

- [54] **WEB REGISTRATION WITH WEB PULL-BACK AND SKEWING MEANS**
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- [73] Assignee: **said James A. Black**, by **said Harry Russell Farwell**
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- [52] U.S. Cl. **101/115; 101/124; 101/126; 101/129; 101/181; 101/426**
- [51] Int. Cl. **B41f 15/24; B41f 13/04**
- [58] **Field of Search** **101/124, 228, 231, 232, 101/248, 426, 114, 115, 116, 126, 129, 118, 181; 271/54, 58, 59; 226/6, 52, 62, 64, 143**

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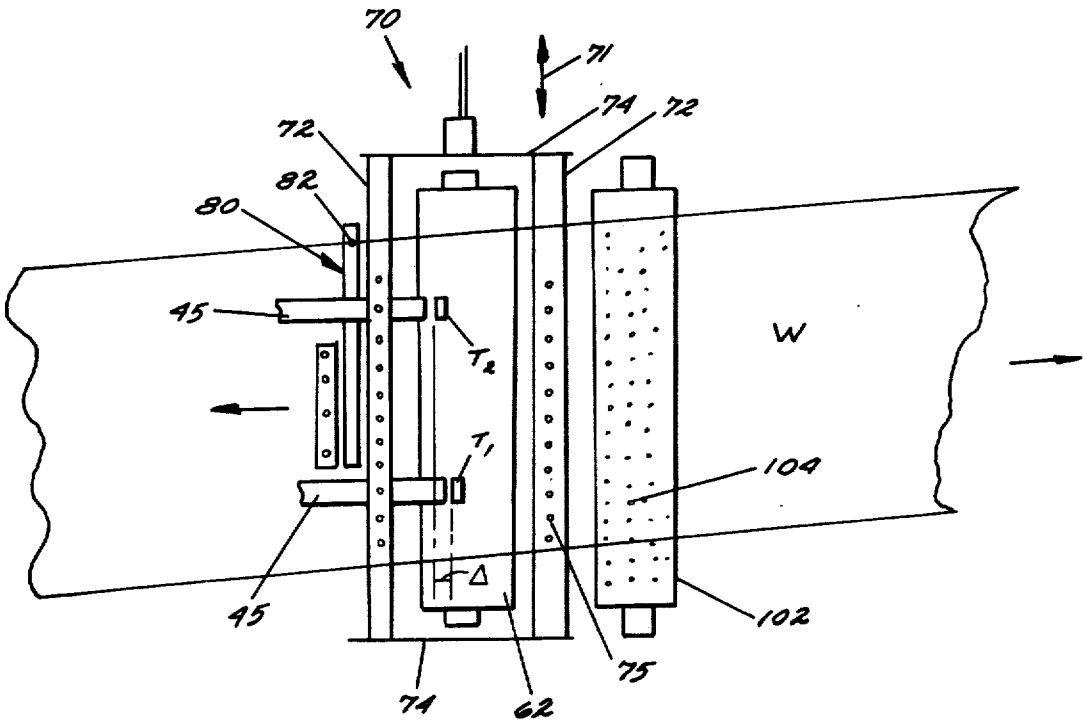
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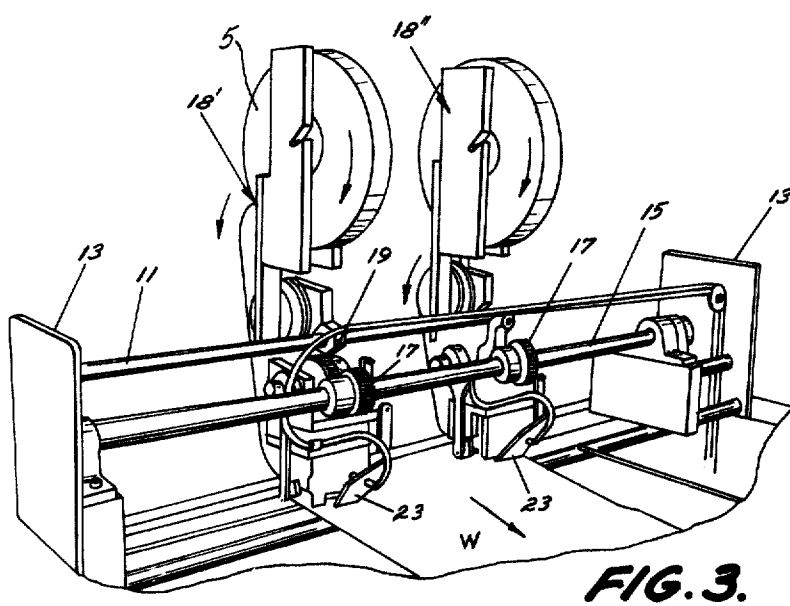
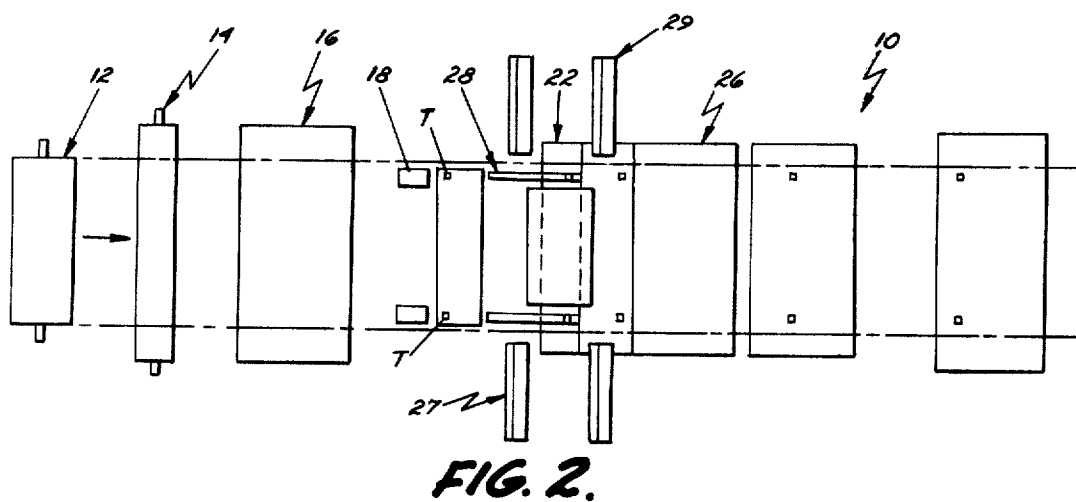
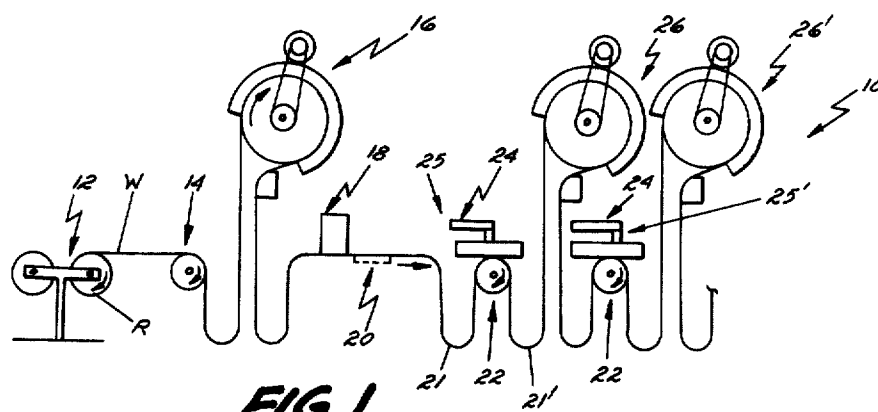
Primary Examiner—Edgar S. Burr
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Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A screen printing press utilizes a continuous printing web to which is applied a pair of spaced web registration tabs for each printing area. The web is fed into a printing station and during a registration portion of each printing cycle, is drawn against a pair of registration blades spaced to contact the tabs to provide longitudinal registration of the web with respect to the printing cylinder such that the web is skewed slightly. Lateral registration of the web is achieved by drawing the web to one side of the printing press until its edge is detected by sensing means. The screen frame carriage is registered with the print cylinder by a pair of adjustable stops on the carriage which contact the resiliently movable printing cylinder to assure predetermined alignment between the carriage and the print cylinder at the initiation of the printing portion of each cycle of operation. The continuous web can be fed through a plurality of such printing stations between which are interposed drying stations to provide multicolored prints.

