Feb. 2, 1943. J. T. MONTAGUE 2,309,914

CONTINUOUS FABRIC PRINTING MACHINE

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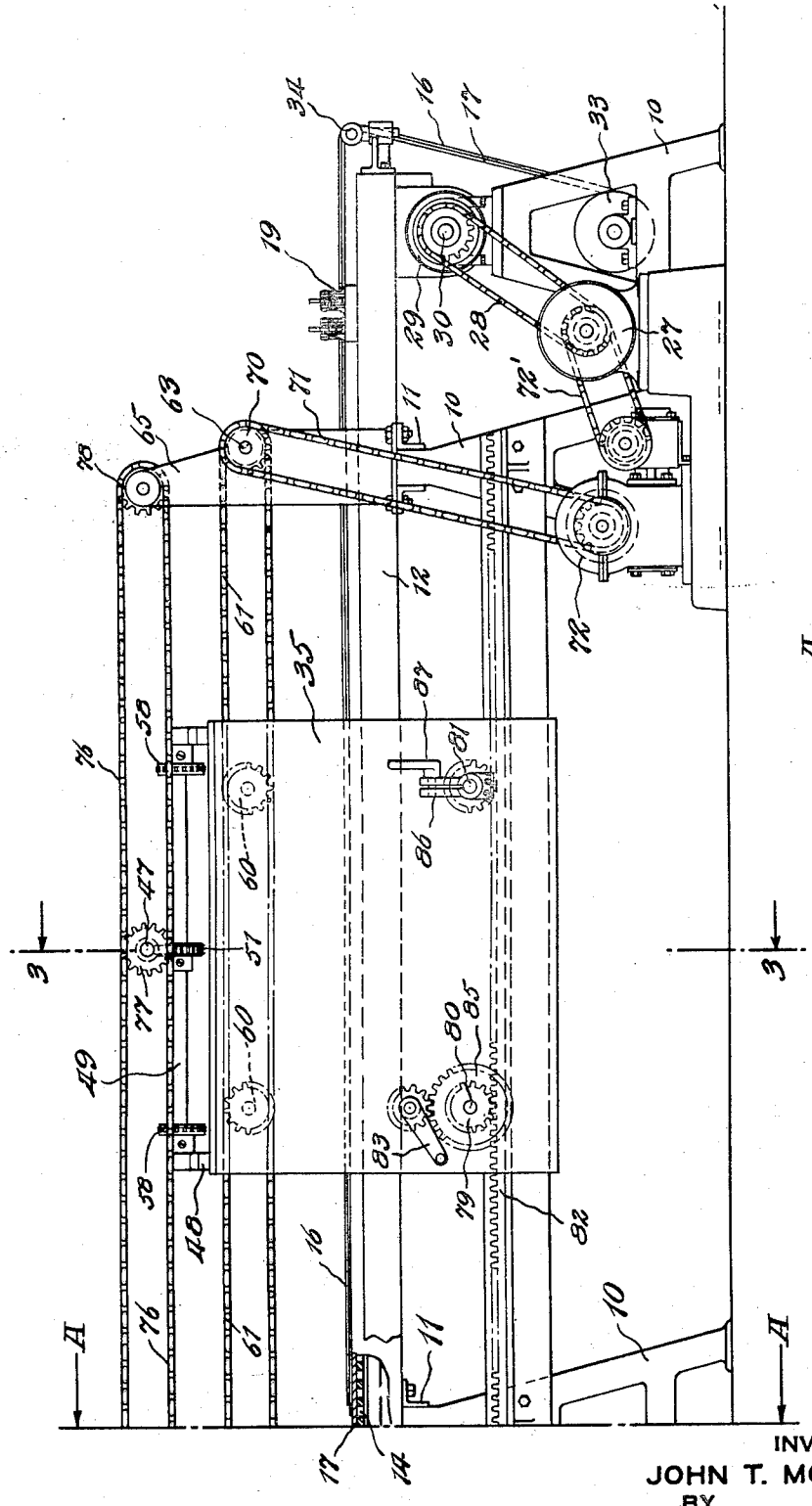


Fig. 1.

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CONTINUOUS FABRIC PRINTING MACHINE

Filed July 29, 1940 8 Sheets-Sheet 2

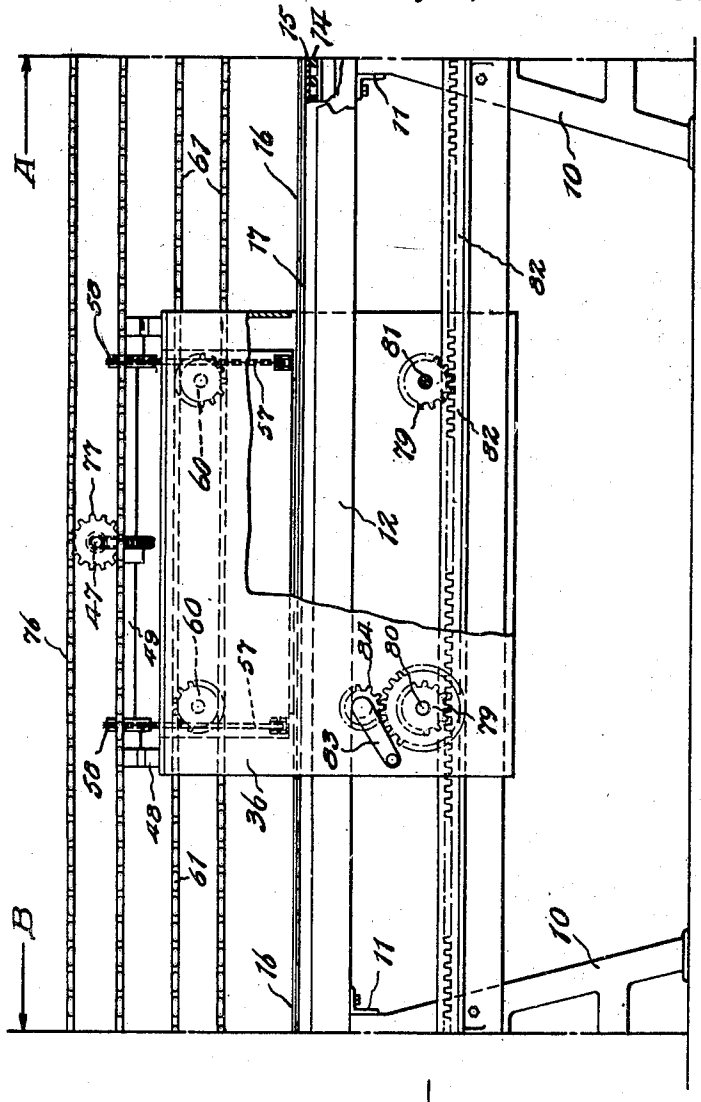


Fig. 1.

