

June 23, 1964

W. L. WELLS

3,138,095

SILK SCREEN PRINTING PRESS

Filed Oct. 27, 1960

14 Sheets-Sheet 1

FIG. 34

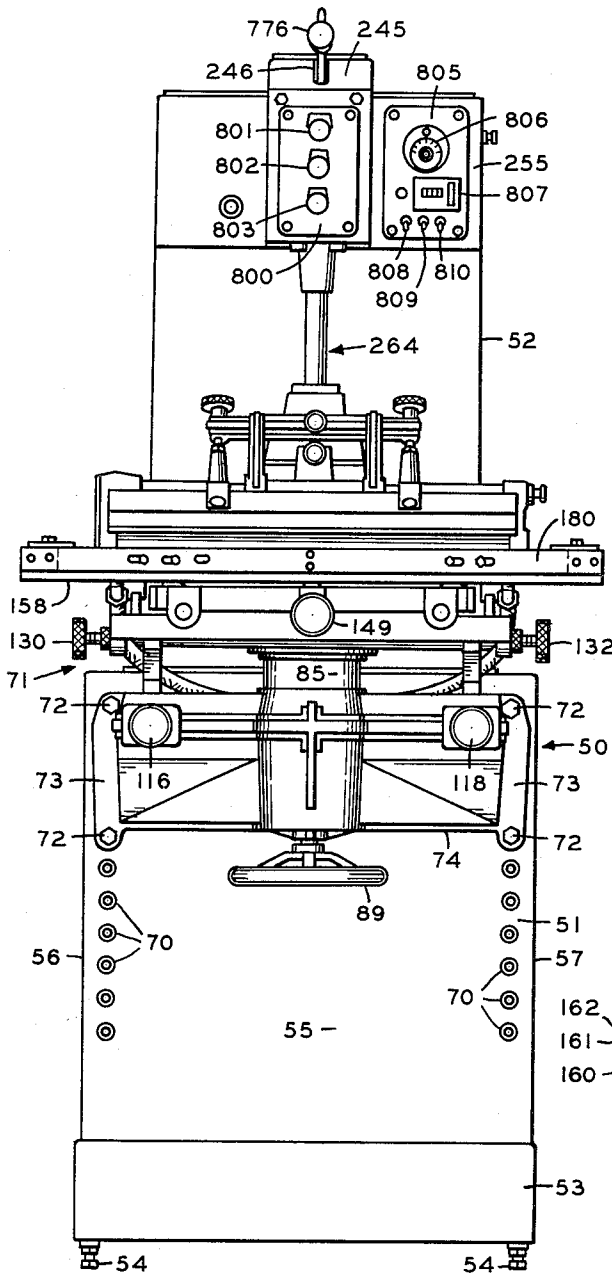


FIG. 1

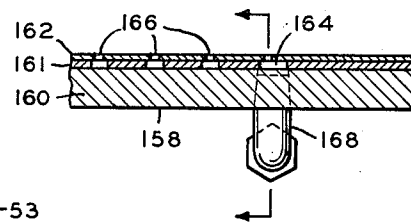
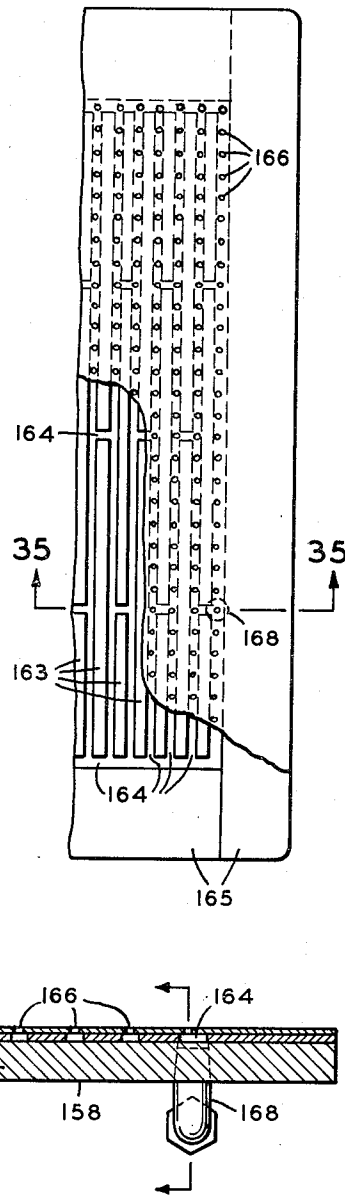


FIG. 35

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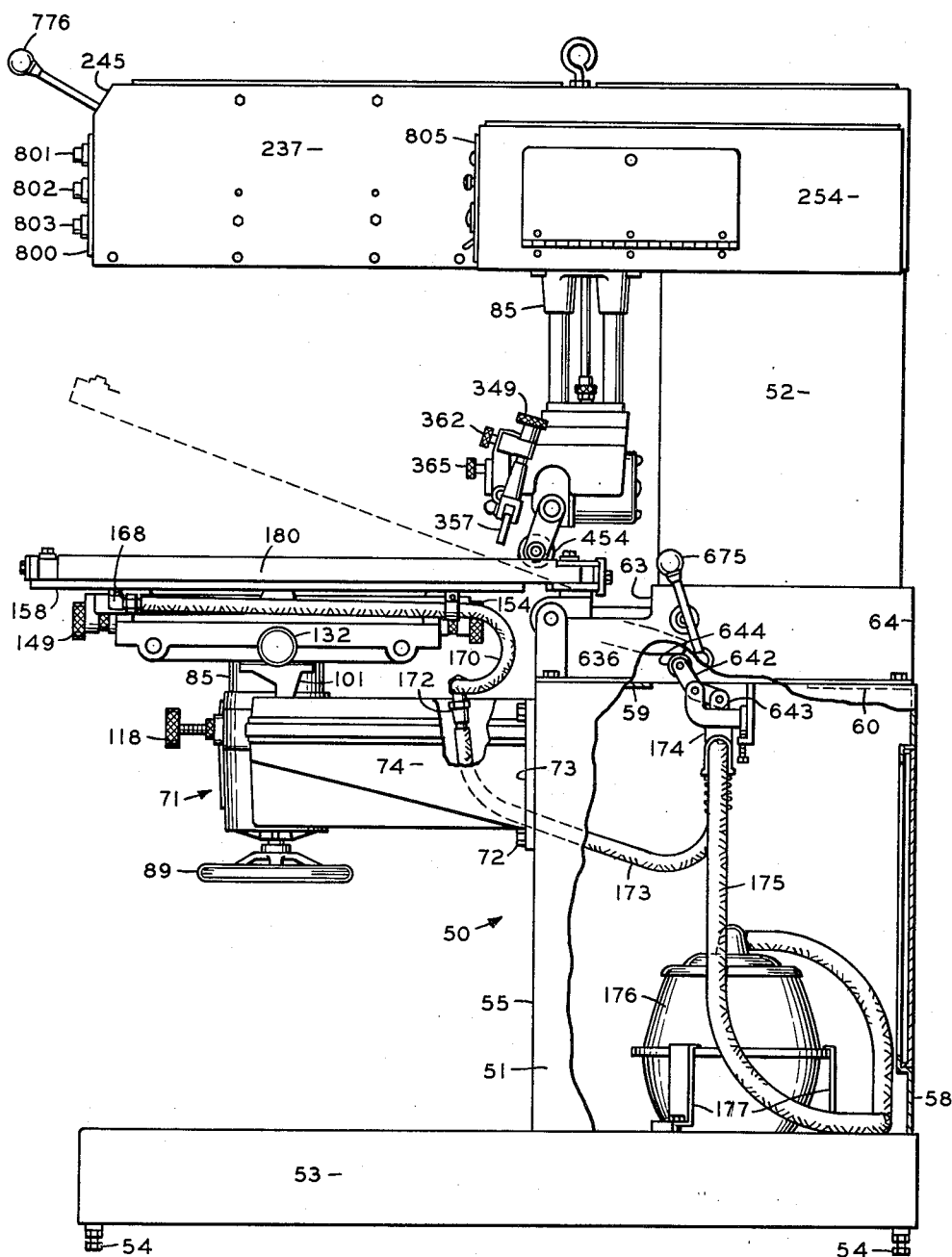


FIG. 2

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FIG. 3

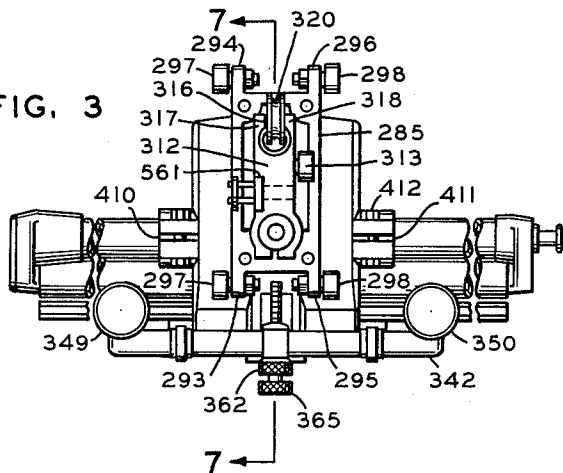


FIG. 6

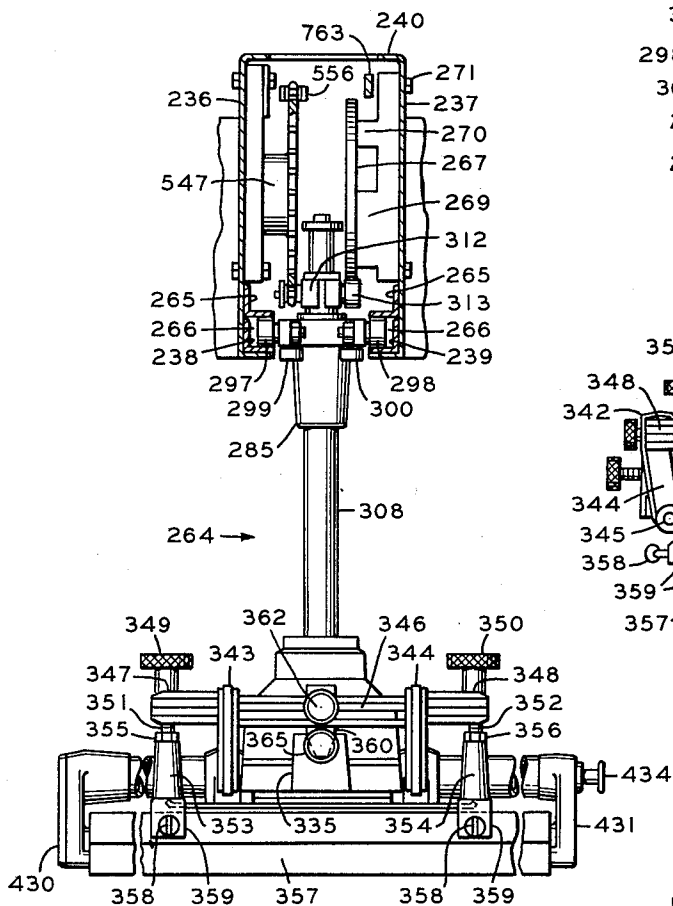
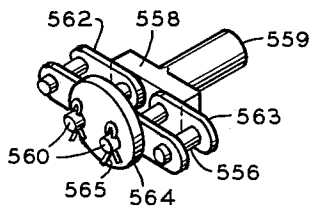


FIG. 4

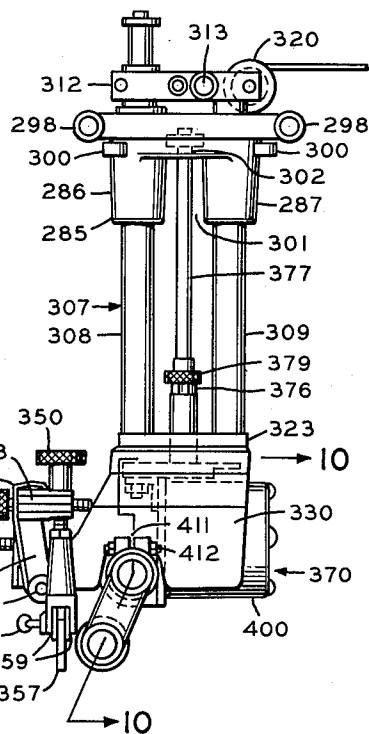


FIG. 5

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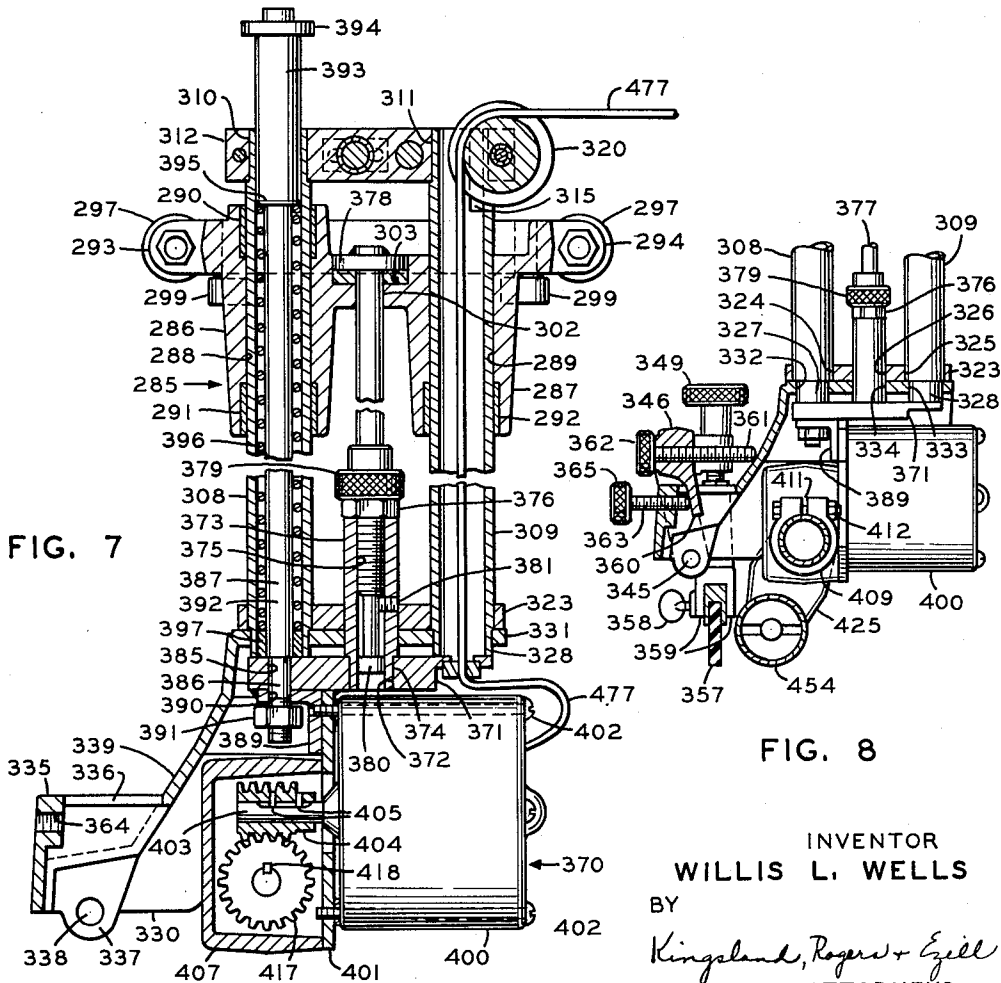
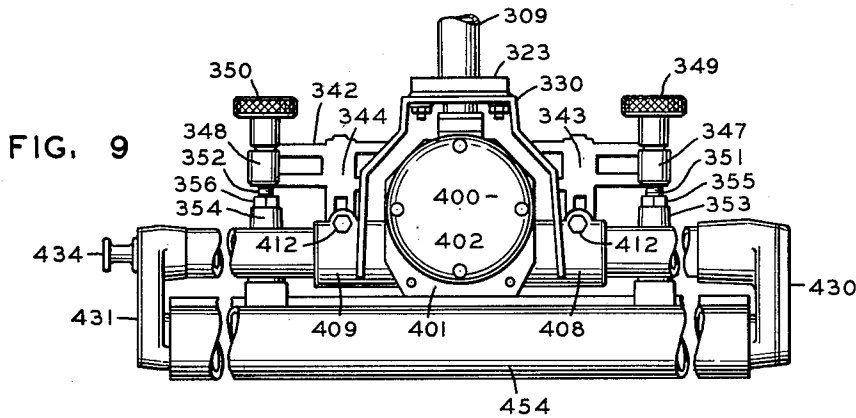