27 Claims, 24 Drawing Figures





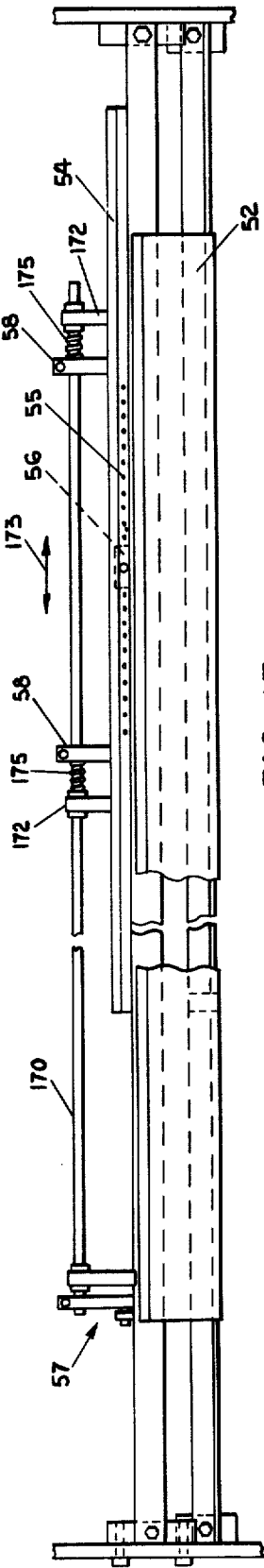


FIG. 13

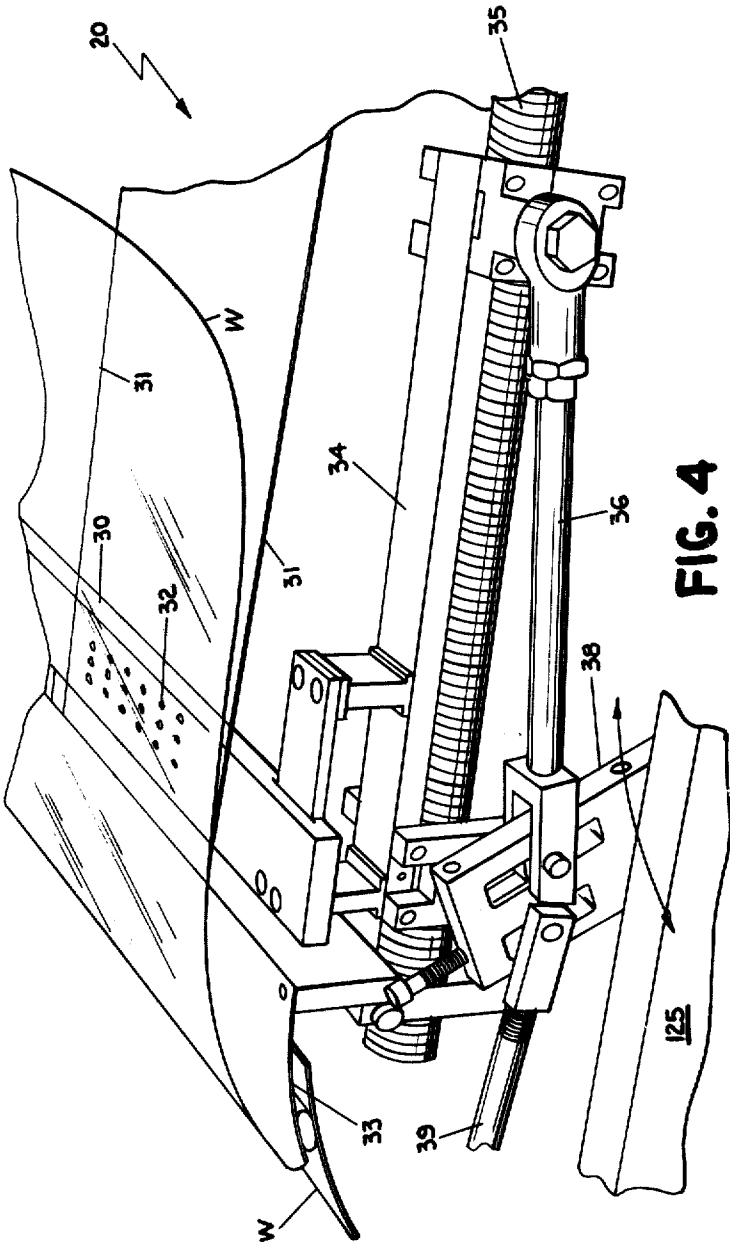