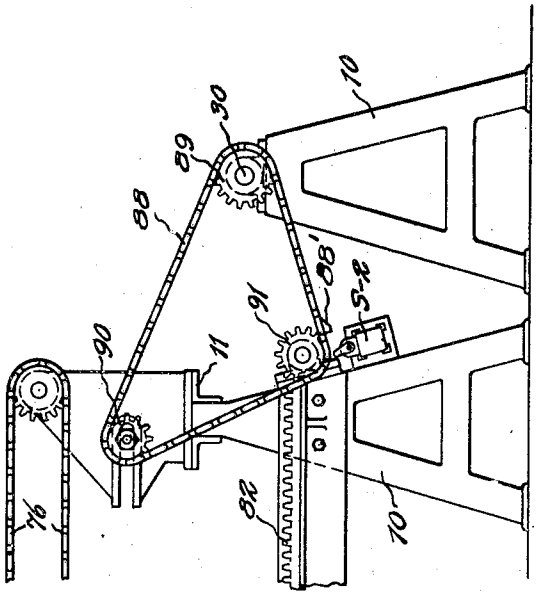


Fig. 4.

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CONTINUOUS FABRIC PRINTING MACHINE

Filed July 29, 1940 8 Sheets-Sheet 3

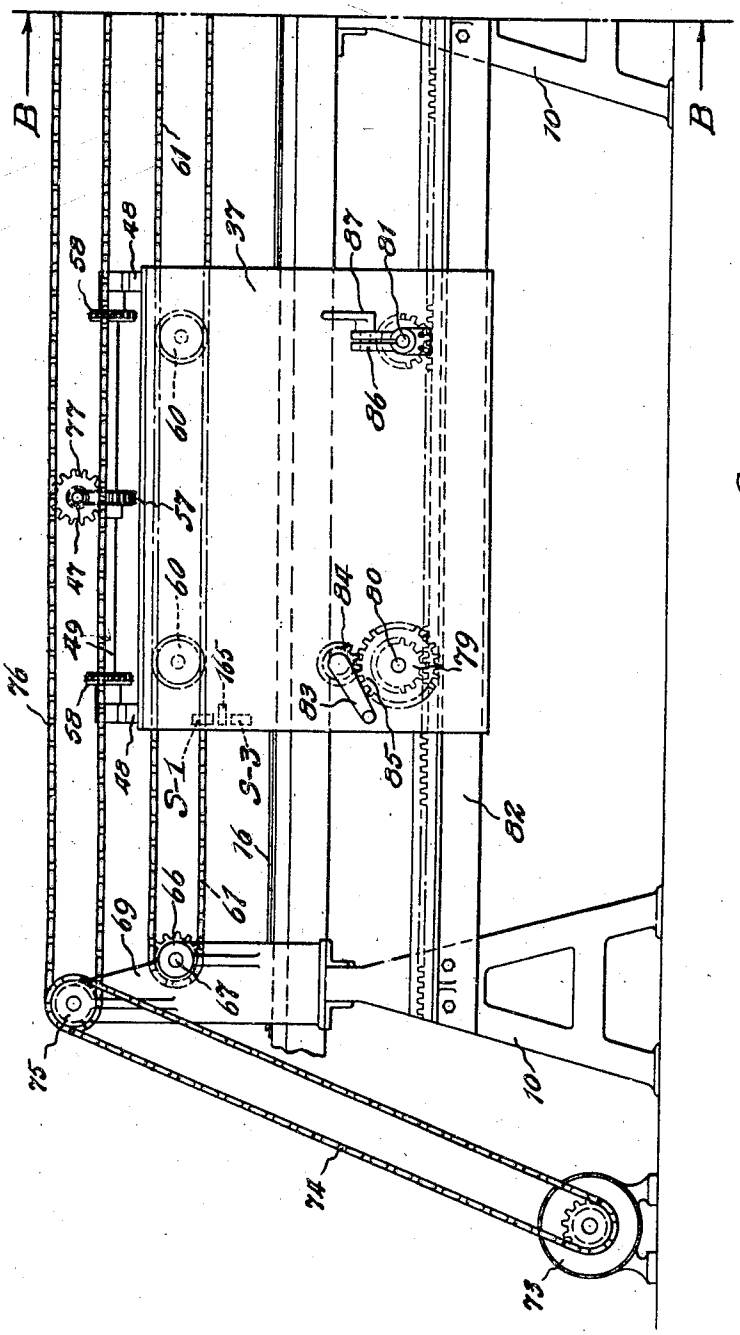


Fig. 1.

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CONTINUOUS FABRIC PRINTING MACHINE