FIG. 8

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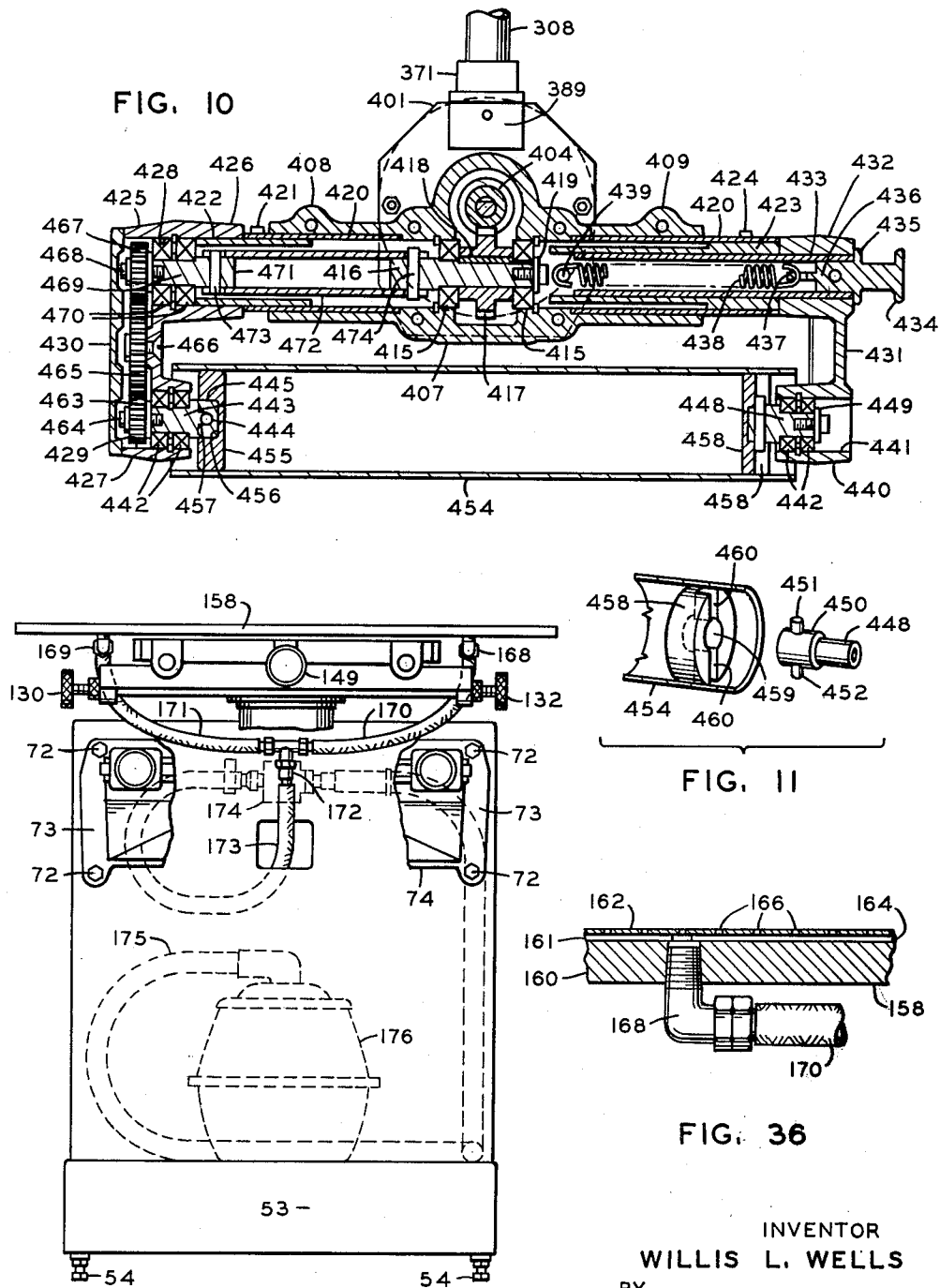
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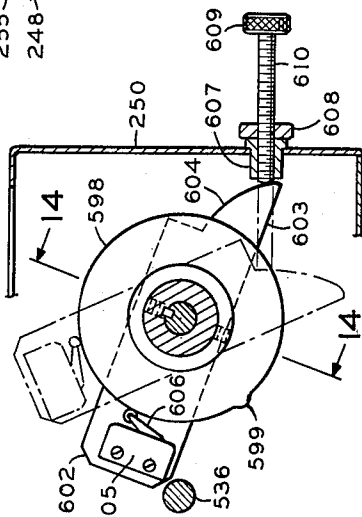
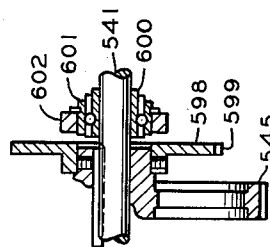
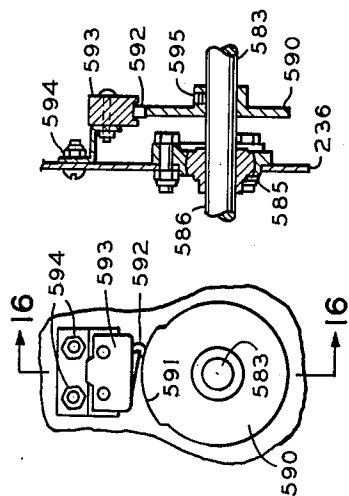
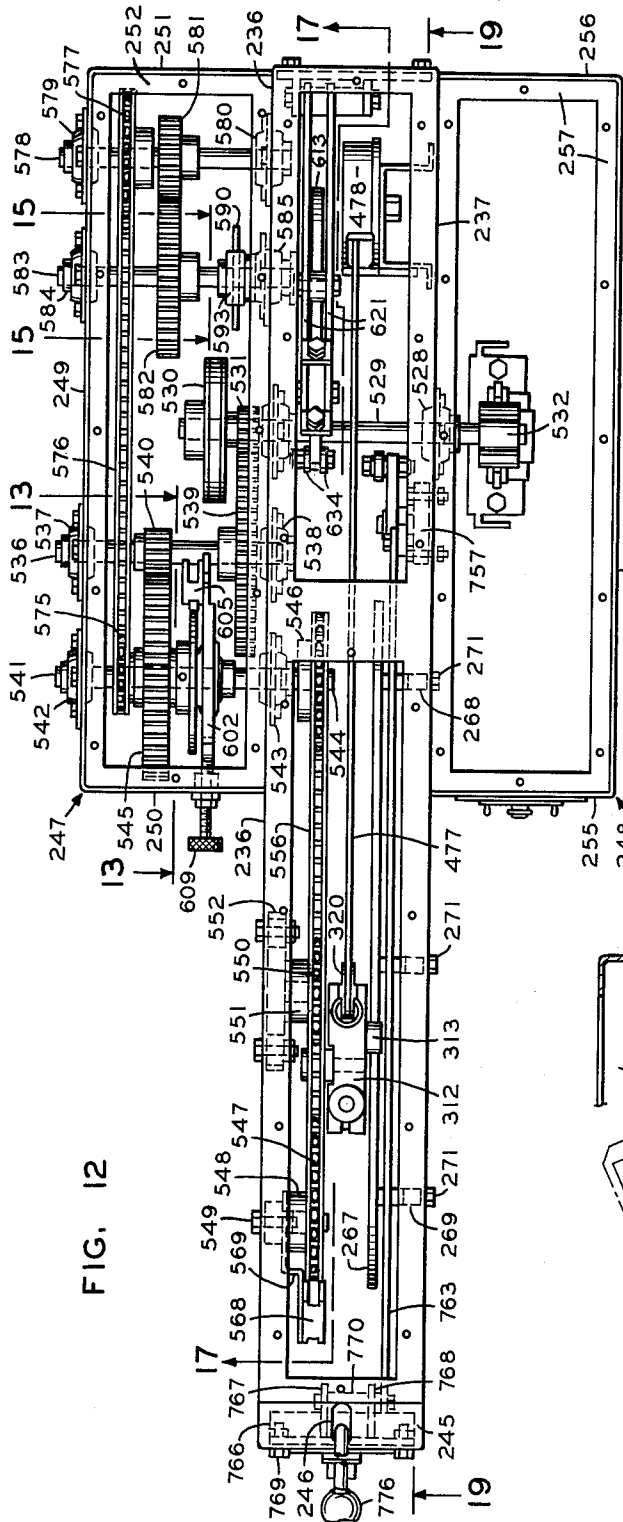
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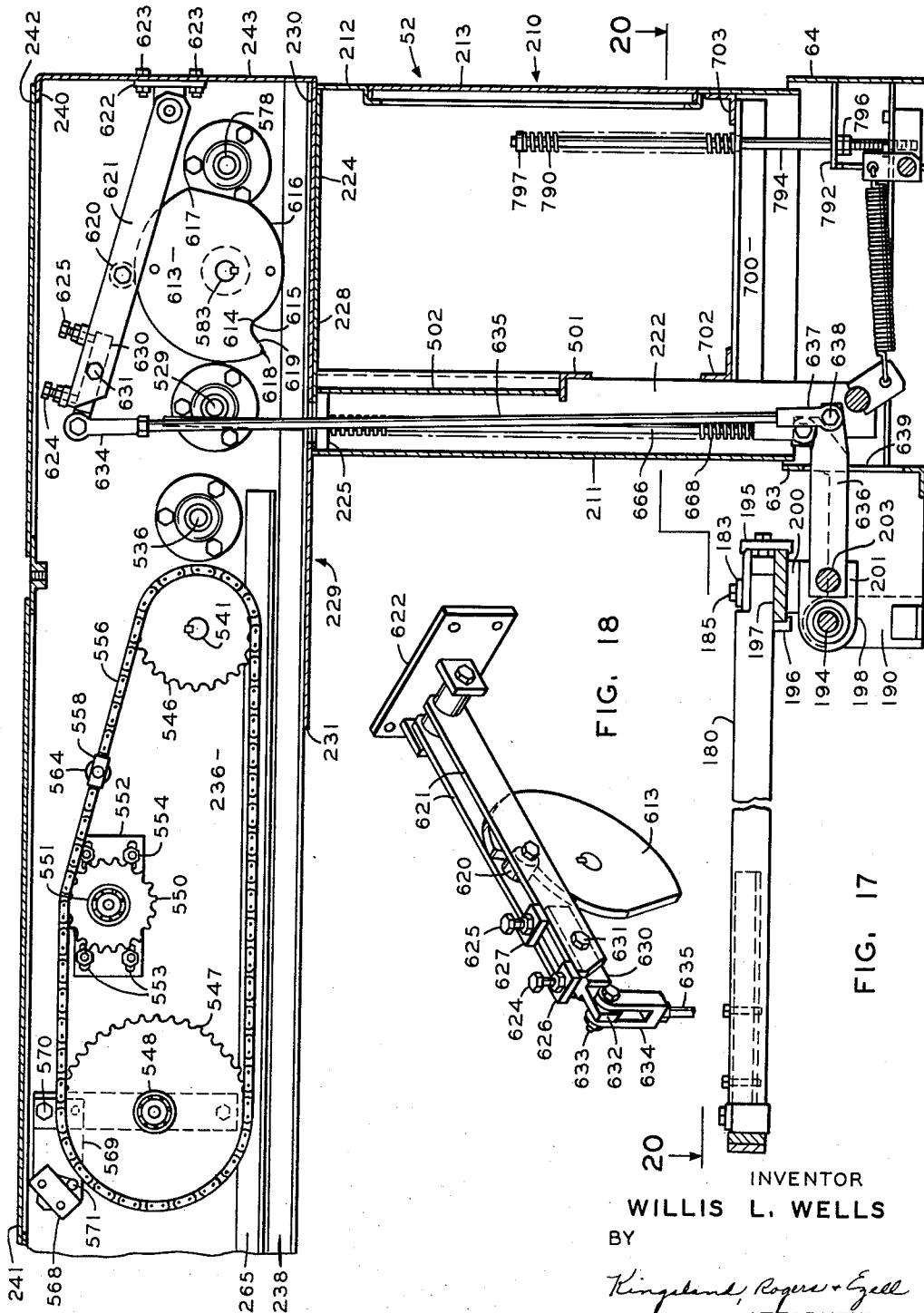
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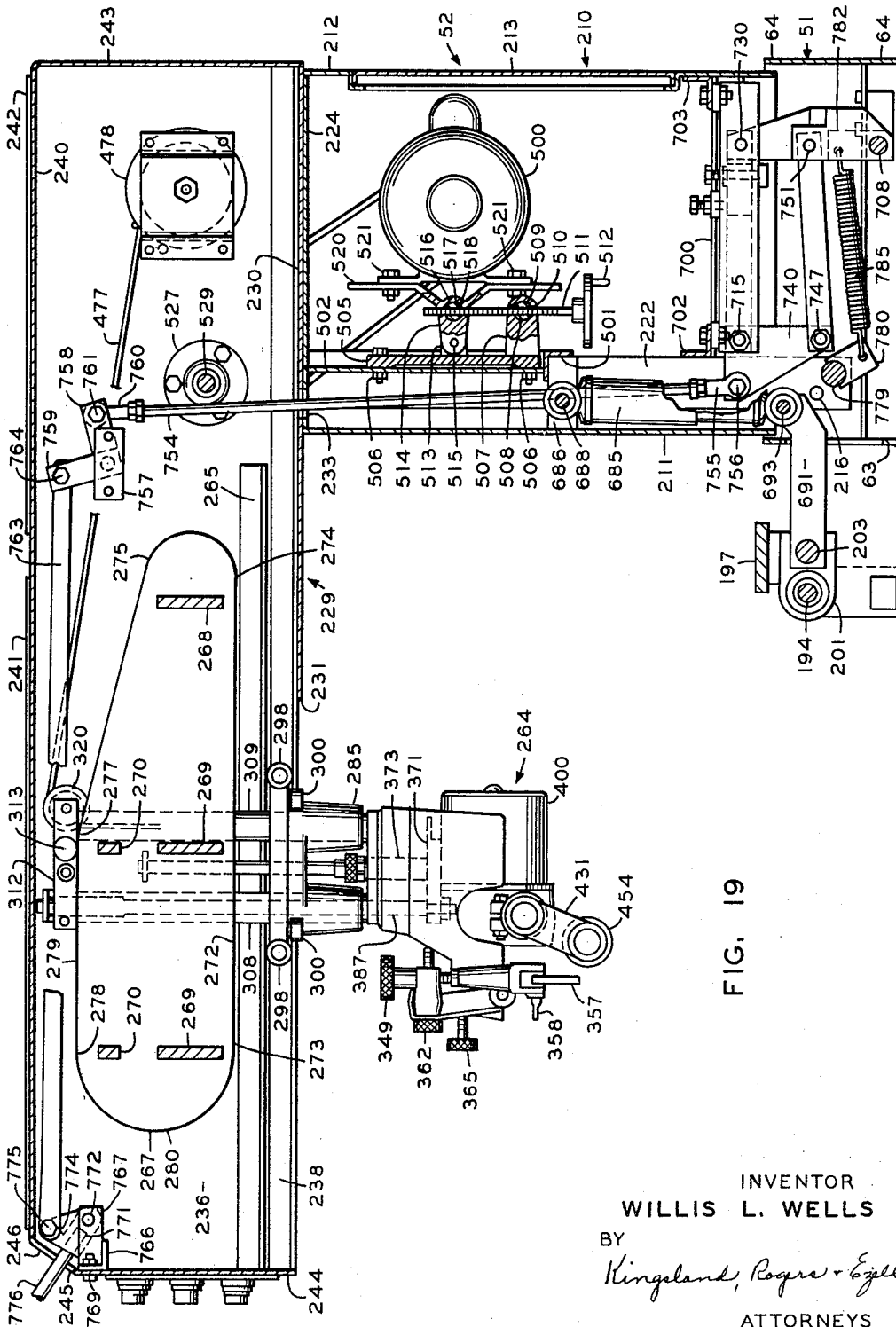
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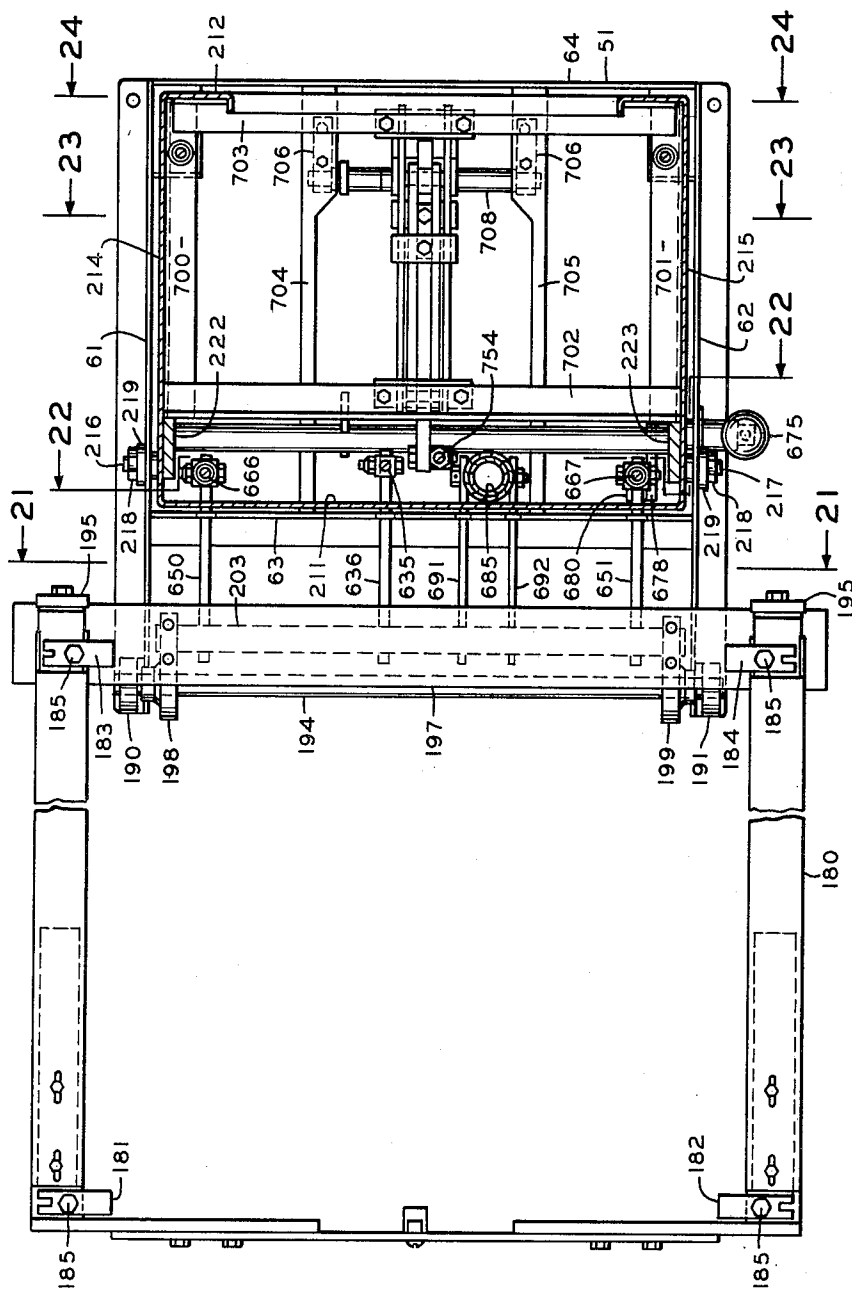