FIG. 4

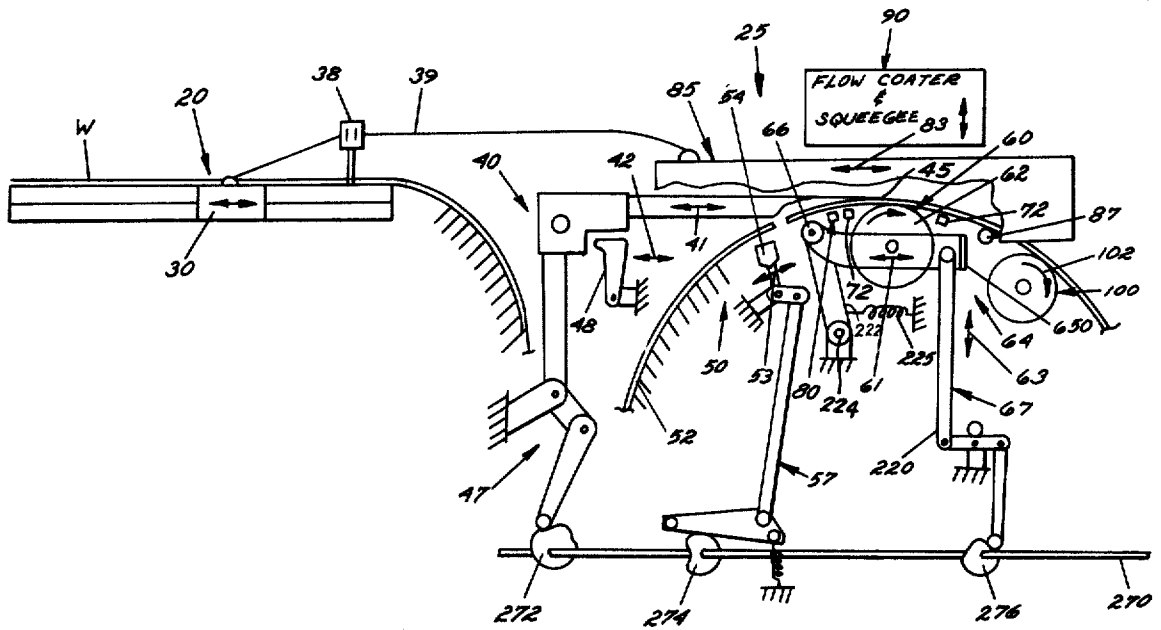


FIG. 5.

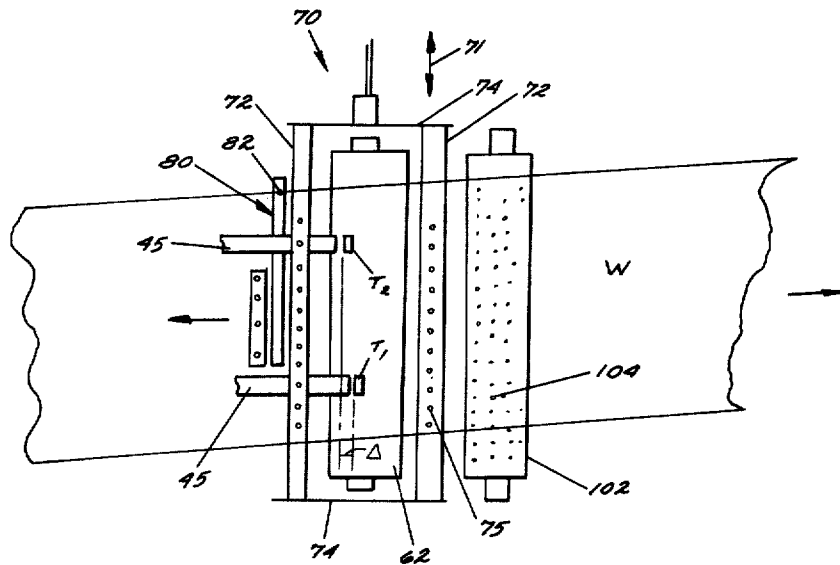


FIG. 6.