Filed July 29, 1940 8 Sheets-Sheet 4

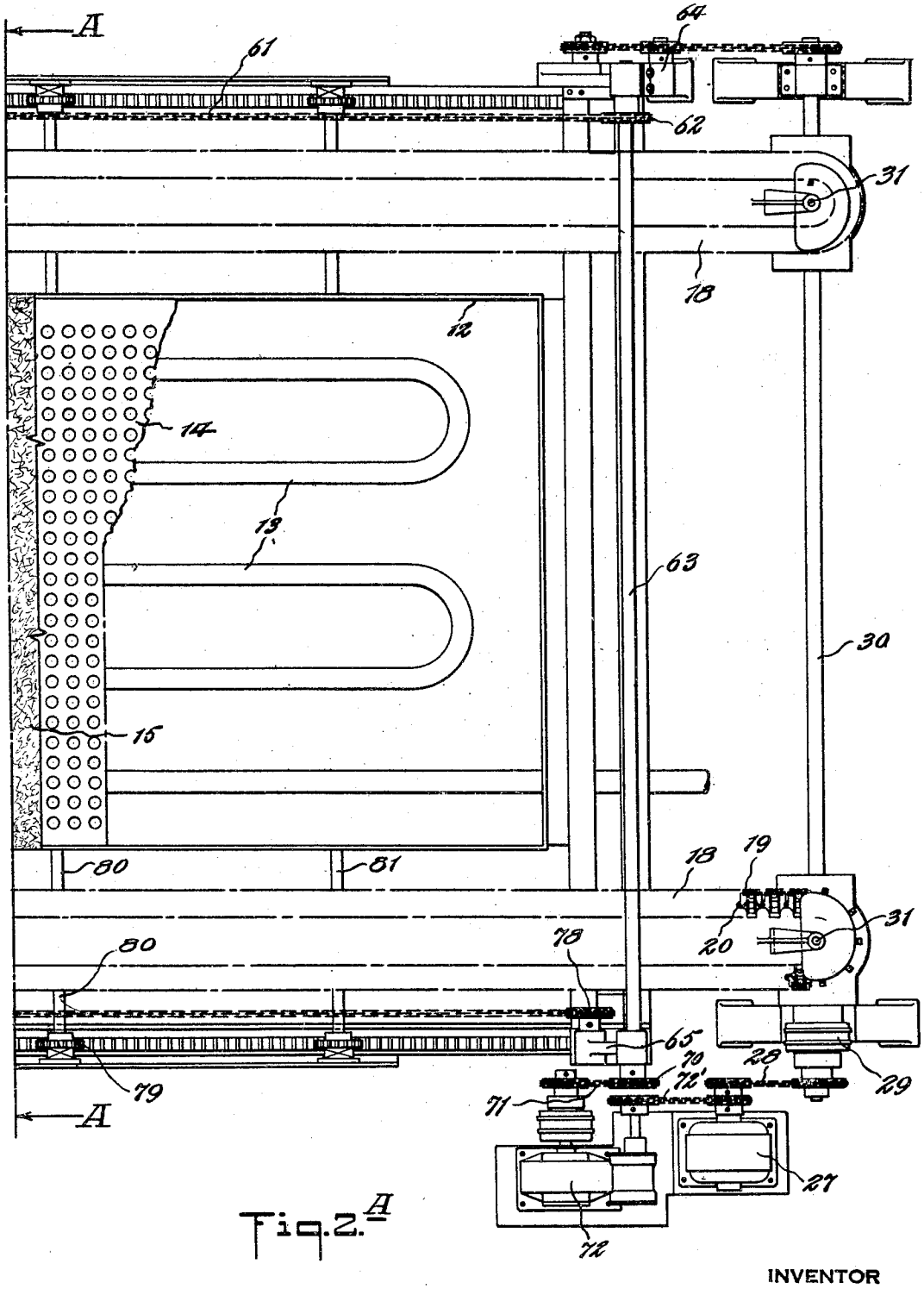


Fig. 2.A

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CONTINUOUS FABRIC PRINTING MACHINE

Filed July 29, 1940 8 Sheets-Sheet 5

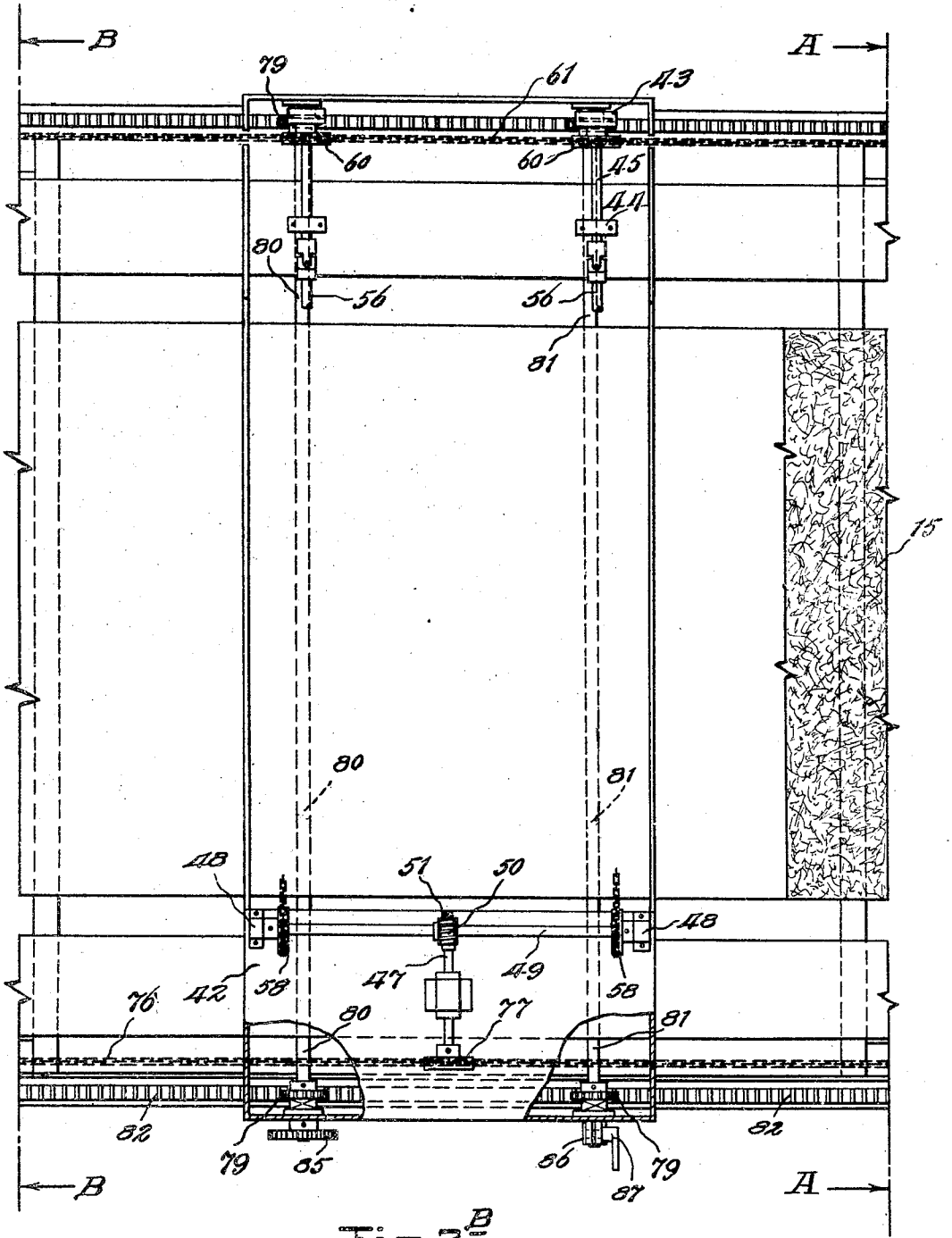


Fig. 2B

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CONTINUOUS FABRIC PRINTING MACHINE