FIG. 20

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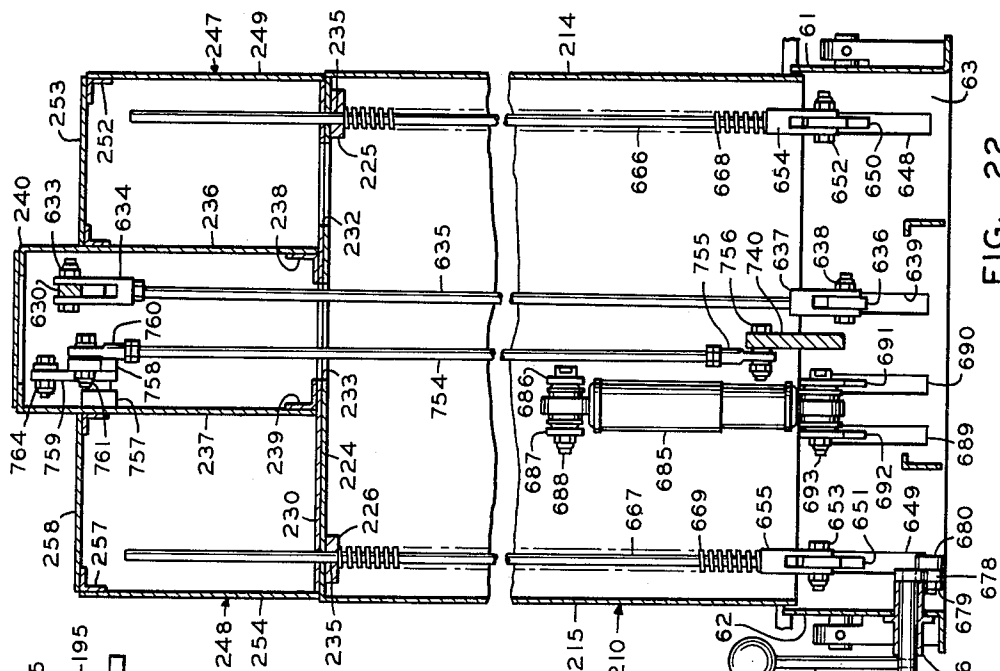


FIG. 21

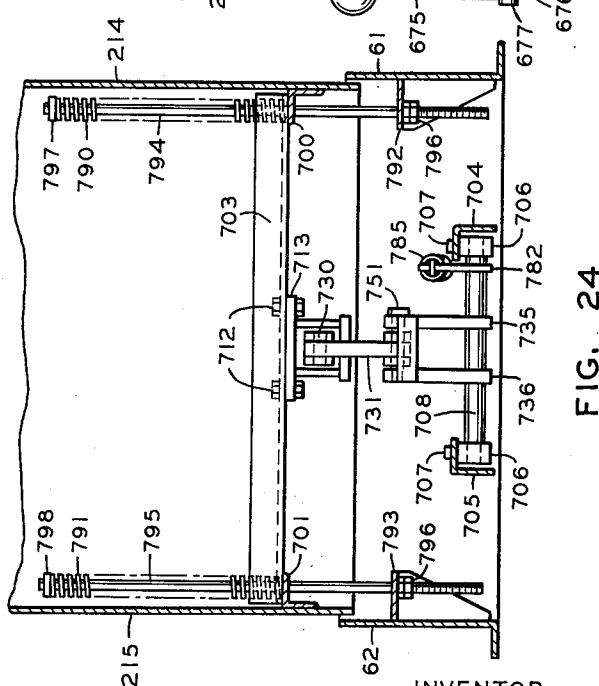


FIG. 24

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FIG. 25

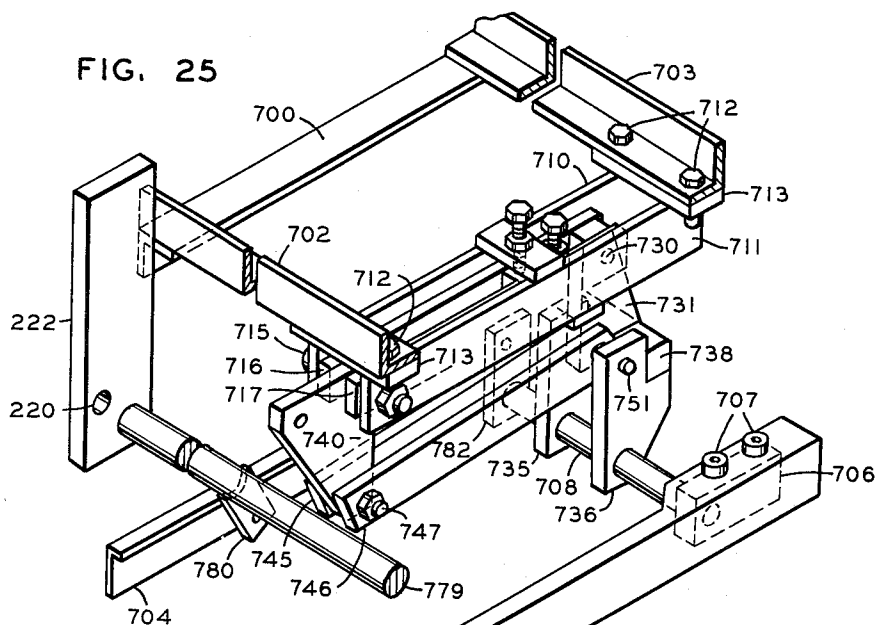
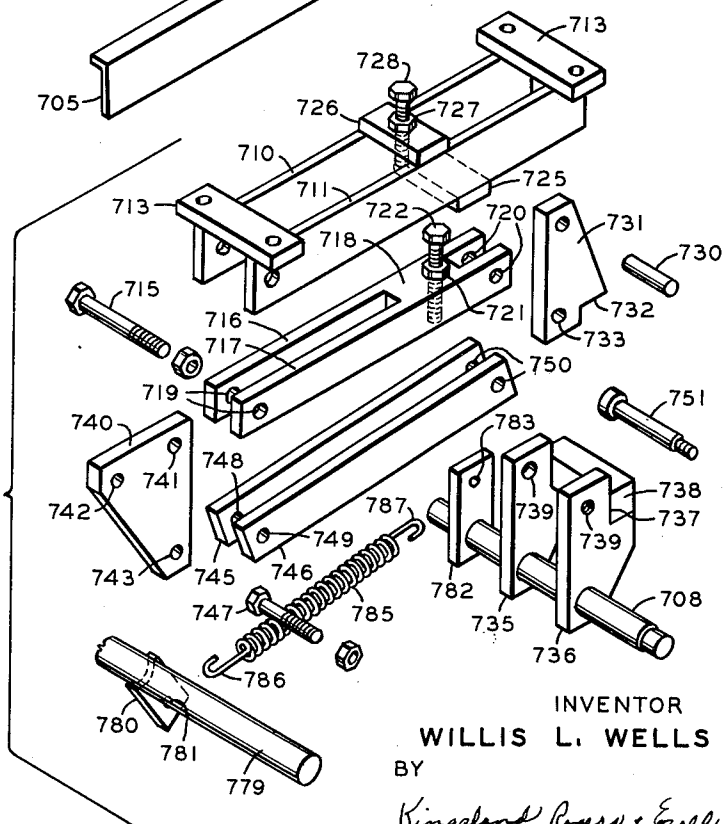


FIG. 26



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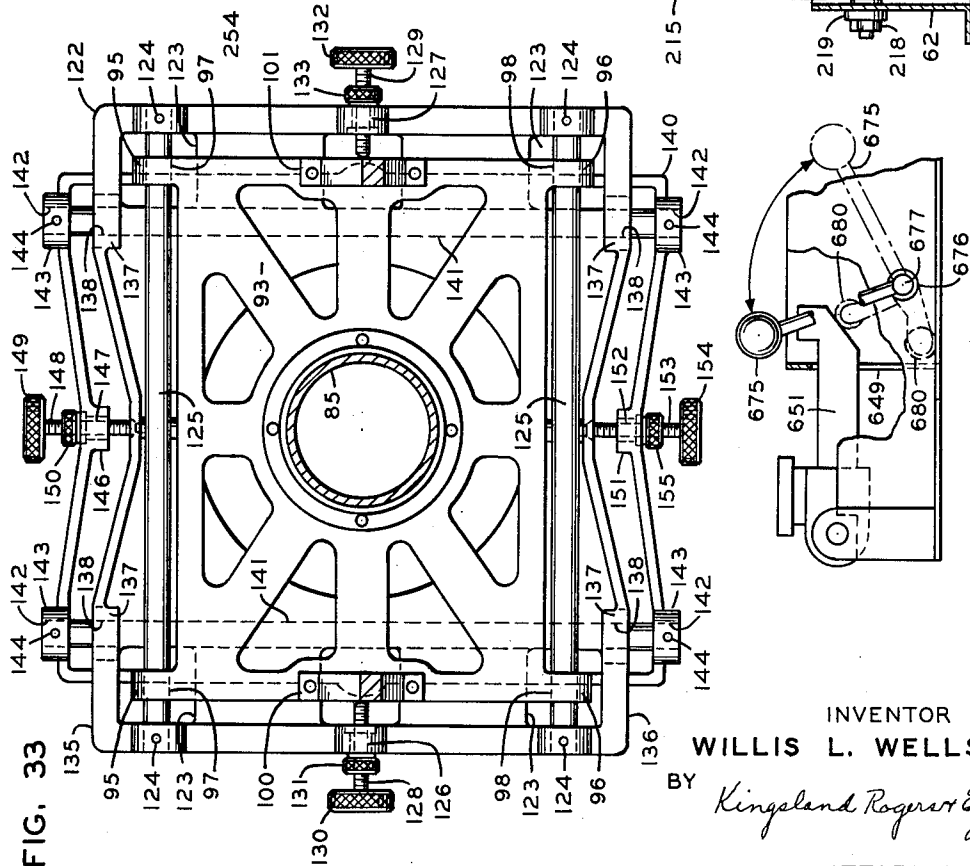
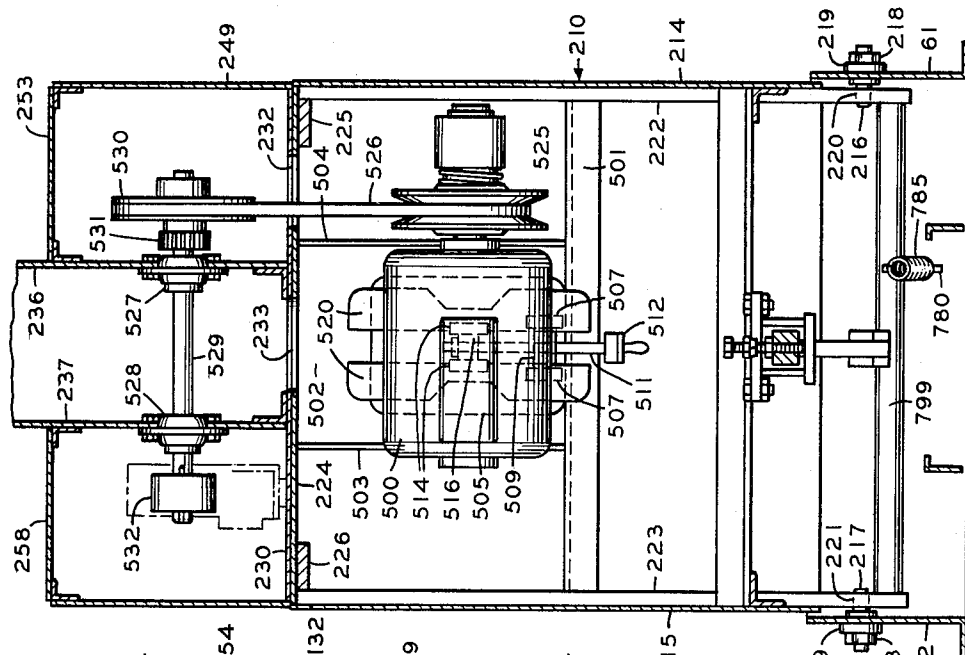
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SILK SCREEN PRINTING PRESS

