to move the paddle frame with respect to the stencil, and means to initiate the actuation of the last named means when the stencil carrying frame reaches a printing position.

7. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil toward and away from the table, a paddle frame and paddle adapted to move color over the stencil, means to move the paddle frame over the stencil, and means actuated by the final movement of the paddle frame to actuate the means to move the stencil away from the table.

8. Stencil printing mechanism comprising a table upon which material to be printed is adapted

to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the carriage with respect to the table, and means operated by relative movement between the carriage and table to locate the carriage at successive stencil applying points.

9. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the carriage with respect to the table, means to move the stencil with respect to the table, and means operated upon predetermined movement between the carriage and table to move the stencil into a printing position against the table.

10. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the carriage with respect to the table, means to move the stencil with respect to the table, means operated upon predetermined movement between the carriage and table to move the stencil into a printing position against the table, and means operated upon the completion of a printing operation to elevate the stencil from the table.

11. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, means to apply a color to the stencil, means to operate the color applying means and means operated by movement of the stencil against the table to initiate the operation of the last named means.

12. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, means to apply a color to the stencil, means actuated upon movement of the stencil against the table to operate the color applying means, and means actuated by the color applying means upon completion of the application of color to the stencil to move the stencil away from the table.

13. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the carriage with respect to the table, means to move the stencil toward and away from the table, and means operated upon movement of the stencil away from the table to actuate the carriage moving means.

14. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the carriage with respect to the table, means to move the stencil toward and away from the table, and means operated upon movement of the stencil to a printing position to render the stencil moving means inoperative.

15. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, a carriage movable with respect to the table, a stencil on the carriage, means to move the stencil with respect to the table, a paddle frame and paddle adapted to move color over the stencil, means to move the carriage with respect to the table, means actuated upon a predetermined movement of the carriage along the table to interrupt the movement of the carriage, and means actuated by movement of the stencil toward the table to move the paddle frame with respect to the stencil.

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