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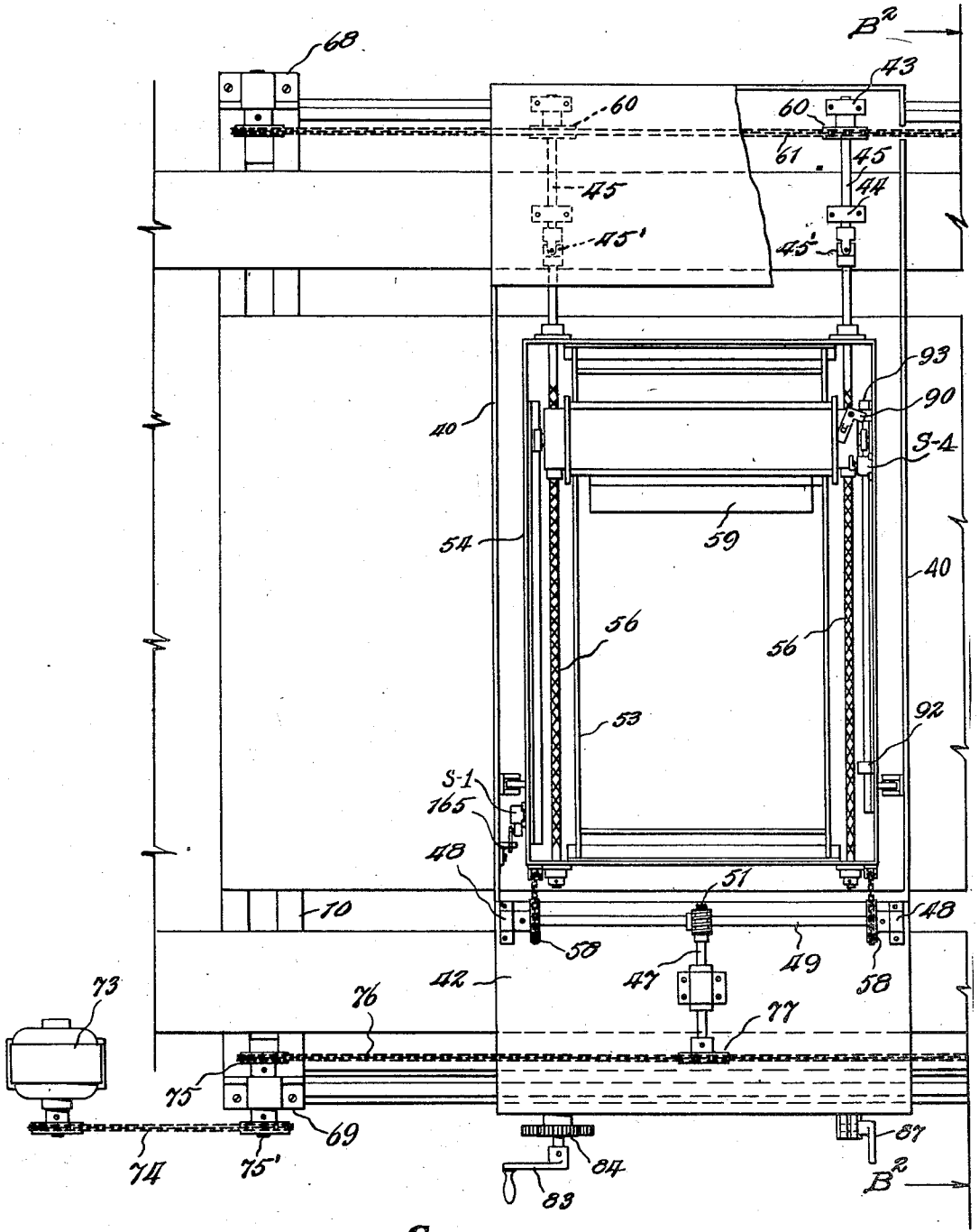


Fig. 2. C

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CONTINUOUS FABRIC PRINTING MACHINE

Filed July 29, 1940 8 Sheets-Sheet 7

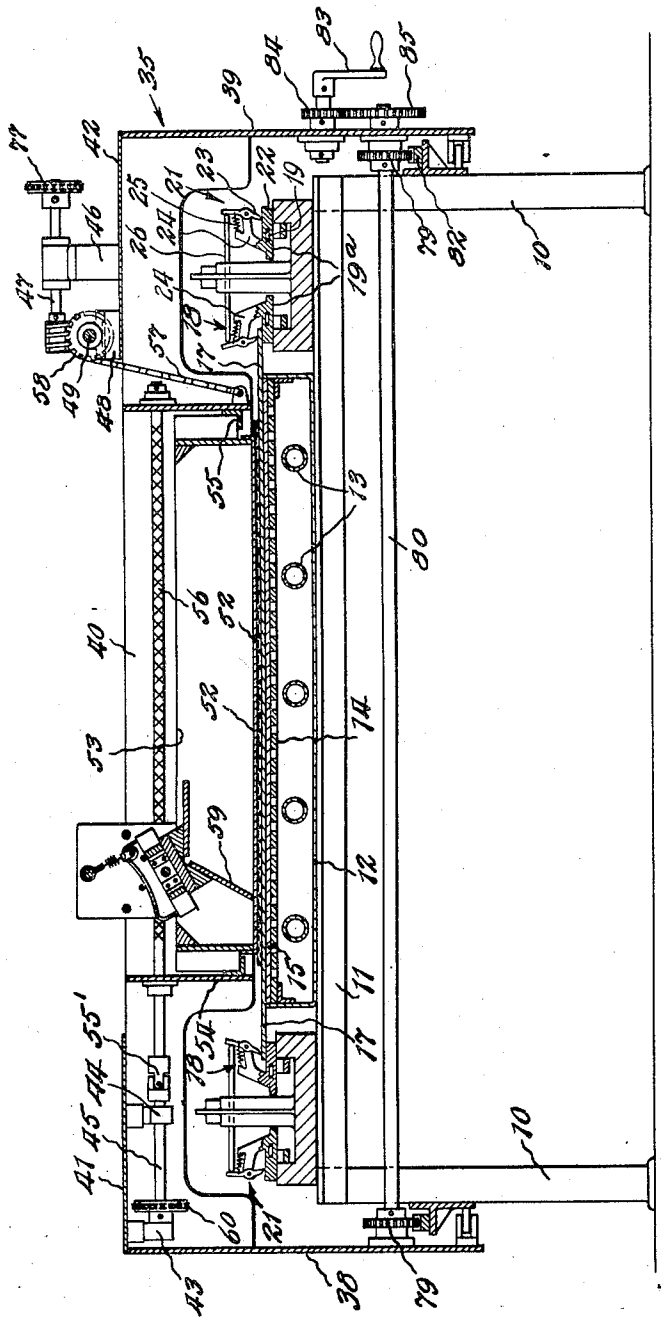


Fig. 3.