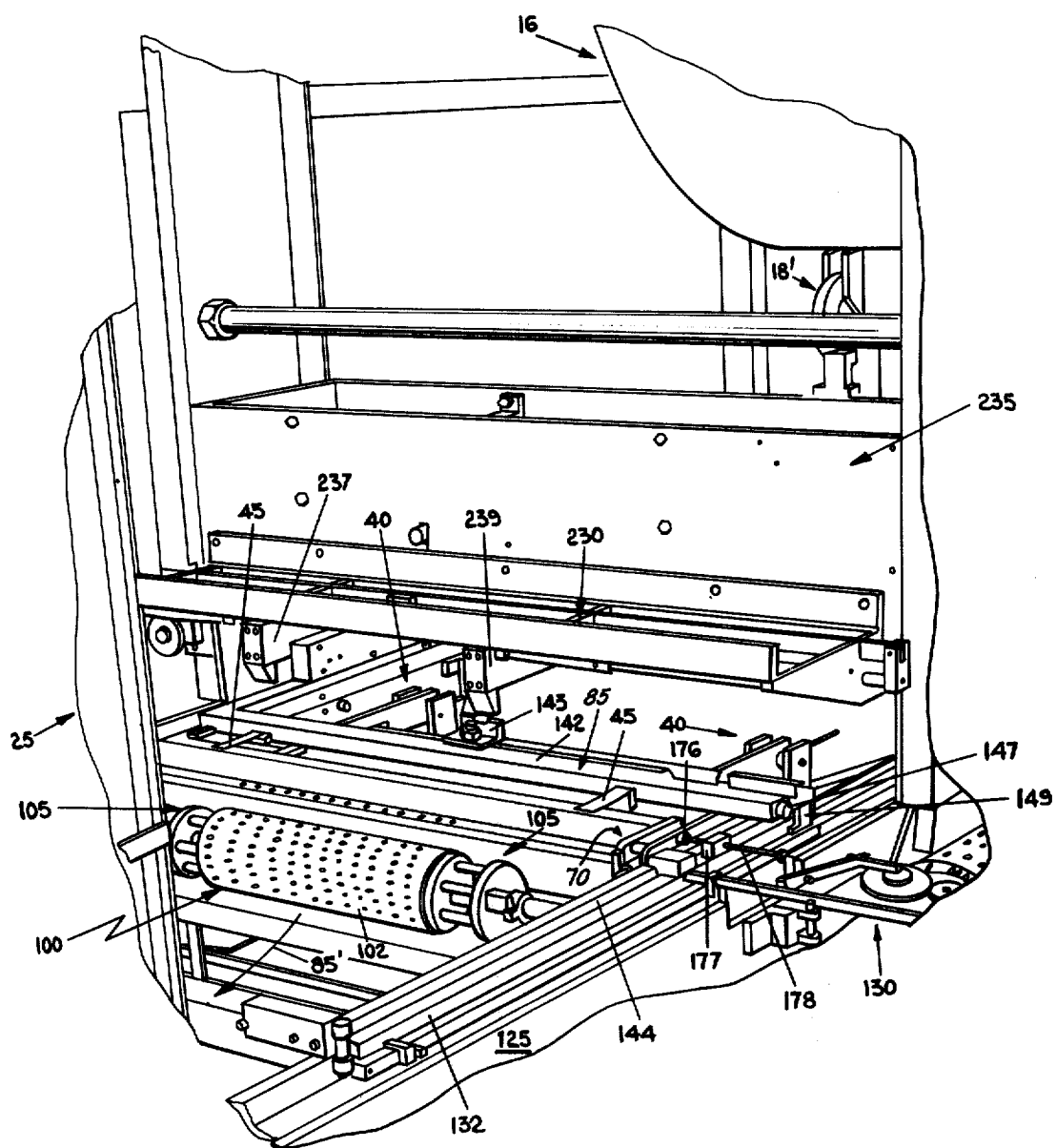


FIG. 7