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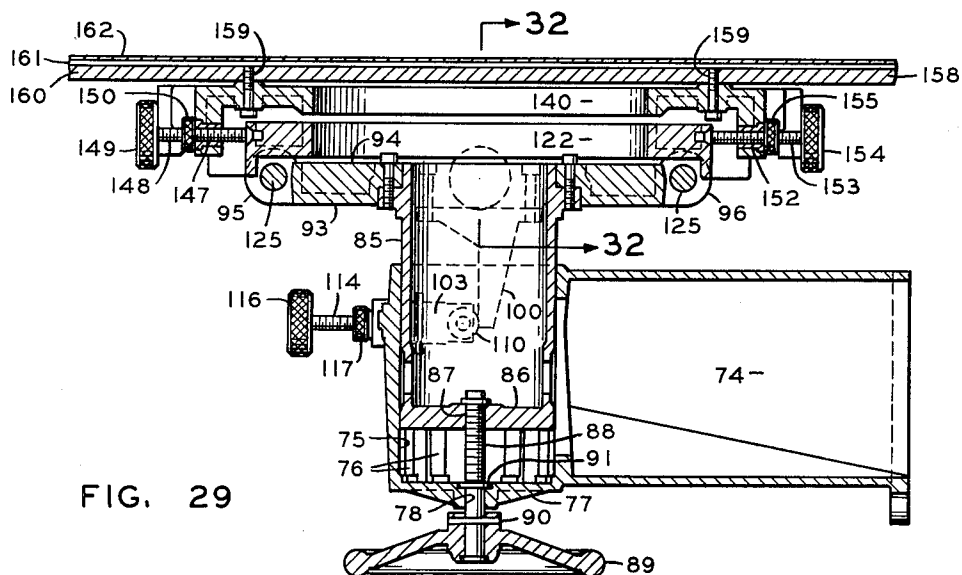
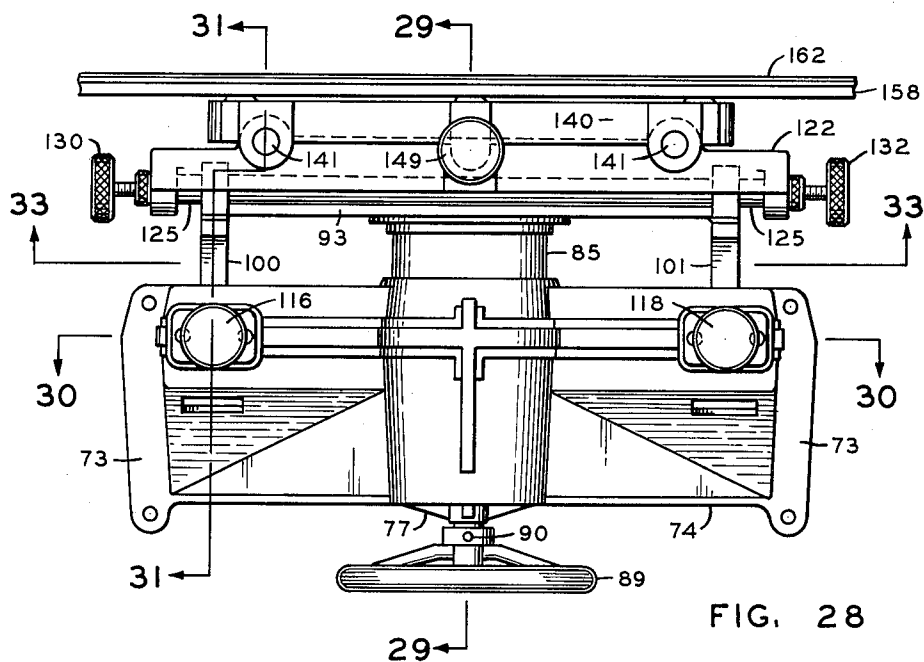
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FIG. 30

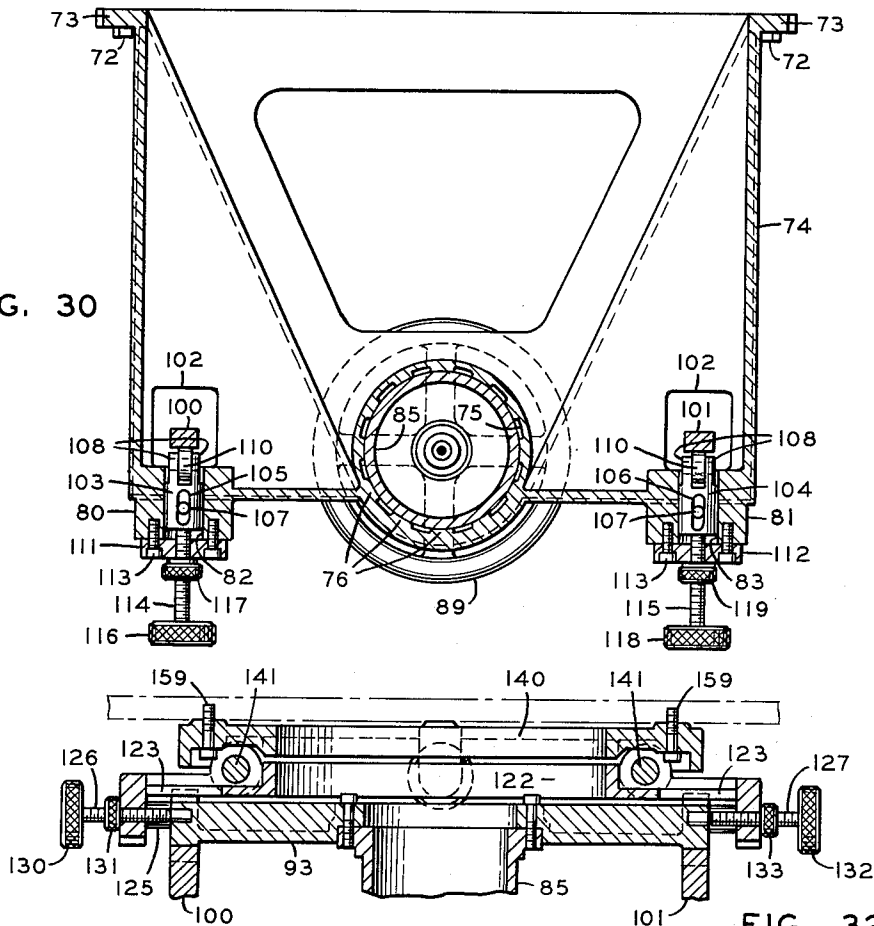


FIG. 32

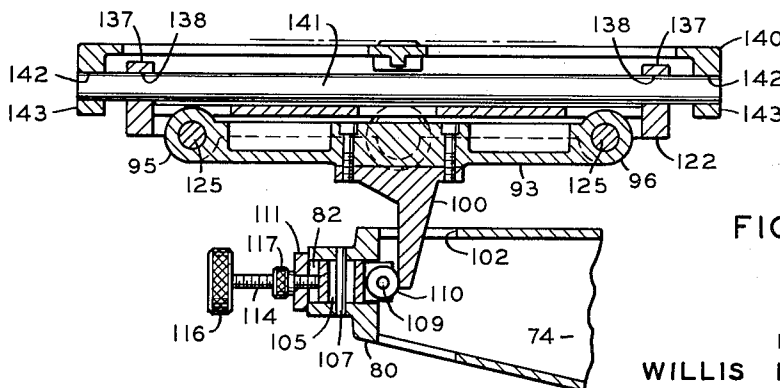


FIG. 31

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3,138,095

SILK SCREEN PRINTING PRESS

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Filed Oct. 27, 1960, Ser. No. 65,347

20 Claims. (Cl. 101-123)

This invention relates to a silk screen printing press. The machine is the type that can be used for printing such materials as electronic circuits, ceramics, plastics, textiles, metals, or woods and papers.

The art of silk screen printing presses is well known. Basic to it is the provision of a table of platen having a flat surface for supporting blank material. With the blank material upon the table, a stencil, commonly called a silk screen, is placed over the blank. Ink is then forced through openings in the screen to produce the printing operation.

While originally the printing was performed almost entirely by hand, modern development has produced machines that automatically lift the screen between each printing operation for rapid duplication. The machine of the present invention goes beyond those of the prior art in providing completely automatic and entirely flexible apparatus for silk screen printing.

Another important, and highly sought after, objective in the art is the provision of a machine that spreads ink evenly across the screen and that produces a sharp print by an effective off-contact operation. The machine herein described includes means for effectively accomplishing that objective. These means include an ink tray adjacent the rear edges of the platen. An ink applying assembly moves under the influence of a unique control system across the screen from front toward rear. At the end of this stroke, an ink roller carried by the assembly rotates within the tray and picks up a uniform film of ink over its entire peripheral surface. The roller continues to rotate as it is transported above and out of contact with the screen to its forward position from which it begins a printing stroke. Because of the rotation of the roller, the film of ink adheres to it rather than dripping down upon the screen. Of course, the ink is taken off the roller as the ink contacts the screen.

The machine is further characterized by extreme versatility and ease of use which are additional objects of the invention. For example, the roller that is carried by the ink applying assembly can be adjusted vertically. Following the ink roller, and attached to the assembly, is a squeegee for applying such pressure to the top of the screen that ink is forced through. The squeegee also wipes the surplus of ink from the top of the screen above the blank that is being printed. The squeegee can be adjusted vertically in height relative to the height of the roller, and it can be tilted from side to side. In addition, the angle of incidence or approach of the squeegee can be adjusted.

The ink applying assembly is supported adjacent the top of a frame housing and, in addition to the appropriate power source for reciprocating the assembly horizontally, there is a guide means in the form of a cam that determines the path of movement of the assembly as it is reciprocated. An important feature of the cam guide means is the fact that it moves the assembly along a substantially horizontal plane during the printing stroke of the assembly. In the other direction of movement of the assembly, the cam first raises the assembly, and with it the roller and squeegee, to separate it from the blank material being printed. The assembly is then guided by an elevated path over the top of the cam guide means to its position for repeating the printing stroke.

Another object of the invention, therefore, is to provide

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a silk screen printing press with a control system for assuring the even distribution of ink over the screen.

The ink roller that is carried by the assembly is powered by a motor contained within the movable assembly. The cord line that supplies power to the motor must, necessarily, pass through the machine. In order to prevent interference by the cord means in the reciprocation of the assembly, there is a spring tension element about which the cord is wound for maintaining a generally constant tension on the cord, regardless of the position of the ink applying assembly. This assurance that the cord will not interfere with the operation of the machine is another object of the invention.

Still another object is to provide in the control mechanism for the printing machine a system of automatic stop means. The stop means will stop and start the assembly at exactly the same position during each printing cycle. A feature of the stop and start means is the fact that the stopping position of the ink applying assembly can be adjusted. Likewise, the duration of pause between stop and restart can be adjusted.

The machine has a table or platen for supporting a blank upon which the printing operation is to take place. The table is attached to the frame below the ink applying assembly. There is a screen that is separately and pivotally attached to the frame. Thus, the height of the table can be adjusted relative to the screen to obtain any desired degree of off-contact printing. Because the squeegee is separately adjustable in height, it can be positioned to press the adjacent part of the screen against a blank on the table while forcing ink through that part of the screen. Since the screen is tight, the rest of it will tend to remain separated from the table. Nevertheless, the roller need not contact the screen because it, also, is separately adjustable in height.

The screen is of a general type that is used in conventional silk screen printing presses except that it is operated in a novel manner in direct relation to the motion of the ink applying assembly. In this regard, there is a connection between the ink applying assembly and the screen that operates automatically to pivot the screen during movement of the ink applying assembly. The screen is raised or pivoted away from the table when the ink applying assembly is raised by the sprocket chain and the cam guide means, and the screen is lowered upon movement of the ink applying assembly back to its lowermost plane of horizontal movement.

Accordingly, another object of the invention is to provide a printing machine with a screen that is controlled to print relative to the table by the ink applying assembly.

In certain instances, it is desired that more than one printing run be made. The present machine incorporates a screen lock for holding the screen against the table during the otherwise normal operating cycle. Therefore, successive printing passes can be made with the assurance that each printing stroke will occur with the screen in a single set position.

There is another extremely important object of the invention, and that is the provision of a machine that can be made to "skip print" even though the ink applying assembly continues to cycle. The "skip print" is accomplished by a lever mechanism that pivots the upper part of the frame housing, carrying with it the ink applying assembly away from the table. Thus, upon operation of the lever, the blank material on the table can be handled or adjusted even though the ink applying assembly continues to reciprocate.

Still another object is to provide a blank supporting table for a printing machine that is fully adjustable. There are a plurality of vertically spaced points on the frame housing to which the table can be attached according to the approximate height at which it is to be

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used. In addition, there is a fine adjustment in the form of a wheel beneath the table for making critical height adjustments of the table. (Also, as already mentioned, the heights of the roller and squeegee can be separately adjusted.) The position of the table can be adjusted from side to side, fore and aft, and its angle can be varied by pivoting it about a vertical axis.

Other objects are to provide a silk screen printing press having a roller for spreading ink and which is readily removable for ease of cleaning and for replacement in a variety of lengths.

Yet another object of the invention is the provision of a printing press than can print with a plurality of colors in a single operation. Because the machine is provided with stationary tray means for holding the ink and with removable roller means for spreading the ink, the tray means can be divided into a plurality of compartments, side by side, each containing a different color of ink; and the roller means can comprise a plurality of adjoining roller surfaces with sufficient space between them for receiving the tray partitions.

A further object of the invention is to provide a silk screen printing machine characterized by extreme ruggedness and rigidity. All of the action of the machine is accomplished with positive mechanisms journaled in lifetime bearings.

A still further object of the invention is to provide a printing machine with a table subjected to a vacuum with valve means between the vacuum source and the table controlled by the raising and lowering of the screen.

Yet another object of the invention is to provide a silk screen printing press having an ink roller and squeegee that is moved past the screen with a pause time at the end of the ink spreading stroke, the velocity of movement and the duration of pause time being independently variable.

In the drawings:

FIGURE 1 is a front elevation view of the silk screen printing press;

FIGURE 2 is a side elevation view of the printing press taken from the right side of FIGURE 1, but with parts broken away to show the vacuum connection and the actuating means for controlling the activation of the vacuum means;

FIGURE 3 is a plan view of the ink applying assembly removed from the machine. The scale of FIGURE 3 is somewhat greater than that of FIGURES 1 and 2;

FIGURE 4 is a front elevation view of the ink applying assembly on an enlarged scale with certain other parts appropriate to the ink applying assembly being shown in section;

FIGURE 5 is a side elevation view of the ink applying assembly as removed from the machine, taken from the right side of FIGURE 4;

FIGURE 6 is an enlarged isometric detail of the manner in which the sprocket chain that drives the ink applying assembly is connected to that assembly;

FIGURE 7 is a view in section taken along the line 7—7 of FIGURE 3. The scale of FIGURE 7 is greater than that of FIGURE 3;

FIGURE 8 is a view in section similar to that of FIGURE 7, but on a reduced scale with parts broken away and showing the attachment of the squeegee;

FIGURE 9 is a rear elevation view of the lower part of the ink applying assembly. The figure is on an enlarged scale;

FIGURE 10 is a view in section taken along the line 10—10 of FIGURE 5, but on an enlarged scale;

FIGURE 11 is an isometric detail, partly in section, showing the way in which the roller is applied to the assembly;

FIGURE 12 is a plan view of the printing press with the top panels removed to show details of the interior;

FIGURE 13 is a view in section taken along the line 13—13 of FIGURE 12;

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FIGURE 14 is a view in section taken along the line 14—14 of FIGURE 13;

FIGURE 15 is a view in section taken along the line 15—15 of FIGURE 12;

FIGURE 16 is a view in section taken along the line 16—16 of FIGURE 15;

FIGURE 17 is a partial view in section taken along the line 17—17 of FIGURE 12;

FIGURE 18 is an isometric detail of the mechanism for lowering the screen prior to the printing stroke of the machine;

FIGURE 19 is a view in section taken along the line 19—19 of FIGURE 12;

FIGURE 20 is a view in section taken along the line 20—20 of FIGURE 17;

FIGURE 21 is a view in section taken along the line 21—21 of FIGURE 20;

FIGURE 22 is a view in section taken along the line 22—22 of FIGURE 20;

FIGURE 23 is a view in section taken along the line 23—23 of FIGURE 20;

FIGURE 24 is a partial view in section taken along the line 24—24 of FIGURE 20;

FIGURE 25 is an isometric view, partly in section, of certain details of the "skip print" mechanism;

FIGURE 26 is an isometric exploded view of certain elements of FIGURE 25;

FIGURE 27 is a partial view showing the operating mechanism for locking the screen against the table;

FIGURE 28 is a front elevation view of the table showing the adjusting mechanism;

FIGURE 29 is a view in section taken along the line 29—29 of FIGURE 28;

FIGURE 30 is a view in section taken along the line 30—30 of FIGURE 28;

FIGURE 31 is a partial view in section taken along the line 31—31 of FIGURE 28;

FIGURE 32 is a partial view in section taken along the line 32—32 of FIGURE 29;

FIGURE 33 is a view in section taken along the line 33—33 of FIGURE 28;

FIGURE 34 is a partial plan view on enlarged scale of the table with parts broken away to show the vacuum paths;

FIGURE 35 is a view in section taken along the line 35—35 of FIGURE 34;

FIGURE 36 is a view in section taken along the line 36—36 of FIGURE 35; and

FIGURE 37 is a front elevation view of the machine omitting the upper part thereof and with the lower portion of the table broken away to show details of the vacuum mechanism and connections.