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CONTINUOUS FABRIC PRINTING MACHINE

Filed July 29, 1940 8 Sheets-Sheet 8

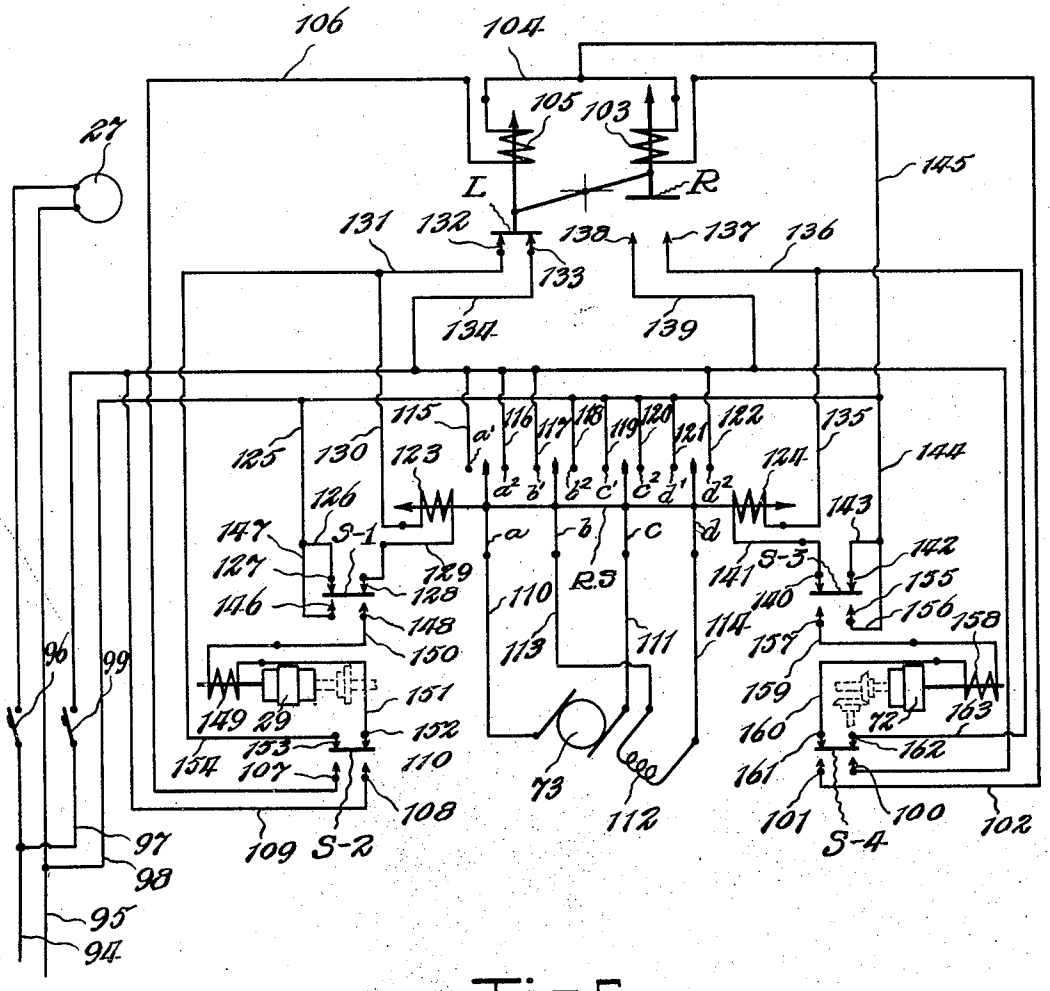


Fig. 5.

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Patented Feb. 2, 1943 2,309,914

UNITED STATES PATENT OFFICE

2,309,914

CONTINUOUS FABRIC PRINTING MACHINE

John T. Montague, Westport, Conn., assignor, by mesne assignments, to Linen Guild, Inc., New York, N. Y., a corporation of New York

Application July 29, 1940, Serial No. 348,137

8 Claims. (Cl. 101—115)

The present invention relates to stencil printing machines and embodies, more specifically, a stencil printing machine wherein one or more impressions are made upon a fabric that is moved with respect to the point or points at which the impression is made.

In order that desired printing operations may be accomplished upon a fabric or other web that is moved with respect to a relatively stationary printing position, the present invention has been designed and an object thereof is to provide a machine for accomplishing such operation wherein the fabric to be printed is effectively controlled to permit successive printings to register accurately thereon.

A further object of the invention is to provide a machine of the above character wherein movable means is provided to carry the fabric to be printed through the machine, the movable means being attached to the fabric during such movement.

Another object of the invention is to provide a device of the above character wherein the movable means is synchronized with the movements of the printing element or elements to permit a desired coordination therebetween.

A further object of the invention is to provide a machine of the above character wherein means is provided for applying a plurality of impressions to the web in such fashion as to cause all of such impressions to register accurately.

Yet another object of the invention is to provide a machine of the above character wherein means is provided to adjust the position of each of the printing mechanisms to permit proper registration of a plurality of impressions for designs of varying sizes.

Further objects of the invention will be apparent as it is described in greater detail in connection with the accompanying drawings, wherein:

Figure 1A is a view in side elevation showing the feed end of a machine constructed in accordance with the present invention;

Figure 1B is a view similar to Figure 1A showing the central portion of the machine wherein a second printing unit is provided, the right hand end A being shown as the same section line as the end A in Figure 1A;

Figure 1C is a view similar to Figures 1A and 1B showing the discharge end of the machine, the right hand end section line B being the same as the left hand section line B of Figure 1B;

Figure 2A is a plan view of the portion of the machine shown in Figure 1A, portions being broken away to facilitate description;

Figure 2B is a plan view of the portion of the machine shown in Figure 1B with portions also being broken away;

Figure 2C is a plan view of the portion of the machine shown in Figure 1C with parts broken away;

Figure 3 is a transverse sectional view, taken on line 3—3 of Figure 1A and looking in the direction of the arrows;

Figure 4 is a fragmentary view of a portion of the drive mechanism showing one of the relay control devices;

Figure 5 is a diagrammatic view showing electrical circuits for accomplishing the various operations of the machine herein described.

Referring to the above drawings, the machine of the present invention is shown as having a plurality of supporting A members 10 upon opposite sides of the machine. These members are provided with transverse horizontal supports 11, upon which a chamber forming member 12 is carried. Within the member 12 are provided steam pipes 13 for supplying drying heat to the fabric to be referred to presently. A perforated plate 14 is carried by the member 12 and over the plate 12 a layer of felt 15 is provided to serve as a supporting surface.

The web upon which the printing is to be effected is shown at 16 and is pasted or otherwise secured to a backing cloth 17 that moves over the felt 15 in a manner to be presently described.

The web 16 is advanced through the machine by means of parallel endless drive systems 18 (Figure 2A), each of which is formed of a plurality of links 19 hinged together at 20 for turning about vertical axes. Upon each link (Figure 3) is mounted a gripper 21 consisting of a generally plate-like member 22 fixed to the link 19 and a lever 23 having a claw-like lower end which is pivotally supported on an arcuate arm 24. A spring 25 engages the arm 24 and the upper end of the lever 23 and normally urges the end of the lever 23 against the member 22 to receive and force the edge of the backing cloth 17 against the member 22. The gripping lever 23 can move against the tension of the spring 25 in a direction to tension the cloth 17, but resists withdrawal of the cloth 17. The lever 23 is moved to receive or release the backing cloth 17 by the cams 26.

The cams 26 are lobe shaped elements mounted on the frame members 10 in position to engage

the upper ends of the levers 23 and move their lower ends inwardly to permit the cloth 17 to pass between the elements 22 and lever 23 and then release them to cause them to grip the fabric.

The drive systems 18 are driven by a main drive motor 27 through a chain 28 and clutch brake 29. The electromagnetic clutch brake 29 engages and disengages the drive to actuate the systems when desired as hereinafter described. Upon engagement, the clutch supplies power to a shaft 30 which, by means of suitable gears not shown drives vertical shafts 31 provided with drive cogs (not shown) to engage between lugs 19a of the links 19.

The web 16 and the backing cloth 17 are wound up on a reel 33 preparatory to feeding through the machine and drawn over an idler roller or guide bar 34. The backing cloth is then fed to the grippers of the parallel systems and, from that point on, the movement of the web is accurately controlled, as hereinafter described.

In order that the printing of the web may be accomplished in a desired manner, the machine is provided with a plurality of printing elements 35, 36 and 37. Each element consists of a frame having end walls 38 and 39 and side walls 40, as best shown in Figure 3. Top plates 41 and 42 are mounted on the frames, the top plate 41 being provided with depending bearing members 43 and 44 within which a shaft 45 is journalled. The top plate 42 is provided with a support 46 in which a shaft 47 is journalled. Also upon the top plate 42 are provided spaced bearings 48 within which a shaft 49 is journalled.

The shaft 49 is driven by means of a worm 50 and worm gear 51 mounted on the shafts 47 and 49, respectively, and raises and lowers the stencil 52 with respect to the web 16. The stencil 52 may be supported in a stencil box 53, similar to that disclosed in my copending application Serial Number 319,856, filed February 20, 1940, which is mounted in the frame 54 by means of angle irons 55 at opposite ends thereof.

The frame 54 is a generally rectangular member which is pivotally supported for movement toward and from the web 16 by means of the universal joints 55' which connect the inner ends of the shafts 45 to the double spiral drive shafts 56 which are journalled in the opposite ends of the frame 54 and extend transversely of the web 16. The end of the frame 54 opposite to the universal joints 55' is raised and lowered by a pair of chains 57 which are wound over the sprockets 58 fixed to the shaft 49.

The double spiral drive shafts 56 are used to drive a scraper or squeegee 59 back and forth over the stencil 52 to force the coloring material onto the web 16.

In order to cause the scrapers 59 of the stencilling elements 35, 36 and 37 to move simultaneously, the shafts 45 are provided with sprockets 60 which are engaged by a longitudinal chain 61 which is supported by a sprocket 62 supported at one end and fixed to a drive shaft 63 journalled in the uprights 64 and 65 at the right hand end of the machine, as viewed in Figure 2A. The chain 61 also is supported at the opposite end of the machine by a sprocket 66 mounted on a transverse shaft 67 also journalled in the uprights 68 and 69 at the left hand end of the machine as viewed in Figure 2C.

As shown in Figure 1A, the shaft 63 is driven by means of a sprocket 70, a chain 71 and a suitable reduction gearing and magnetic clutch 72 and chain 72' by means of the motor 27.

Therefore, when the motor 27 is operating and the magnetic clutch is engaged, the shafts 45 will be caused to rotate, driving the scraper 59 back and forth along the double spiral shafts 56.

The stencilling frames 54 are raised and lowered by means of a motor 73, which through a chain drive 74 rotates a sprocket 75 supported on a stub shaft 75' journalled in the upright 69 of the frame.

The sprocket 75 carries a chain 76 which cooperates with the sprockets 77 on the shafts 47 and thus upon rotation will cause either a raising or lowering of the stencil frame 54. The right hand end of the chain 76 is supported on a suitable sprocket 78 journalled in the upright 65 at the right hand end of the frame.

The chain drives described above permit adjustment of the stencilling frames of the units 35, 36 and 37 along the web in order to secure proper register of the designs printed on the web.

One form of adjusting means for the elements 35, 36 and 37 consists of suitable gear wheels 79 at opposite sides of the frame which are supported upon transverse shafts 80 and 81, journalled in the walls 38 and 39 of the stencil units 35, 36 and 37. The gear wheels 79 mesh with racks 82 on opposite sides of the frame and thus upon rotation of the gear wheels cause the elements 35, 36 and 37 to move longitudinally of the frame into adjustable position. Movement of the elements 35, 36 and 37 may be effected by means of a crank 83 which is journalled in the side 39 of the elements and is provided with a gear 84 which meshes with a larger gear 85 fixed to the shaft 80.