In the description to follow, the machine is considered to have a front, a rear, and left and right sides. These may be determined by reference to FIGURE 1 which shows the front. The left and right sides are as viewed in FIGURE 1.

The Table Assembly

Referring particularly to FIGURE 2, the housing or frame 50 of the machine is comprised of two sections, a bottom section 51 and a top section 52. The bottom section 51 includes a base 53 that stands on individually adjustable feet 54. Upwardly, depending from the base 53, the bottom section 51 includes a front wall 55, left and right side walls 56 and 57, respectively, and a rear wall 58. The part near the top of the lower section 51 is appropriately flanged as at 59 and 60 to support upper side panels 61 and 62 that are bolted to the flanges 59 and 60 and front and rear panels 63 and 64 that are welded to the side panels 61 and 62. The upper front panel 63 is spaced from the forward ends of the side panels 61 and 62 as can be seen in FIGURE 20.

The front panel of the bottom section 50 has two par-

allel rows of vertically aligned tapped holes 70. A table assembly 71 is mounted by bolts 72 to upper ones of the holes 70. Other of the holes 70 may be used for supporting the table according to the height at which it is to be mounted. The bolts 72 fasten through flanges 73 of a large casting 74, the shape of which can be best appreciated from FIGURES 1, 2, 28, 29 and 30.

The casting 74 is for supporting a table as will be described, and for this purpose the central forward part of the casting 74 is formed with a vertical internal cylinder 75 having kerfs 76 spaced along its inside wall. The bottom 77 of the cylinder 75 is closed except for a hole 78 through its center.

Toward each side of the cylindrical part 75 of the casting 74, and toward the top of the casting 74 are thickened or reinforced corners 80 and 81, and each of the thickened corners 80 and 81 is bored through from front to rear at 82 and 83, respectively. The cylinder 75 is for axially centering a table supporting cylinder, and the bores 82 and 83 are for receiving certain mechanism for pivoting the table about a vertical axis through the center of the cylinder 75. All of this will follow in detail.

The table supporting cylinder 85, before mentioned, fits slidably within the internal cylinder 75. It also can rotate within the cylinder 75. The bottom 86 of the cylinder 85 is closed, except for a threaded hole 87 through the center of the bottom 86.

An elongated screw 88 is threaded into the hole 87. The screw 88 passes through the hole 78 in the bottom 77 of the cylinder 75 and has a turning wheel 89 fixed by a pin 90 to its lower end. There is a washer 91 that prevents the downward movement of the screw 88.

As can be seen in FIGURE 29, the cylinder 85 is raised and lowered by rotation of the wheel 89, which rotates the screw 88, the threads of which mesh with the threads of the hole 87.

Because the table is adjustable in all directions, and because it must be perfectly steady once it has been adjusted, there are a number of different parts between the table and the cylinder 85. The first of these, to which the cylinder 85 is bolted, is a casting 93, the top 94 of which fits flush with the cylinder 85. The casting 93 has forwardly extending wings 95 at each side of it, and similar rearwardly extending wings 96. There are co-axial holes 97 through the wings 95 and co-axial holes 98 through the wings 96.

The mechanism for pivoting the casting 93, with the cylinder 85, about the axis of the cylinder 75 includes a pair of levers 100 and 101 bolted to the under surface of the casting 93 toward the sides. The levers 100 and 101 project downwardly from the casting 93 through holes 102 in the casting 74. The location of the lever arms 100 and 101 and the holes 102 is such that the lower ends of the levers 100 and 101 are positioned adjacent the bores 82 and 83 through the corners 80 and 81 of the casting 74.

There are a pair of cylindrically shaped blocks 103 and 104 slidably disposed within the bores 82 and 83, respectively. Each of the cylindrical blocks 103 and 104 has a pair of vertically aligned slots 105 and 106 through it, and there are a pair of pins 107 fixed to each of the corners 80 and 81 of the casting 74. The slots 105 and 106 cooperate with the pins 107, to define the limits of movement of the cylindrical blocks 103 and 104.

The inner end of each block 103 and 104 has spaced apart ears 108. There is a pin 109 fixed between each set of ears 108 for rotatably supporting a pair of rollers 110. The rollers 110 are each intended to bear against one of the levers 100 and 101. Both rollers can be used to control the positions of the levers 100 and 101.

There are small plates 111 and 112 fastened by bolts 113 across the forward ends of the bores 82 and 83, respectively. Threaded through the plates 111 and 112 are a pair of screws 114 and 115, respectively. The screw 114 has a handle 116 on its end and a lock nut 117 to fix

it in position. There is a similar handle 118 and lock nut 119 for the screw 115.

As will be apparent from FIGURES 30 and 31, the casting 93 can be rotated relative to the casting 74 upon positioning the rollers 110 against the lever arms 100 and 101. Thus, if the handle 116 is turned clockwise and the handle 118 counterclockwise, the casting 93 will be caused to rotate in a clockwise direction, as viewed in FIGURE 30. Because of the special adaptability of the printing press to off-contact printing, the table may often be adjusted in height, particularly to move it away from the screen surface. This adjustment that is accomplished by turning the handwheel 89 is useful particularly upon a change of blanks upon the table, which blanks may be of various thicknesses. Such height adjustment is accomplished without friction against the lever arms 100 and 101 because of the rollers 110.

The means for raising and lowering the table and for pivoting it has been described. There is also movement from side to side and fore and aft. For the side to side movement, there is a cast plate 122, the shape of which can be seen in FIGURES 28, 29, 31, 32 and 33. There are cuts 123 through the corners of the casting 122 to allow space for the wings 95 of the casting 93 that project upwardly therefrom. Fixedly secured between the sides of the cast plate 122 by studs 124 are a pair of bars 125. The bars 125 pass through the holes 97 and 98 in the wings 95 and 96 of the casting 93. The bars 125 fix the position of the cast plate 122 relative to the casting 93 while permitting it to slide from side to side.

There are a pair of tapped holes 126 and 127 through the sides of the cast plate 122 into which are threaded a pair of screws 128 and 129, respectively. The inner ends of the screws 128 and 129 bear against the sides of the casting 93. For the screw 128 there is a handle 130 and a lock nut 131. There is a handle 132 and a lock nut 133 for the screw 129. The cast plate 122 is shifted from side to side merely by operation of the handles 130 and 132. After it is positioned, the lock nuts 131 and 132 are tightened.

The cast plate 122 has front and rear walls 135 and 136, respectively, each having raised bosses 137 adjacent the sides of the plate 122. There are holes 138 through the bosses 137. Opposing ones of the front and rear holes 138 are coaxial.

To provide fore and aft movement of the table, there is a cast frame 140, as illustrated in FIGURES 28, 29, 31, 32 and 33. There are a pair of bars 141 that are fixed to holes 142 in forward and rearward bosses 143 of the frame 140 by studs 144. The bars 141 each pass through a pair of the holes 138 in the cast plate 122, as shown in FIGURE 33.

The forward side of the cast frame 140 has a central thickened portion 146 with a tapped hole 147 through it. There is a screw 148 that is threaded through the hole 147 with its free end bearing against the forward side of the cast plate 122. The screw 148 has a handle 149 for turning it and a lock nut 150 for locking it.

In the rearward side of the cast frame 140 is another central boss 151 having a tapped hole 152 through it. There is a screw 153 threaded through the tapped hole 152 having a handle 154 and a lock nut 155.

The cast frame 140 is moved forwardly or rearwardly by turning the handles 149 and 154. Obviously, one of the handles must be loosened if the other is to be turned in a clockwise direction.

Operation of the Table Assembly

The blanks to be printed are supported on a table or platen 158. The table 158 is attached to the cast frame 140 by screws 159. From the foregoing, it can be appreciated that adjustment of the table in any direction is possible. There is approximate vertical positioning of the table according to which ones of the holes 70 the table assembly is attached. There is micrometer adjustment in a vertical direction upon rotation of the

handwheel 89. Such rotation raises the cylindrical casting 85, as well as the castings 93, 122 and 140, and the table 158.

There is adjustment from side to side upon rotation of the handles 130 and 132. These handles fix the position of the casting 122 (and with it the casting 140 and the table 158) relative to the casting 93 (and the principal frame 50 of the machine). The position of the table fore and aft can be selectively fixed by rotation of the handles 149 and 154. The screws 148 and 153 connected to these handles position the cast frame 140 and the table relative to the casting 122. And, finally, the table can be rotated by rotating the handles 116 and 118. The pressure of the screws 114 and 115 against the levers 100 and 101 determines the angular position of the cylindrical casting 85 relative to the casting 74.

The Vacuum System

The table 158 is made up of three layers 160, 161 and 162 that are welded on top of one another in the order named. The middle section 161 comprises a large number of formica strips 163 so arranged on the plate 160 as to form interconnected air passages 164. In addition, the middle layer 161 has a border 165 formed by formica plates that entirely enclose the air passages 164. The top plate 162 completely covers the air passages 164 but has a plurality of small vacuum holes 166 through it in communication with the passages 164.

An air hose connection 168 is fastened through the lower plate 160 of the table 158, and communicates with the interconnected air passages 164. There is a similar air hose connection 169 at the opposite end of the table. The connections 168 and 169 pass through hoses 170 and 171, respectively, to a T-fitting 172 that in turn is connected to a hose 173. These connections are shown in FIGURE 37. The hose 173 is connected to a valve 174 of the type that is lever operated to be opened and closed, as will be described.

From the valve 174, there is a hose connection 175 to a vacuum power source 176 which is illustrated as being in the form of a conventional vacuum cleaner. The vacuum power source is suitably secured to the base 53 by clamps 177. The purpose of the vacuum connection to the table 158 is to hold the blank material to the table. When the material is placed upon the table, it covers the holes 166 so that the vacuum can be effectively created by the power source 176. The vacuum will hold the material to the table even while the latter is being adjusted into one of its many possible positions.

Mounting of the Screen Frame Holder

A screen frame holder 180 is pivotally attached between the upper side plates 61 and 62 of the bottom section of the frame. The screen frame holder need not be described in detail, inasmuch as its typical structure may be varied considerably and is generally conventional to the art. It should, however, be noted that the screen frame holder includes form plates 181, 182, 183 and 184, fastened by quickly releasable bolts 185 to the frame holder 180. These plates releasably secure a screen frame 186 (shown in dotted lines in FIGURE 21) in such a way that the screen frame can be readily replaced upon loosening of the four bolts 185.

What is important to the invention is the way that the screen frame holder 180 is connected to and controlled by the machine in synchronization with other of the operating elements. The supporting structure for the screen frame holder 180 includes two upstanding brackets 190 and 191 welded respectively to the side panels 61 and 62. Journaled in holes 192 and 193 that are formed through the brackets 190 and 191 is a bar 194. The bar 194 can rotate within the holes 192 and 193.

Fastened to the rearward undersurface of the frame 180 by clamps 195 and 196 is a plate 197 to which are

screwed a pair of brackets 198 and 199. Each of the brackets 198 and 199 is formed of two pieces 200 and 201 fastened together in an elbow shape, as illustrated in FIGURE 19.

The forward end of the lower plate 201 of each bracket 198 and 199 has a hole 202 through it that receives the bar 194, and each of the brackets 198 and 199 is welded to the bar 194 adjacent to and inside of its respective bracket 190 and 191 to limit axial shifting of the bar 194.

Rearward is another bar 203 that is welded to the brackets 198 and 199. Various levers are welded to the bar 203 for pivoting the screen about the bar 194, and these levers will be described hereafter in detail, along with their operating mechanism.

The Ink Applying Assembly

Reference has been made to the top section 52 of the frame 50. The top section 52 has a lower frame 210 comprising a front panel 211, a rear panel 212 with a removable access plate 213, and side panels 214 and 215. As can be seen in FIGURE 20 of the drawings, the cross-sectional size of the front, rear, and side panels just identified, is such that the upper frame section 52 can fit within the space defined by the panels 61, 62, 63 and 64 of the bottom frame section 51. In addition, referring to FIGS. 19 and 23, it can be seen that there are opposed pins 216 and 217 fastened by nuts 218, together with appropriate bushings 219, to side frame members 61 and 62 of the bottom section 51. These pins 216 and 217 are journaled within holes 220 and 221 that are in reinforcing bars 222 and 223 respectively. The reinforcing bars 222 and 223 are positioned near the forward edges of the side panels 214 and 215, respectively, and are welded in place.

Welded to the top of the bars 222 and 223, and to the top edges of the front panel 211, rear panel 212, and side panels 214 and 215, is a top panel 224. Welded to the forward corners of the top panel 224, and to the upper sides of the bars 222 and 223, respectively, are a pair of bearing blocks 225 and 226.

The top frame section 52 has an upper part 229 that includes a bottom panel 230 superposed upon and bolted to the panel 224. The panel 230 extends beyond the panel 211 and terminates in a front edge 231. It should be here noted that there are holes 232 and 233 through the panels 224 and 230 to allow for various operating mechanisms that will be described. In addition, there are smaller holes 235 that pass through the blocks 225 and 226, respectively, and through the panels 224 and 230.

There are side panels 236 and 237 projecting upwardly from the panel 230, and set inwardly from the side edges of the panel 230. The side panels 236 and 237 are welded to angle irons 238 and 239, respectively, that are in turn welded to the panel 230 adjacent the sides of the hole 233. The side panels 236 and 237 and the angle iron bars 238 and 239 extend a considerable distance forward of the edge 231 of the panel 230, as shown in FIGURE 19. There is a top panel 240 between the upper edges of the side panels 236 and 237, and including removable access panels 241 and 242. There is also a rear panel 243 and a front panel 244. Between the front panel 244 and the top panel 241, there is a sloping panel 245 having a vertical slot 246 in it. The slot 246 accommodates the operating lever for a "skip print" mechanism that will be described.

There are side wings 247 and 248 for the frame. The side wing 247 includes a side panel 249, a front panel 250, and a rear panel 251. There is an angle iron frame 252 welded to the panels 236, 249, 250 and 251, and a removable top panel 253 is bolted to the angle iron frame 252.

The right side wing frame 248 has a side panel 254 and front and rear panels 255 and 256, respectively, with an angle iron frame 257 supporting a removable top panel 258.

There is an ink applying assembly 264 that is mounted to reciprocate horizontally and vertically in the upper frame section 52. The guide mechanism for the ink applying assembly includes a pair of angle iron members 265 mounted parallel to and above the angle iron bars 238 and 239. The angle iron members 265 are welded to the panels 236 and 237. A pair of horizontal tracks 266 with both upper and lower limits are thus defined between the angle members 238 and 239 and the angle members 265.

Mounted above the tracks 266, and spaced toward the side panel 237 is a cam plate 267. The cam plate 267 is welded to appropriate spacers 268, 269 and 270, that are in turn fastened by bolts 271 to the side panel 237. The shape of the cam plate 267 is important, and as can be seen in FIGURE 19, the lower surface 272 between the points 273 and 274 is straight and horizontal. From the point 274, the cam plate 267 arcs upwardly to the point 275, from which point there begins a gradual and uniform ascent 276 to the point 277. Between the points 277 and 278, there is a straight horizontal surface 279. From the point 278, the cam 267 defines a surface 280 that is semi-circular to the point 273.

The ink applying assembly 264 includes a carriage 285 that is cast with a pair of downwardly depending sleeves 286 and 287. The sleeves 286 and 287 are bored through at 288 and 289, respectively. The upper end of the bore 288 is lined with a bushing 290, the lower end with a bushing 291 and the lower end of the bore 289 with a bushing 292.

The left side of the carriage 285 has forward and rearward extensions 293 and 294, and the right side of the carriage 285 has forward and rearward extensions 295 and 296. Bolted to the extensions 293 and 294 are a pair of wheels 297. Similar wheels 298 are bolted to the extensions 295 and 296. The wheels 297 are adapted to ride along the track 238 and the wheels 298 are adapted to ride within the track 239.

To guide the carriage 285 laterally, there are a pair of wheels 299 bolted to the left side of the carriage 285 beneath and inward of the wheels 297. The wheels 299 have a vertical axis of rotation. There are similar wheels 300 having vertical axes of rotation adjacent the wheels 298. As can be seen in FIGURE 4, the wheels 299 and 300 are adjacent the channel members 238 and 239 to limit the movement of the carriage 285 laterally between the channel members.

Between the sleeves 286 and 287 of the carriage is a space 301. There is a vertical hole 302 through the carriage 285 above the space 301 with a resilient washer or buffer 303 resting upon the carriage above the hole 302.

A cam follower housing 307 is carried by the carriage 285. The cam follower housing 307 includes a pair of tubes 308 and 309 positioned to reciprocate within the bores 288 and 289, respectively. The upper ends 310 and 311 of the tubes 308 and 309, respectively, are reduced in cross-section and are pressfit into suitable holes in a cam follower block 312. They may be welded thereto.

There is a roller cam follower 313 that is bolted to the right side of the follower support 312. The roller 313 is adapted to follow the contour of the cam plate 267 to cause the ink applying assembly to reciprocate in a vertical direction. The cam follower 313 is held from moving laterally away from the cam plates 267 by the angle members that define the tracks 266 and by the rollers 299 and 300.

It will be noted from FIGURES 3 and 7 that the rear portion of the tube 309 is cut away at 315 near its top. In addition, there is a slot 316 in the rear part of the cam follower block 312 and above the cutout 315. To the wings 317 and 318 on either sides of the slots 316 is mounted a pulley 320. The pulley 320 is for guiding a power cord.

At the lower end of the tubes 308 and 309, there is a plate 323 having holes 324 and 325 for fitting over the tubes 308 and 309. In addition, there is a hole 326 through the center of the plate 323. The plate 323 is welded to the tubes 308 and 309.

The lower ends 327 and 328 of the tubes 308 and 309, respectively, are reduced in size below the plate 323. There is a casting 330 having a top 331 with holes 332 and 333 for fitting onto the flanges 327 and 328 of the tubes 308 and 309. The casting 330 is bolted in place, as illustrated in FIGURES 7 and 9. The casting 330 also has a hole 334 contiguous with the hole 326.

The casting 330 has a hollow interior and a lower front part 335 that projects forwardly. The top of the front part 335 has a slot 336 through it. One either side of the front part 335, there are downwardly depending flanges 337. Each of the flanges 337 has a hole 338 through it. From the rear of the front extension 335, and the rear of the slot 336, the casting 330 has an upwardly sloping front wall 339.

There is a squeegee frame 342 having vertical arms 343 and 344 connected by pins 345 to pivot about the holes 338 in the casting 330. A middle horizontal arm 346 connects the span between the upper ends of the arms 343 and 344, and there are rearwardly bent wings 347 and 348 depending outwardly from the arms 343 and 344, respectively.

There are handles 349 and 350 that are free to rotate within the ends of the wings 347 and 348, respectively, but they are restricted against vertical movement relative thereto. Integral with and depending downwardly from the handles 349 and 350 are screws 351 and 352, respectively.

There are a pair of squeegee mounts 353 and 354 with lock nuts 355 and 356 adjacent to their tops. The squeegee mounts 353 and 354 are hollow, and the screws 351 and 352 are threaded through the amounts 353 and 354, and can extend as far as necessary within the mounts 353 and 354. A conventional squeegee 357 of rubber or the like is clamped by thumb screws 358 between ears 359 at the lower ends of the mounts 353 and 354. The squeegee 357 is readily replaceable by simple rotation of the thumb screws 358.

The squeegee 357 can be raised and lowered by rotation of the handles 349 and 350. In addition, the squeegee 357 can be tilted at an angle to the table if the handles 349 and 350 are turned by different amounts, if concentrated or uneven pressure is desired.

At the center of the metal bar 346 of the frame 342, there is a downwardly depending tab 360. There is a relatively long bolt 361 threaded through the bar 346 with its end bearing against the front 339 of the casting 330. There is a handle 362 for rotating the bolt 361. Immediately below the bolt 361 is another bolt 363 that is threaded through a tapped hole 364 in the front of the forward section 335 of the casting 330. The end of the bolt 363 bears against the tab 360 that is integral with the bar 346. There is a handle 365 for rotating the bolt 363.

By means of the handles 362 and 365, which are accessible from the exterior forward side of the ink applying assembly, the angle of incidence of the squeegee 357 can be adjusted. This can be done with positive stops because the bolt 361 limits the pivotal movement of the squeegee 357 in one direction and the bolt 363 limits that movement in the opposite direction.

There is a roller conveyor assembly 370 that is carried by the carriage 285 and the cam follower housing 307. The roller conveyor housing or assembly includes a mounting plate 371 to which are attached certain supporting means. To this end the mounting plate 371 has a hole 372 through it. There is a sleeve 373 having a reduced end 374 that is pressfit into the hole 372 and welded. The sleeve 373 is hollow bored and has internal threads 375. A jamb nut 376 is provided.

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There is a long bolt 377 having a washer 378 welded to its top that is passed through the hole 302 in the carriage 285 and the hole in the bushing 303, and threaded into the bore 375. The bolt 377 has a turning knob 379 welded to it. There is a cylindrical guide element 380 beyond the lower end of the threads of the bolt 377 for maintaining the bolt 377 coaxial with the bore 375, even when the bolt is only partially threaded into the bore 375. A setscrew 381 through the side of the sleeve 373 is for limiting the upward travel of the bolt 377.

At the forward end of the mounting plate 371, there is a hole 385 for receiving the reduced ends 386 of a shaft 387. There is a piece of angle iron 389 welded to the underside of the plate 371 to support a motor as will appear. The angle iron 389 has a hole 390 through it coaxial with the hole 385. A nut 391 fastens the shaft 387 to the plate 371 and the angle iron 389.

The main section 392 of the shaft 387 is of smaller diameter than the internal diameter of the tube 308. However, at the upper end 393, the diameter of the shaft 387 is increased to almost that of the internal tube span. There is a washer 394 welded to the top of the larger part 393 of the shaft 387.

At the point 395 where the shaft 387 increases in diameter, a spring seat is defined. A compression spring 396 is seated against the seat 395. At the lower end of the tube 308, there is welded a sleeve 397 that acts both as a lower seat for the spring 396 and as a bushing for the shaft 387. The axial position of the shaft 387 is thus continuously guided by the larger part 393 at its upper end and by the sleeve 397. The shaft 387 can reciprocate vertically within the sleeve 308 between the limits defined by the washer 394 and by the plate 371 at the lower end of the tube 308.

For attaching a motor 400 to the roller conveyor assembly 370, there is a plate 401 that is welded to the piece of angle iron 389. The motor 400 is fastened by bolts 402 to the plate 401 and to the angle iron 389. The shaft 403 of the motor 400 projects forwardly and has worm gear 404 fixed to it by setscrews 405.

There is a casting 407 that covers the shaft 403 and the worm gear 404. The casting 407 has internal and horizontal left and right sleeves 408 and 409, respectively. There are slots 410 and 411 through the tops of the sleeves 408 and 409, respectively, so that the sleeves can be tightened by bolts 412. There are a pair of ball bearings 415 fitted within the sleeves 408 and 409. The ball bearings 415 provide a rotatable amount for a shaft 416.

A gear 417 that meshes with the worm gear 404 is mounted between the ball bearings 415. The gear 417 is fixed to the shaft 416 by a key 418. There is a washer 419 bolted to the right end of the shaft 416 for locking the shaft against movement past the right ball bearing 415. There are certain driven connections to the shaft 416 that will be described.

Hollow cylindrical shafts 420 are bolted within the sleeves 408 and 409, respectively. Fixed within the left hand shaft 420 by a bolt 421 is a sleeve 422. The sleeve 422 projects beyond the end of the tube 420. At the opposite side of the casting 407, there is a sleeve 423 fastened within the right hand shaft 420, by a bolt 424.

There is a casting 425 having a cylindrical extension 426 that is screwed onto the end of the sleeve 422. Below the extension 426 and spaced therefrom, is another extension 427. The internal surface 428 of the extension 426 is cylindrical, and so is the internal surface 429 of the extension 427. There is an end cap 430 that covers the left end of the casting 425.

Opposite the casting 425, there is another casting 431 having a cylindrical extension 432 with a hollow tube 433 pinned within it. The hollow tube 433 slidably extends within the sleeve 423. A knob 434 having a bearing flange 435 for limiting its movement inwardly of the tube 433 has a cylindrical extension 436 that projects within the

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tube 433. There is a hook 437 on the inner end of the extension 436 for the attachment of a tension spring 438. The opposite end of the tension spring 438 is attached to a pin 439 that is connected to the sleeve 433.

Below the extension 432 of the casting 431, there is another extension 440 with an internal cylindrical surface 441 coaxial with the cylindrical surface 429 of the casting 425. There are a pair of ball bearings 442 fitted within the extension 427, and a similar pair of ball bearings 442 fitted within the extension 440.

There is a shaft 443 journaled to rotate within the ball bearings 441 and having pin elements 444 extending laterally from the sides of the enlarged head 445 on the inner end of a shaft 443.

Journaled within the bearings 442 there is a shaft 448 with a washer 449 limiting its movement in one direction and an enlarged cylindrical head 450 limiting its movement in the opposite direction. There are pin elements 451 and 452 projecting laterally from the side of the head 450.

There is an ink roller 454 that can rotate with the shafts 443 and 448. Within the left side of the ink roller 454 is a cylindrical block 455 having a recess 456 for receiving the head 445 of the shaft 443 with slots 457 for receiving the pins 444.

A similar block 458 is pressfit within the right side of the ink roller 454. The block 458 has a recess 459 for receiving the head 450 of the shaft 448, and slots 460 for receiving the pins 451 and 452.

There is a driving connection between the shaft 443 and the shaft 416 that includes a spur gear 463 fastened by a bolt 464 to the end of the shaft 443 so as to rotate coaxially therewith. It may be noted that the shaft 443 is locked against longitudinal movement by the spur gear 463 at one end and the head 445 at the other end.

The spur gear 463 meshes with a larger spur gear 465 journaled on a ball bearing that is bolted at 466 to the casting 425 between the extensions 426 and 427. The spur gear 465 in turn meshes with another spur gear 467 that is attached by a bolt 468 to the end of a shaft 469. The shaft 469 is rotatable within ball bearings 470 that are pressfitted within the cylindrical surface 428 of the extension 426.

The shaft 469 has an enlarged head 471 of the same diameter as the left end of the shaft 416. There is a cylindrical tube 472 fitted over the end 471 of the shaft 469 and over the left end of the shaft 416. The tube 472 is fastened by a pin 473 to the shaft 469 and by a pin 474 to the shaft 416.

There is a power cord 477 attached to the motor 400. The cord 477 is drawn through the tube 309 and over the pulley 320. The cord 477 is wrapped about a spring biased pulley 478 that is mounted to the panel 236 of the frame. From there it is connected by means not shown to a source of alternating current.

Operation of the Ink Applying Assembly

It can be seen from FIGURE 10 that the roller 454 can be caused to rotate upon energization of the motor 400. The power is transmitted through the motor shaft 403 and the worm gear 404 to the gear 417. The gear 417 transmits its rotational power through the shaft 416 and the tube 472 to the shaft 469. The spur gear 467 that is attached to the shaft 469 rotates with that shaft and causes the idler gear 465 to rotate. Rotation of the idler gear 465 causes the gear 463, with which it is in mesh, to rotate, and with the gear 463 the shaft 443 rotates. Because the pins 444 project within the slots 457 in the block 455, rotation of the shaft 443 causes the ink roller 454 to rotate.

The opposite end of the ink roller 454 is free to spin because the shaft 448 is rotatable within the roller ball bearings 442.

An important feature of the invention is the ease with which the roller 454 can be cleansed of ink. For this

purpose, it can be readily removed. The same removability allows replacement of the roller by a different sized roller, along with replacement of the sleeves 422 and 423. (Only the bolts 421 and 424 need be loosened for removal of these sleeves.) In removing the roller, the knob 434 is pulled, and the tube 433 can then slide outward of the sleeve 423. When the casting 431 moves outward, the pins 451 and 452 and the cylindrical head of the shaft 448 are drawn free of the recess 459 and the slots 460. The ink roller 454 can then be grasped and slid to the right, as viewed in FIGURE 10 to free the recess 456 and the slots 457 from the head 445 and pins 444 of the shaft 443. The tension spring 438 will always tend to draw the tube 433 within the sleeve 423 so that the shaft 448 will always be pressed against the block 458.

The relative movement of the carriage 285, the cam follower housing 307 and the roller conveyor assembly 370 will now be described, and for this purpose reference may be made to FIGURES 7 and 19.

Because the carriage 285 has rollers 297 and 298 that are always limited against vertical movement by the track 266, the carriage 285 can move only in a horizontal direction. On the other hand, the cam follower housing 307 includes the cam follower roller 313 that always follows the contour of the cam plate 267. Therefore, the cam follower housing 307 is subjected to vertical movement.

When the cam follower housing 307 is caused to move vertically relative to the carriage 285, the tubes 308 and 309 that are attached to the block 312 will also move vertically and slide within the cylindrical surfaces 288 and 289. For example, when the cam follower housing 307 is caused to move upwardly, the tubes 308 and 309 will slide upwardly, carrying with them the plate 323, the casting 330, and the sleeve 397, all of which are attached to the tubes. Of course, such upward movement of the casting 330 carries upwardly the squeegee 357 with the frame 342 to which it is attached.

The cam follower housing 307 will move upwardly for a short distance without affecting the position of the roller conveyor assembly 370, or until the top of the block 312 engages the under surface of the washer 394, all of the while compressing the spring 396. At the same time, the plate 323 and the casting 330 slide along the cylindrical tube 373.

When the block 312 presses upwardly against the washer 394 that is attached to the shaft 387, it causes that shaft to be raised. Raising of the shaft 387 lifts the plate 371, and with it the angle member 374 and the plate 401. This upward movement of the plate 401 causes the motor 400, and the casting 407 carrying the roller 454 and its drive connection to the motor, to be raised.

It should be here noted that the roller conveyor housing 370 can be separately adjusted in height relative to both the carriage 285 and the cam follower housing 307, by the simple rotation of the knurled knob 379. Rotation of the knob 379 causes the bolt 377 to turn within the sleeve 373. If it is turned further within the sleeve 373, the sleeve will be raised, carrying with it the plate 371 to which it is attached, and therefore the motor 400 and roller assembly. It will likewise cause the shaft 387 to be raised. Rotation of the knob 379 in the opposite direction will allow the weight of the motor 400 and the roller assembly, aided by the compression spring 396, to lower the roller assembly 370.

The Power Supply and Drive Train to the Ink Applying Assembly

The power that carries the ink supplying assembly 264 along the cam surface 267 is provided by a motor 500 mounted within the lower section 210 of the top frame assembly 52. To support the motor 500, there is an angle iron bar 501 welded between the plates 222 and 223, as illustrated in FIGURES 17, 19 and 23. A plate 502 having strengthening flanges 503 and 504 is welded

to the bar 501 and to the top plate 224 of the frame section 210.

A motor mounting plate 505 is fastened by bolts 506 to the plate 502. The plate 505 has a pair of outwardly extending arms 507. The arms 507 have holes 508 through them. Rotatably mounted within the holes 508 and spanning the distance between the arms 507 is a shaft 509 having a threaded hole 510 through its center along a diameter. A screw 511 having a hand wheel 512 is threaded through the hole 510.

Above the arms 507, there is an arm 513 that projects outwardly from the plate 508, and a pair of arms 514 are mounted by a pin 515 to pivot on either side of the arm 513. There is a rotatable shaft 516 journaled in holes 517 in the arms 514, and the shaft 516 has a threaded hole 518 through its center along a diameter for receiving the upper end of the bolt 511.