The devices may be locked in adjusted position by means of a clamp 86 consisting of a split element fixed to the wall 39 and provided with a screw handle 87 which causes the clamp 86 to firmly grip the shaft 81 and prevent rotation of the gears mounted thereon.

The device in accordance with the present invention is provided with an electrical circuit best shown in Figure 5 which automatically controls operations of all of the elements thereof. It will be understood that in operation, the supporting cloth 17 with the fabric web 16 thereon must be moved intermittently to properly locate the web successively under the various stencilling elements 35, 36 and 37. Movement of the web and the feed chains 19 is controlled by the mechanism disclosed in Figure 4 which includes a chain 88 mounted on suitable sprockets 89, 90 and a sprocket 91. The sprocket 89 is keyed to the transverse shaft 30 and therefore causes the chain to move therewith. The chain 88 is provided with one or more switch operating lugs 88' which cooperate with the main control switch S2 for declutching the shaft 30 from the motor 27.

This switch also through the circuit presently to be described controls the operation of the magnetic clutch of the gear reduction drive 72 to cause the stencil frame to be lowered into engagement with the web upon discontinuation of movement of the web 16.

The scraper 59 is driven by the motor 27 as described above and operation of the motor is controlled by a pair of switches S1 and S3 which are mounted on the wall 40 of one of the stencilling elements, for example, element 37, (Figs. 1C and 2C) and are actuated by an arm 165 on the frame 54, as shown in Figure 2C. These switches likewise are under the control of a switch S4 which is actuated by the scraper 59 upon one complete reciprocation thereof. In order to

avoid tripping of the switch S4 in both directions of travel of the scraper 59, the tripping cam 90 which cooperates with the switch S4 consists of an L-shaped element pivotally supported on the scraper which is rocked into and out of the path of the arm of the switch S4 by lugs 92 and 93 on the stencilling frame 54.

Referring to Figure 5, the operation of the machine will be described in connection with the electrical circuits by means of which the motor 73 and electromagnetic clutches 29 and 72 are controlled. This circuit is similar to that disclosed in my copending application Serial Number 319,856. At the left, in Figure 5, is illustrated a power line consisting of wires 94 and 95. A switch 96 may be provided in this line to control motor 27 and wires 97 and 98 may be connected thereto to supply current to the system now to be described. A switch 99 may be provided in either of the wires 97 or 98 to control the operation of the mechanism, the wire 97 being connected to one back contact 100 of the switch S4. The other back contact 101 of this switch is connected by means of a wire 102 to the coil 103 of a relay R. The other terminal of the coil 103 is connected by means of a wire 104 to the coil 105 of a relay L, the other terminal of this coil 105 being connected by means of a wire 106 to the back contact 107 of switch S2. The other back contact 108 of switch S2 is connected to the wire 97 by means of a wire 109.

In order that the motor 73 may be reversed, its armature is connected to the movable contacts a and c of a reversing switch R. S., by means of wires 110 and 111, respectively. The field 112 of motor 73 is connected to switch contacts b and d by means of wires 113 and 114, respectively.

Stationary contacts a^1 and a^2 of contact a are each connected to the wire 97 by means of wires 115 and 116, respectively. Stationary contacts b^1 and b^2 of contact b are connected to wires 97 and 98, respectively, by means of wires 117 and 118. Stationary contacts c^1 and c^2 of contact c are connected to the wire 98 by means of wires 119 and 120, respectively. Stationary contacts d^1 and d^2 of contact d are connected to wires 98 and 97 by wires 121 and 122, respectively. The reversing switch R. S. is moved into either left or right hand closed positions by means of coils 123 and 124, respectively. When the coil 123 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 124 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 73 will be the same in either of the positions of the reversing switch R. S. However, the polarity of the field 112 will be reversed when the switch R. S. is moved from one closed position to the other.

The coils 123 and 124 are controlled by the relays L. and R. and the switches S1 and S3 in the following manner. Current from the wire 98 is supplied through wires 125 and 126 to the front contact 127 of switch S1. The other front contact 128 of the switch S1 is connected to the coil 123 by means of a wire 129. The other terminal of coil 123 is connected by means of a wire 130 to a wire 131 that is connected to contact 132 of the relay L. The other contact 133 of the relay L is connected to a wire 134 that is connected to the other supply wire 97.

One terminal of the coil 124 is connected by means of a wire 135 to a wire 136 that is connected to one contact 137 of the relay R. The other contact 138 of relay R is connected to the wire 97 by means of a wire 139. The other terminal of coil 124 is connected to the front contact 140 of switch S3 by means of a wire 141, while the other front contact 142 of switch S3 is connected by means of a wire 143 to a wire 144 that is connected to the supply wire 98. A wire 145 also connects the supply wire 98 to the wire 104.

Back contact 146 of switch S1 is connected to the wire 125 by means of a wire 147, while the other back contact 148 of switch S1 is connected to the coil 149 that actuates the electromagnetic clutch 29, by means of a wire 150. The other terminal of coil 149 is connected by means of a wire 151 to the front contact 152 of switch S2. The other front contact 153 of switch S2 is connected to wire 131 by means of a wire 154.

Back contact 155 of switch S3 is connected to wire 144 by means of a wire 156, while the other back contact 157 of switch S3 is connected to coil 158 by means of wire 159. The coil 158 actuates the electromagnetic clutch 72 in a manner to be presently described. The other terminal of coil 158 is connected by means of a wire 160 to the front contact 161 of switch S4, while the other front contact 162 of switch S4 is connected to wire 136 by means of a wire 163.

The operation of the device will now be described. Assuming that the web 16 is moving toward a printing position, the lug 88', when the web 16 reaches the printing position, will actuate the switch S2 to open contacts 152 and 153 and close contacts 107 and 108. This will cause current to flow from wire 97 through wire 109, across contacts 107 and 108, through wire 106, through coil 105 and wires 104 and 145, to the supply wire 98. This will energize the coil 105, breaking contacts 132 and 133, and closing contacts 137 and 138. The web 16 having stopped when the switch S2 breaks contacts 152 and 153 will remain in the printing position and by reason of the closing of relay R, current will flow from supply wire 97 through wire 139 and contacts 138 and 137, through wires 136 and 135, to the coil 124, then through wire 141, across contacts 140 and 142, and through wires 143 and 144 to the supply wire 98. Coil 124 being energized closes the reversing switch R. S. in the right-hand position and the motor 73 is operated to lower the stencil into the printing position as shown in Figure 3. When the stencil reaches this position, the arm 165 on the frame 54 actuates switch S3 to open contacts 140 and 142 and close contacts 155 and 157. This stops the stencil in printing position by opening the circuits of motor 73 inasmuch as the reversing switch R. S. is normally held in the open position illustrated in Figure 5, and current will then flow from supply wire 98 through wires 144 and 156, across contacts 155 and 157, through wire 159 and coil 158, through wire 160 and across contacts 161 and 162 of the switch S4, through the wires 163 and 136, to the relay R, across contacts 137 and 138 and through wire 139 to the supply wire 97. This energizes the coil 158 and actuates the clutch 72 to cause the scrapers 59 to move back and return across the stencil.