Integral with the arms 514 is a mounting plate 520, and the motor 500 is fastened by bolts 521 to the plate 520.

By reference to FIGURE 19, it can be seen that the motor 500 can be raised and lowered by pivoting the plate 520 about the pin 515. This pivoting is accomplished by turning the hand wheel 512. Because the shafts 509 and 516 are rotatable within their mounts, the threads that mesh with the bolts 511 will not jam, regardless of the pivotal position of the motor 500.

There is a variable speed pulley 525 driven by the motor 500. A belt 526 is looped over the pulley 525.

There are a pair of bearings 527 and 528 mounted in the plates 236 and 237, respectively, of the frame. Journaled to rotate within the bearings 527 and 528 is a primary drive shaft 529. A pulley 530 is fastened to the end of the shaft 529, and the belt 526 is passed about the pulley 530. The tension on the belt 526 can be regulated upon pivoting of the motor 500 by rotation of the hand wheel 512.

Mounted between the pulley 530 and the bearing 527 is a spur gear 531. At the opposite end of the shaft 529 there is mounted a solenoid energized brake wheel 532 that is of conventional construction and operation.

Forward of the main drive shaft 529, and slightly above it, there is an intermediate drive shaft 536. The shaft 536 is journaled to rotate within the bearings 537 and 538 that are mounted to the plates 249 and 236, respectively. There is a large spur gear 539 mounted to rotate with the shaft 536 and to mesh with the smaller spur gear 531 on the shaft 529. Also mounted on the shaft 536 is a smaller spur gear 540.

Located still further forward in the machine and at the same level of elevation as the shaft 536 is another shaft 541 that is mounted within bearings 542 and 543. The shaft 541 has an end 544 that projects beyond the bearing 543.

A large spur gear 545 is mounted to rotate with the shaft 541 and to mesh with the spur gear 540. Onto the projecting gear 544 of the shaft 541 is mounted a sprocket wheel 546.

Toward the forward end of the machine, there is another and larger sprocket wheel 547 journaled in a suitable bearing 548 that is mounted to the side plate 236 by a bolt 549. Between the sprocket wheels 546 and 547 there is an idler sprocket wheel 550 journaled in a suitable bearing 551 that is mounted to a plate 552. The plate 552 has slots 553 in its corners and is fastened by bolts 554 to the side plate 236 so that it can be slid horizontally within the limits of the slots 553.

Referring to FIGURE 17, it will be noted that the sprocket wheel 546 has approximately the same radius as the radius of the arcuate portion between the points 274 and 275 of the cam 267, that the idler wheel 547 has a radius that is approximately the same as the arcuate portion 280 of the cam 267 and that the idler wheel 550 is mounted so that its peak occurs opposite the point 277 of the cam 267. It will be further noted that there is a

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sprocket chain 556 looped about the sprocket wheels 546, 547 and 550, and that the shape of the sprocket chain 556 as well as its size, from FIGURE 17, appears to be substantially the same as the shape and size of the cam surface contour of the cam plate 267.

The sprocket chain 556 is connected to the block 312 of the cam follower housing 307. For this purpose, it can be seen from FIGURES 3 and 6 that there is a special block 558 having an integral shaft 559 projecting from one end and a pair of spaced pins 560 projecting from the opposite side. The shaft 559 is fixed tightly to the block 312 with the plate 558 fitting within a suitable recess 561 in the block 312.

Two links 562 and 563 of the chain 556 are slipped over the pins 560, and are held in place by a plate 564 that is in turn held in place by cotter pins 565. The pins 560 thus form a part of the sprocket chain 556 so that as the sprocket chain moves along the path defined by the wheels 546, 547 and 550, it carries with it the pins 560 and, therewith, the cam follower housing 307.

Above the sprocket wheel 547, there is a counter micro-switch 568 that is adjustably mounted on a plate 569. The plate 569 is fastened by bolts 570 to the side panel 236 of the frame. The switch 568 has a switch arm 571, which is in the path of the plate to be actuated by that plate.

From FIGURES 12, 19 and 23, it can now be appreciated that power is delivered by the motor 500 to the ink applying assembly 264 by way of the belt 526 that is driven by the motor pulley 525. The belt 526 rotates the pulley 530 and the spur gear 531. The spur gear 531 meshes with and drives the gear 539, causing the gear 540 to rotate. Rotation of the gear 540 drives the gear 545 and the sprocket wheel 546 so that the chain 556 drives the ink applying assembly 264.

The Switch Control Mechanism for the Power Motor

There is a drive train that is operated by the shaft 541. It includes a sprocket wheel 575 that is mounted to rotate with the shaft 541, as shown in FIGURE 12. There is a sprocket chain 576 that is driven by the wheel 575 and the sprocket chain 576 drives a sprocket wheel 577, the sprocket wheel 577 being mounted to a shaft 578 and the shaft 578 being journaled in bearings 579 and 580. These bearings are mounted to the plates 249 and 236, respectively.

A spur gear 581 meshes with the larger spur gear 582 that is mounted on a shaft 583. The shaft 583 is journaled in bearings 584 and 585 that are mounted to the panels 249 and 236, respectively. There is an end 586 of the shaft 583 projecting beyond the bearing 585.

There are means for automatically stopping the chain 556 at any predetermined position thereof by opening the circuit to the motor 500. These means include a cam 590 that is mounted on the shaft 583. As can be seen in FIGURE 15, the cam 590 has a raised portion 591 over approximately one-fifth of its surface. The raised portion 590 is a switch actuator for actuating the arm 592 of a switch 593. The switch 593 is fastened by bolts 594 to the plate 236.

As shown in FIGURE 16, there is a setscrew 595 for fixing the cam 590 to the shaft 583. The setscrew 595 can be loosened to adjust the position of the raised actuating portion 591 according to the position of the cam 590 at which it is desired to actuate the switch.

Connected to the shaft 541 is another switch mechanism for controlling the operation of the motor 500. This mechanism includes a cam 598. The cam 598 has a switch actuator 599 on its surface in the form of a raised bump.

Next to the cam plate 598 is a ball bearing assembly having an inner race 600 that is fixed to the shaft 541 and an outer race 601 that is rotatable relative to the inner race. Fixed to the outer race 601 is a switch arm

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602 having a forwardly extended portion 603 with an upper curved surface 604. A microswitch 605 is mounted to the opposite end of the arm 602 with a switch lever 606 in the path of the actuator 599.

The switch arm 602 is rotatable about the shaft 541, that is limited in its rotational path by the position of the shaft 536 in one direction and by an adjusting bolt 610 in the opposite direction. The adjusting bolt is threaded through a bushing 607 fixed to the front plate 250 of the frame, and there is a locknut 608 on the bolt 610. A handle 609 is provided for turning the bolt 610.

Operation of the Motor Switch Control

An examination of FIGURE 13 will show that the position of the switch 605 can be controlled by rotation of the handle 609. The solid line position of the switch 605 and the arm 602 shows one extreme position of the switch at which the actuator 599 will strike the lever 606. The dotted line position of the arm represents another position at which the switch 605 will be actuated upon a rotation of the cam 598 to a different position. The movable arm 602 thus provides a means for varying the point at which the actuator 599 starts the switch lever 606, and this variation can be selected according to the position at which it is desired to stop the sprocket chain 556 and with it the ink applying assembly.

The wiring for the switches is not illustrated, but they are connected in parallel so that both must be opened before the motor 500 is deenergized. Therefore, the actuator 599 must trip the switch lever 606 at a time when the raised surface 591 of the cam 590 is actuating the switch 593. Because of the reduction in speed between the shaft 541 and the shaft 583 (the sprocket wheel 575 being smaller in diameter than the sprocket wheel 577 and the spur gear 581 being smaller in diameter than the spur gear 582), the cam plate 598 will make a number of revolutions during every single revolution of the cam plate 590. Accordingly, the adjustment of the position of the switch on 602 can be employed to adjust the stopping position of the sprocket chain 556 in small increments but over a relatively short span of variations. On the other hand, if it is desired to stop the sprocket chain 556 at a point or position that is a considerable distance from the position resulting from any given setting of the cams 590 and 598, the setscrew 595 can be loosened and the cam plate 590 rotated about the shaft 583. By this means a great change in the stopping position can be accomplished because the cam plate 590 makes only a single revolution for every complete cycle of the sprocket chain 556. The cam plate 590 having been adjusted, the position of the switch plate 602 can be set according to the exact position at which the chain pitch 556 is to be stopped.

Automatic Control of the Screen Frame Holder and the Vacuum Control

There are means provided for automatically raising and lowering the screen frame holder 180 during the cycle of the ink applying assembly about the cam plate 267. As shown in FIGURES 12 and 17 this means includes a cam plate 613 connected to the ends 586 of the shaft 583. The cam plate 613, like the cam plate 590, makes a single revolution for every cycle of the sprocket chain 556. The cam plate 613 begins at a point 614 of relatively short distance from the shaft end 586 and continues for slightly less than half of its perimeter over a portion 616 that is of gradually increasing diameter to the point 617. From the point 617 to a point 618, opposite, the point 615, the cam plate 613 is of uniform diameter. There is a sharp break 619 between the points 618 and 615.

There is a cam follower in the form of a roller 620 that is fastened between a pair of follower arms 621. The follower arms 621 are pivotally attached to a bracket 622 which is in turn fastened by bolts 623 to the plate 243 of the frame.

At the free end of the follower arms 621 are a pair of setscrews 624 and 625. The setscrews 624 and 625 are

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threaded through blocks 626 and 627, respectively, that are welded to the tops of the arms 621.

There is a connecting block 630 that fits between the arm 621 and that is pivotally attached therebetween by a bolt 631. The block 630 can be pivoted about the bolt 631 according to the position of the setscrews 624 and 625.

Pivotally attached to the reduced end 632 of the block 630 by a bolt 633 is a U-bracket 634 that is fastened to a connecting rod 635.

The shaft 203 that is connected between the brackets 201 which support the screen frame 180 has been alluded to. A lever arm 636 is welded to that shaft 203. At the lower end of the connecting rod 635 there is connected a U-shaped bracket 637 and this bracket 637 is pivotally attached by a bolt 638 to the lever arm 636. There is a slot 639 through the plate 63 in the frame through which the lever 636 projects.

As can be seen in FIGURE 17, when the arms 621 pivot, the rod 635 will be reciprocated. Reciprocation of the rod 635 causes the lever arm 636 to pivot the shaft 194 to thereby tilt the screen frame holder 180 upward.

The lever arm 636 performs another function and that is to open and close the valve 174 to the vacuum source 176 that leads to the table 158. As shown in FIGURE 2, the valve 174 includes a lever arm 642 that is pivotally connected to the body of the valve 174 and that includes a valve closing member 643. The lever arm 642 also includes a roller 644 that is in the path of the lever arm 636.

The valve 174 is so constructed that when the valve actuating member 643 moves downward, the valve is opened, admitting a vacuum connection between the vacuum source 176 and the table 158. When the actuating member 643 is moved upwardly upon depression of the lever arm 636 against the roller 644, the valve is shut off, thereby releasing the vacuum pressure from the table 158. Because of this valve operation that has been described, whenever the screen is raised, the vacuum is disconnected from the table so that the blank upon which the printing operation has been performed can be readily removed. When the screen is returned, the blank is held to the table by the suction of the vacuum.

There is a spring arrangement that counterbalances the weight of the screen frame holder 180 and causes the screen to be raised when the lever arms 621 and rod 635 drop. For this purpose, there are a pair of slots 648 and 649 through the plates 63, and passed through these slots 648 and 649, respectively, are a pair of lever arms 650 and 651. The lever arms 650 and 651 are welded to the shaft 203 at one end. To their opposite ends are pivotally connected, by bolts 652 and 653, a pair of U-brackets 654 and 655, respectively. The U-brackets 654 and 655 are connected to a pair of rods 666 and 667 that are passed through the holes 235 in the plates 225 and 226.

There are a pair of compression springs 668 and 669 seated upon the brackets 654 and 655, respectively, and pressed against the under side of the plates 225 and 226. The compression springs 668 and 669 constantly tend to press the lever arms 650 and 651 downwardly to pivot the screen frame holder 180 away from the table 158. They are held against pivoting the screen frame holder 180 by the position of the cam follower 620 about the cam plate 613.

Again referring to FIGURE 17, the tilting action of the screen upward and away from the table is performed by the strength of the springs 666 and 667 when they are released to operate by the position of the cam 613. Thus, when the cam follower reaches the point 618, the arms 621 are free to drop under the force of the springs 666 and 667 so that the rod 635 can reciprocate downwardly and cause the lever arm 636 to pivot the screen upwardly. The screen is returned when the cam follower rides upwardly under the influence of the cam surface between the points 615 and 617.

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There is a lever 675 that is accessible from the exterior of the machine for preventing the tilting of the screen 180 during the otherwise normal cycle of operation. The lever 675 is pivotal within a bushing 676 that passes through the plate 63 of the frame, as shown in FIGURE 22. The shaft portion 677 of the lever 675 that passes through the bushing 676 has a lever arm 678 attached to its inner end, and at the extreme end of the lever arm 678 there is attached, by a bolt 679, a roller 680.

As shown in FIGURE 27, the lever arm 675 can be shifted to revolve the roller 680 to the upward position illustrated at which it abuts the underside of the arm 651 that is welded to the shaft 203. With the roller 680 in that upper position, the screen cannot pivot so that when the cam 613 rotates to the position at which the rod 635 would normally drop, it will be prevented from dropping because of the position of the lever 675.

There is a shock absorber 685 for reducing the shock of the screen movement. The shock absorber is particularly shown in FIGURES 19 and 22. For mounting the shock absorber 685, there are a pair of spaced-apart plates 686 and 687 welded between the wall 211 and the angle member 501. One end of the shock absorber is pivotally attached between the plates 686 and 687 by a bolt 688.

There are a pair of slots 689 and 690 through the plate 63, and passed through the slots 689 and 690 are a pair of lever arms 691 and 692. The lever arms 691 and 692 are welded at one end to the shaft 203. The lower end of the shock absorber 685 is pivotally attached between the lever arms 691 and 692 by a bolt 693. The shock absorber is of the conventional hydraulic type.

The Skip Print Control Assembly

The skip print mechanism will now be described. It is the mechanism for pivoting the upper frame 52 about the lower frame 51.

There are a pair of angle members 700 and 701 welded to the side plates 214 and 215, respectively, between the blocks 222 and 223 and the back plate 212. Welded adjacent the front of the bars 700 and 701, and to their tops, is across angle member 702. There is a similar cross angle member 703 welded to the tops of the bars 700 and 701 at their rearward end.

Below the angle members 700 and 701 are another pair of angle members 704 and 705, the ends of which are welded to the plates 63 and 64 of the lower frame section 51. As can be seen in FIGURE 20, the angle members 704 and 705 are placed inwardly from the sides 61 and 62 of the frame, but are, nevertheless, parallel to the bars 700 and 701. There are a pair of bearing blocks 706 fastened by bolts 707 to the rearward ends of the bars 704 and 705. A shaft 708 is journaled between the bearing blocks 707 and is rotatable relative thereto.

Referring to FIGURES 25 and 26, there are a pair of plates 710 and 711 that are fastened by bolts 712 to the under side of the bars 702 and 703. There are spacer blocks 713 between the bars 702 and 703 and the plates 710 and 711. The plates 710 and 711 are welded to the bars 713 and the bars 713 are bolted to the angles 702 and 703.

At the forward ends of the plates 710 and 711 there is a long bolt 715 that passes between them. Pivotally mounted on the bolt 715 are a pair of spaced-apart plates 716 and 717 held together by an integral central spacer 718. There are coaxial holes 719 through the forward ends of the bars 716 and 717 and coaxial holes 720 through the rearward ends of the bars. The bolt 715 passes through the holes 719. There is a hole through the center spacer portion 718 of the bars 716 and 717 with a jamb nut 721 at its top. A bolt 722 is threaded into the nut 721. The bolt 722 can pass through the central portion 718.

Beneath the bars 716 and 717, there is welded to the underside of the plates 710 and 711 a cross plate 725.

The end of the bolt 722 bears against the top of the cross plate 725.

Welded to the tops of the plates 710 and 711, and forward of the plate 725 is another cross plate 726. The cross plates 726 has a hole through it with a jamb nut 727 across the top of the hole. There is a bolt 728 threaded into the nut 727 and through the plate 726. The bolt 728 bears against the middle section 718 of the plates 716 and 717 forward of the bolt 722.

By means of the two bolts 722 and 728, the position of the plates 716 and 717 can be adjusted. The bolt 722 determines the lowermost limit of the plates and the bolt 728 the uppermost limit.

Pivotally mounted by a pin 730 through the holes 720 is a generally triangular plate 731 having a square cornered notch 732 cut in its lower rearward corner. Forward of the notch 732, there is a hole 733 through the plate 731.

There are a pair of plates 735 and 736 affixed to the shaft 708. The plates 735 and 736 are generally triangular in shape, as illustrated in FIGURE 26, and have notches 737 cut in their upper rearward ends. A block 738 is welded to the notches of each plate 735 and 736. Forward of the block 738 and above it, each of the plates has a hole 739 through it. The holes 739 are coaxial.

Connected with the plates 716 and 717, and between them, to the plates 710 and 711 is a triangular block 740. The triangular block 740 has holes 741, 742 and 743 through it. The pin 715 passes through the hole 741.

On either side of the plate 740, there are a pair of bars 745 and 746 pivotally attached to the plate 740 by a bolt 747 that passes through holes 748 and 749, respectively of the bars 745 and 746, and through the holes 743 of the plate 740. At the opposite end of the bars 745 and 746 there are a pair of coaxial holes 750.

There is a pin 751 that passes first through the hole 739 in the plate 735, then the hole 750 in the bar 745, the hole 733 in the plate 731, the hole 750 in the bar 746, and finally is threaded into the hole 739 which is tapped for the purpose. The plate 731, the bars 745 and 746, and the plates 735 and 736 can all pivot about the pin 751.

Referring to FIGURE 19, it can be seen that there is a rod 754 having a U-bracket 755 that is pivotally attached by a bolt 756 to the hole 742 in the plate 740.

A block 757 is bolted to the plate 737 of the frame, as shown in FIGURE 22, and the block 757 pivotally supports a pair of lever arms 758 and 759 that are welded together at right angles to one another. The upper end of the rod 754 includes an eye-member 760 that is pivotally attached by a bolt 761 to the end of the lever arm 758.

Another rod 763 is pivotally attached by a bolt 764 to the other lever arm 759.

At the forward end of the machine, there is an angle iron member 766 having a pair of arms 767 and 768 welded to it that is fastened by bolts 769 to the front plate 244. A cast connector 770 having a recess 771 in it is fastened by a bolt 772 between the arms 767 and 768. The casting 770 has an eccentric extension 774 above the recess 771 and the forward end of the rod 763 is pivotally attached to the extension 774 by a bolt 775. There is a lever 776 that projects through the slot 246 in the front of the frame and is tightly secured within the recess 771.

Operation of the Skip Print Assembly

The operation of the "skip print" mechanism is as follows. When the lever 776 is raised or pivoted about the pin 772, it causes the rod 763 to reciprocate rearwardly. When the rod 763 so reciprocates, it pivots the lever arms 758 and 759 which are welded together, so as to cause the rod 754 to reciprocate downwardly. Downward movement of the rod 754 causes the triangular plate 740 to move rearwardly. When the plates 745 and 746 move rearwardly, they force the plates 735 and 736 to

pivot rearwardly about the shaft 708, and the plate 731 to pivot rearwardly about the pin 730. This pivoting of the plates 731 and the plates 735 and 736 reduces the distance between the pins 730 and the shaft 708. Because the shaft 708 is fixed in position, the upper housing section 52 will be caused to pivot about the pins 216 and 217. This pivoting will cause the rear end of the upper housing section 52 to be lowered and the front part of the upper section to be raised, raising with it the ink applying assembly 265.

There is a bar 779 having its ends fixed to the plates 222 and 223. There is a plate 780 welded to the bar 779 and having a hole 781 through it.

A plate 782 is welded to the shaft 708. The plate 782 has a hole 783 through it. Connected to the holes 781 and 783 is a tension spring 785 having hooks 786 and 787 that are inserted in the holes 781 and 783, respectively. The tension spring 785 tends to return the plates 731, 735 and 736 to their forwardmost position.

The forwardmost position of the plates 731 and 735 and 736 is limited by the abutment of the block 738 within the notch 732 of the plate 731. There are a pair of compression springs 790 and 791 for counteracting the weight of the frame and mechanism when pivoting the upper section 52. The mounting means for the springs 790 and 791 include a pair of brackets 792 and 793 that are welded to the plates 61 and 62, respectively. A pair of rods 794 and 795, and having nuts 796 threaded onto their lower ends, are passed through holes in the angle members 700 and 701, as illustrated in FIGURE 24. The upper ends of the rods 794 and 795 have washers 797 and 798 welded to them. The compression springs 790 and 791 are seated between the angle members 700 and 701 and the washers 797 and 798. The springs 790 and 791 bias the rear part of the upper frame section 52 in a downward direction about the pivot pins 216 and 217. The strength of the springs 790 and 791 is such that when the lever 776 is pivoted, the additional force required to pivot the upper part of the machine will be within the strength of the operator of the machine.

General Operation

The wiring for the machine is not illustrated in the drawings. Specifically, it is not a principal part of the invention. It may be pointed out that there are certain switch controls on the front of the machine for operating the various parts of the printing press.

Referring to FIGURE 1, a switch plate 800 is mounted on the front plate 244 of the frame, and the switch plate 800 includes a "run-job" switch 801, an "on" switch 802, and an "off" switch 803.

To the right of the plate 800, as viewed in FIGURE 1, and mounted upon the plate 255 of the frame, is another switch plate 805 having mounted thereon a timer dial 806, a counter 807 (energized each time the plate 564 actuates the microswitch 568), a manual-automatic switch 808, a vacuum switch 809 and a roller switch 810.

The wiring for the switches is such that, when the switch 808 is set for "manual," the "run-job" switch 801 must be depressed for each cycle of the ink applying assembly 264. In other words, when the switch 801 is depressed the motor 500 will be energized to cause the sprocket chain 556 to make one cycle of movement about the sprocket wheels 546 and 547. Once the motor 500 is deenergized by the cam plates 590 and 598, striking their respective switches 593 and 605, the motor 500 will remain deenergized until the switch 801 is again depressed.

Normally, the machine is turned on by depression of the switch 802 (after which the switch 803 must be depressed to turn the switch off) and the switch 808 is set for "automatic." Ordinarily, when the switch 802 had been depressed, the switch 809 will be turned on to energize the vacuum source 176, and the switch 810 will be turned on to energize the roller motor 400.

The timer dial 806 is connected to the motor 500 by

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suitable electric circuitry to control the duration of pause during which the motor 500 remains deenergized each time the switches 593 and 605 open the motor circuit. In the preferred embodiment, the timer 806 is wired to permit pause or open time between the range of zero and fourteen seconds.

To begin the operation of the machine, the table assembly 71 is fastened to the front plate 55 of the frame by positioning the bolts 72 in those ones of the holes 70 that will provide the approximate height of the table that is desired. (This particular adjustment will rarely be necessary.) Thereafter, the wheels 116 and 118 are rotated to fix the angular position of the table and the handwheel 89 is rotated to fix the exact height of the table, usually determined by the space that is to be fixed between the screen and the blank on the table. If the table is to be moved sideways, the wheels 130 and 132 are rotated to provide the exact position of the table in that direction and the wheels 149 and 154 may be rotated to exact the position of the table fore and aft.

Operation of the machine begins with the roller conveyor assembly 370 in a raised position, e.g. the cam follower 313 positioned on the upper surface of the cam plate 267. In this position of the roller conveyor assembly, the screen frame 180 is in a raised position because of the depression of the lever arm 636 by the connecting rod 635.

The blank material can be placed upon the table 158 either before or after the screen frame has been clamped into the screen frame holder.

The height of the roller conveyor assembly, and therefore the ink roller 354, is separately adjusted by rotation of the knurled knob 379. This adjustment is as has already been described. Likewise, the position of the squeegee in a vertical direction can be adjusted by rotation of the knobs 349 and 350, and in an angular direction by adjustment of the knobs 362 and 365. These adjustments also have been described.

The machine is started by depression of the switch 802 and the flicking of the toggle switches 809 and 810 that control the vacuum and roller motor 400, respectively, and assuming that the timer 806 has been set for a desirable pause period, the machine will begin a cycling operation.

With the motor 500 energized, the sprocket chain 556 will move along the path determined by the sprocket wheels 546, 547 and 550. It will carry with it the roller block 312 and the roller conveyor assembly 370 while the carriage 385 reciprocates within the tracks 266. During this movement of the sprocket chain 556, the motor 500 also causes the cam 613 to rotate to in turn cause the cam follower 620 to ride along the surface portion 616. The simultaneous operation of the sprocket chain 556 and the cam plate 613 causes the screen frame holder 180 to be lowered during the forward motion of the roller conveyor assembly 370.

When the roller conveyor assembly 370 reaches the point 278 on the cam plate 267, it is brought around the forward surface of the cam plate, to the point 273, at which the roller 354 is in its lowermost position relative to the screen. The assembly then moves along a rearward path, guided by the tracks 266 and by the lower horizontal surface 272 of the cam plate 267. During this travel, the roller 454 continues to rotate.

As the roller assembly 264 reaches the rearwardmost extent of its stroke, prior to the point beyond which the roller 545 is raised by the cam plate 267, the roller 454 passes through an ink pan (not shown), and the rotating roller 454 picks up a film of ink. It carries the film of ink as it is raised by the cam plate 267. Even though the ink is carried by the roller 454, there is no dripping of the ink because the roller continues to rotate.

As the roller is raised by the cam plate 267, the cam plate 613 reaches the position at which the cam follower

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620 drops past the surface 619. This action lowers the connecting rod 635 and raises the screen frame holder 180.

When the screen frame holder 180 is pivoted upwardly, the arm 636 depresses the valve lever 642 and closes the vacuum connection to the table 158. Thereafter, while the screen frame holder 180 remains in a raised position, the blank material can be removed and replaced by a subsequent one.

When the ink applying assembly 264 reaches a predetermined position relative to the cam plate 267, the motor 500 will be deenergized. This will occur because the cam plates 590 and 598 will both be in position to actuate their respective switch arms 592 and 606. The motor 500 will remain deenergized for the period that has been set by the timer 806.

Upon determination of the pause duration, the motor 500 will be reenergized, and the ink applying assembly 264 will move forwardly as has been described. When the roller 454 is dropped to its lowermost position, and the screen frame holder 180 is pivoted downwardly against the table 158, the ink applying assembly again moves across the screen. The ink roller 454 spreads ink across the screen over the blank material and the squeegee 357 immediately follows the roller at a constant velocity.

It should now be noted that the velocity of the squeegee is constant throughout the entire printing stroke, inasmuch as the ink conveying assembly does not stop upon deenergization of the motor 500 until it has again reached a raised position.

If it is desired to cause the machine to "skip print" the lever 776 can be operated at has been described. This will raise the ink conveying assembly 264 away from the table 158 so that the printing stroke will be made with the roller 454 spaced above the table, and the machine will not print.

Various changes and modifications may be made within the process of this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A printing press comprising a table for supporting blanks to be printed and a roller assembly, having an ink roller and a wiper, automatically operable means for moving the roller assembly past the top of the table, means for adjusting the height of the table relative to the roller assembly, other means for adjusting the height of the roller relative to the top of the table, means for adjusting the height of the wiper relative to the roller and means for adjusting the angle of incidence of the wiper relative to the table.

2. A printing machine comprising a mounting frame, a substantially horizontal table connected to the mounting frame and a printing carriage supported by the mounting frame, the mounting frame including first guide means parallel to the top of the table, means connected to the carriage for maintaining continuous contact with the first guide means, means for reciprocating the carriage between the ends of the first guide means, ink spreading means and ink wiping means supported by the carriage, the wiping means comprising a resilient flexible blade, means for adjusting the height of the blade relative to the ink spreading means, means for adjusting the slope of the blade, and additional guide means including a cam surface and cam follower for vertically reciprocating the ink spreading means and ink wiping means relative to the carriage upon movement of the carriage to predetermined positions along the first guide means, the cam surface having a lower face against which the cam follower bears during movement of the carriage in a first direction, the cam surface having an upper face spaced above the lower face against which the cam follower bears during movement of the carriage in a second direction opposite to the said first direction, the lower face being positioned to oppose upward movement of the cam follower to

thereby hold the ink spreading and ink wiping means in printing position, the upper face being positioned to oppose downward movement of the cam follower to thereby hold the ink spreading and ink wiping means above the printing position.

3. The printing machine of claim 2 including means for adjusting the position of the lowermost extreme of reciprocation of the ink spreading means and ink wiping means relative to the carriage.

4. The combination of claim 2 wherein the several adjusting means are accessible externally of the machine.

5. The combination of claim 2 with means for increasing the distance between the guide means and the table to provide for skip print operation of the machine.

6. The combination of claim 2 with means for halting the reciprocation of the carriage at a position in which the ink spreading means and ink wiping means have reciprocated above the lowermost extreme thereof.

7. The combination of claim 6 wherein the halting means includes means for deenergizing the reciprocating means at selective positions of movement of the carriage.

8. The combination of claim 6 wherein the speed of reciprocation is constant.

9. A printing machine comprising a frame for supporting a table and a carriage, an ink applying assembly supported by the carriage for vertical movement relative thereto, the carriage and ink applying assembly being positioned above the table, horizontal track means for guiding the carriage, the ink applying assembly having a cam follower carried by it, the frame including cam surface means against which the cam follower is adapted to bear for determining the position of the assembly, a power source and flexible drive means connected to the power source and to the carriage for reciprocating the carriage between the limits of the track means, the flexible drive means causing the cam follower to bear against the cam surface means, the cam surface means having a configuration for causing the follower to move toward and away from the table and including a surface for preventing movement of the ink applying assembly away from the table during movement of the carriage in one direction, and another surface for moving the ink applying assembly away from the table during movement of the carriage in the other direction of reciprocation, a screen over the table, and means for pivoting the screen away from the table automatically during movement of the ink applying assembly in its elevated position.

10. The printing machine of claim 9 with means for rendering the screen pivoting means inoperative.

11. The printing machine of claim 9 wherein the ink applying assembly includes roller means, and motor means carried by the assembly for rotating the roller means.

12. The machine of claim 11 with cord means for supplying power to the motor and means for maintaining a substantially constant tension on the cord means regardless of the position of the assembly.

13. The machine of claim 11 with means for adjusting the height of the roller means relative to the guide means.

14. A printing machine comprising a frame having an ink applying assembly mounted above a blank supporting table, means for reciprocating the assembly in a hori-

zontal direction, past the table and in a vertical direction toward and away from the table, a power source for operating the reciprocating means, automatically operative means including a cam and microswitch for stopping the reciprocating means at a selective position of the assembly and a second cam and second microswitch operative in response to the position of the second cam for triggering the stopping means.

15. The machine of claim 14 wherein the position of each cam relative to its microswitch is separately adjustable according to the position at which the ink applying assembly is to be stopped.

16. The machine of claim 14 wherein the stopping means includes pause and restart means for repeating the cycle of the ink applying assembly.

17. The machine of claim 16 wherein the pause time is adjustable in duration.

18. The machine of claim 17 with means to cause the ink applying assembly to move short of the table during reciprocation for a skip print operation during otherwise normal cycling of the assembly.

19. A printing machine comprising a frame for supporting a table and an ink applying assembly, the ink applying assembly being positioned above the table and having a cam follower carried by it, the frame including cam surface means against which the cam follower is adapted to bear for determining the position of the assembly, a power source and flexible drive means connected to the power source and to the ink applying assembly, the flexible drive means causing the cam follower to bear against the cam surface means, the cam surface means having a configuration for causing the follower to move toward and away from the table, the ink applying assembly including a first part that is reciprocable horizontally, the frame having means for precluding vertical movement of the first part, another part of the ink applying assembly carrying the cam follower and being reciprocable vertically relative to the first part, and an ink applying roller and a squeegee attached to the other part.

20. The combination of claim 19 wherein the roller and squeegee are separately vertically adjustable and there are means for adjusting the position of the table.

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