Upon the return movement of the scrapers 59, the switch S4 is actuated by the cam 90 to open the contacts 161 and 162, thus releasing clutch 72, and close contacts 100 and 101. This causes current to flow from the supply wire 97 across the contacts 100 and 101, through the wire 102

and relay coil 103, and through wires 104 and 145 to the supply line 98. The result is that relay R is opened and relay L is closed, causing the motor 73 to be operated in the reverse direction to raise the stencil from the table. This is done by current that flows from supply wire 97 through the wire 134, across contacts 133 and 132, through wires 131 and 130, through coil 123, wire 129, across contacts 128 and 127, and through wires 126 and 125 to the supply wire 98. Coil 123 is thus energized to close the reversing switch R. S. in the left-hand position and effect the operation just referred to.

When the stencil is raised the arm 165 actuates switch S1 to open the circuit of coil 123 through contacts 127 and 128, thus stopping the stencil in the raised position and close the contacts 146 and 148. This supplies current from supply wire 98 through wires 125 and 147, across contacts 146 and 148, through wire 150 and coil 149, through wire 151 and across contacts 152 and 153, through wires 154 and 131, across contacts 132 and 133, and through wire 134 to the supply wire 97. The clutch 29 is thus engaged and the web 16 is moved to the next printing position, causing the complete cycle just described to be repeated.

It is to be observed that switches S2 and S4 and the arm 165 and lug 88' are so formed that, in operation, there is sufficient overtravel of the arm and lug to permit the switches to return to their normal position, which is the "up" position, as illustrated in Figure 5.

When a multi-color design is to be applied to the web 16, the various stencilling units 35, 36 and 37 must be so located that the designs are in exact register. This can be accomplished by adjusting the elements along the path of the web 16 by means of the cranks 83 and locking them in position. The position of the units is determined by the spacing of the lug or lugs 88' on the chain 88 and once determined the units can be located by indicia marks applied to the frame of the device.

From the foregoing description it will be understood that the machine is completely automatic in operation and assures exact register of the colors and designs in multi-color printing operations.

It will also be understood that the device is susceptible to considerable modification without departing from the invention and, therefore, the construction described above should be considered as illustrative and the invention should not be limited save as defined in the following claims.

I claim:

1. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, means for moving a web of said material along said table, a carriage mounted on the table in fixed vertical relation thereto, a stencil movable relatively to said carriage and toward and away from said table, a scraper on said carriage for applying color through said stencil, and means responsive to movement of said stencil with respect to the carriage and toward said web to actuate said scraper to apply color to said web through said stencil.

2. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, means for moving a web of said material along said table, a carriage mounted on the table, a stencil movable relatively to said carriage and toward and away from said table, a scraper on said carriage for applying color through said stencil, means responsive to movement of said web for periodically interrupting movement of said web and moving said stencil into engagement with said web, and means responsive to movement of said stencil with respect to the carriage and toward said web to actuate said scraper to apply color to said web through said stencil.

3. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, means for moving a web of said material along said table, a carriage, a stencil movable relatively to said carriage and toward and away from said table, a scraper on said carriage for applying color through said stencil, means responsive to movement of said web for periodically interrupting movement of said web and moving said stencil into engagement with said web, means responsive to movement of said stencil toward said web to actuate said scraper to apply color to said web through said stencil and means responsive to movement of said scraper for moving said stencil away from said web.

4. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, means for moving a web of said material along said table, a carriage, a stencil movable relatively to said carriage and toward and away from said table, a scraper on said carriage for applying color through said stencil, means responsive to movement of said web for periodically interrupting movement of said web and moving said stencil into engagement with said web, means responsive to movement of said stencil toward said web to actuate said scraper to apply color to said web through said stencil, means responsive to movement of said scraper for moving said stencil away from said web and means responsive to movement of said stencil away from said table for causing movement of said web along said table.

5. Stencil printing mechanism comprising a table upon which material to be printed is adapted to be received, means for advancing a web of said material along said table, racks disposed along the sides of said table, a plurality of carriages, means including gear wheels to support the carriages on said racks for movement along said table, a stencil for each carriage movable relatively to said carriage toward and away from said table, and means for adjusting said carriages along said table so that color applied successively through said stencils will register with other colors on said web.

6. Stencil printing mechanism comprising a table having a surface upon which material to be printed is adapted to be received, racks disposed along the sides of said table, a plurality of carriages, means including gear wheels to support the carriages on said racks for movement along said table, a stencil on each of said carriages movable toward and away from said surface, means for applying color through said stencils, means for advancing a web along said table, means for adjusting the positions of said carriages along said table and means to lock one of the gear wheels of each carriage so as to lock the carriages in adjusted positions so that color applied through said stencils will register with other colors on said web.

7. Stencilling mechanism comprising a table adapted to support material to be printed, means

for moving along said table a web adapted to have said material secured thereto, a plurality of carriages disposed along said table, a stencil on each of said carriages, a motor for simultaneously moving said stencils toward and away from said web, scrapers movable across and for applying color through said stencils, a motor for alternately moving said web and said scrapers, and a circuit including switches actuated in response to movement of said means for moving said web, said stencil and said scraper for successively interrupting movement of said web, moving said stencil toward said table, stopping said stencil when in contact with said material, moving said scraper to apply color to said material, and moving said stencil away from said table.

8. Stencilling mechanism comprising a table adapted to support material to be printed, means for moving a stencil toward and from said table, a movable scraper for applying color through said stencil, means for moving a web of said material along said table, a motor for alternately moving said web and said scraper, a reversible motor for moving said stencil, switches actuated in response to movement of said scraper, said stencil and said means for moving said web, and a circuit for said motors and switches for successively moving said web, stopping said web, moving said stencil into engagement with said web, moving said scraper to print on said web, and moving said stencil out of engagement with said web.

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