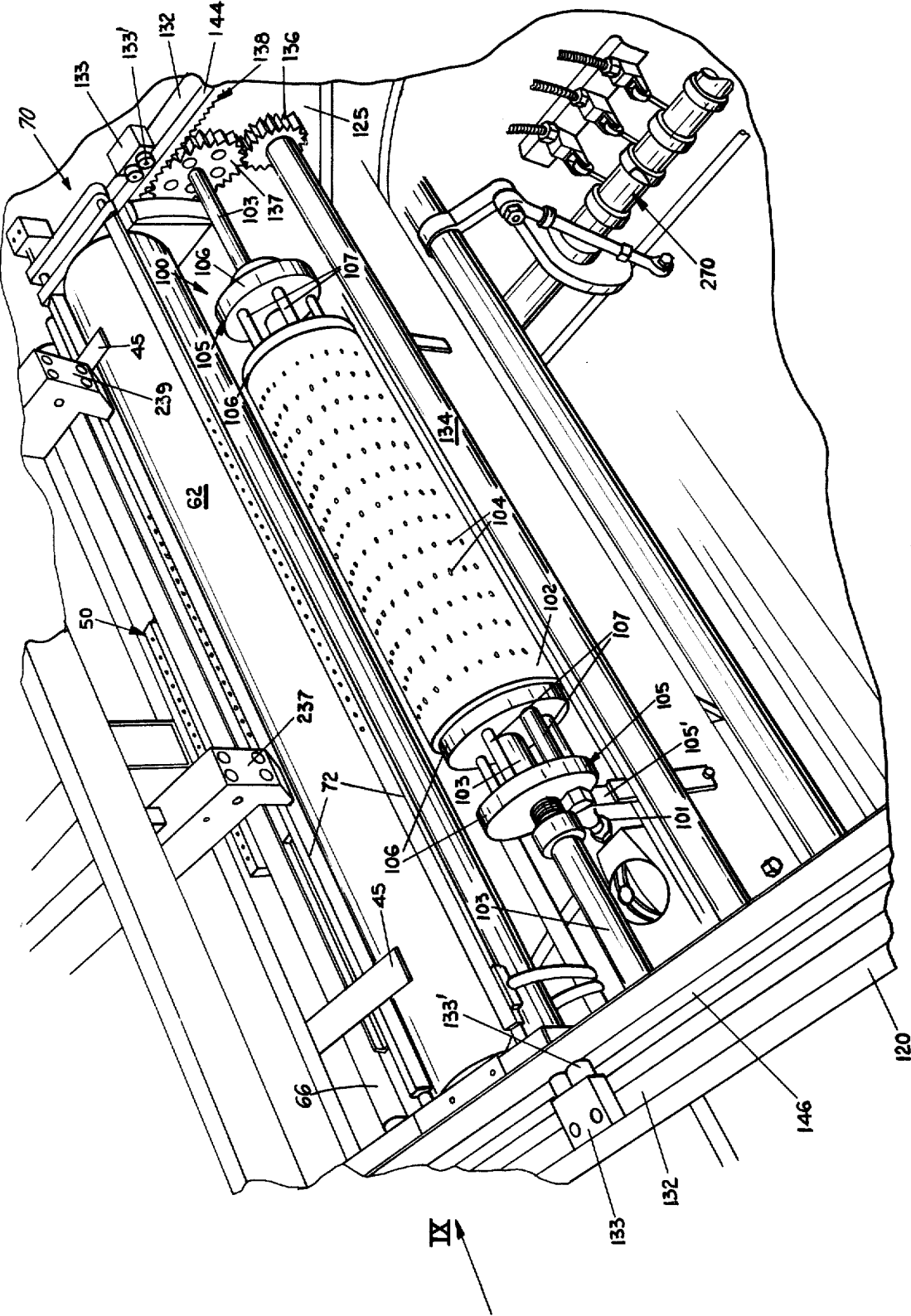


FIG. 8

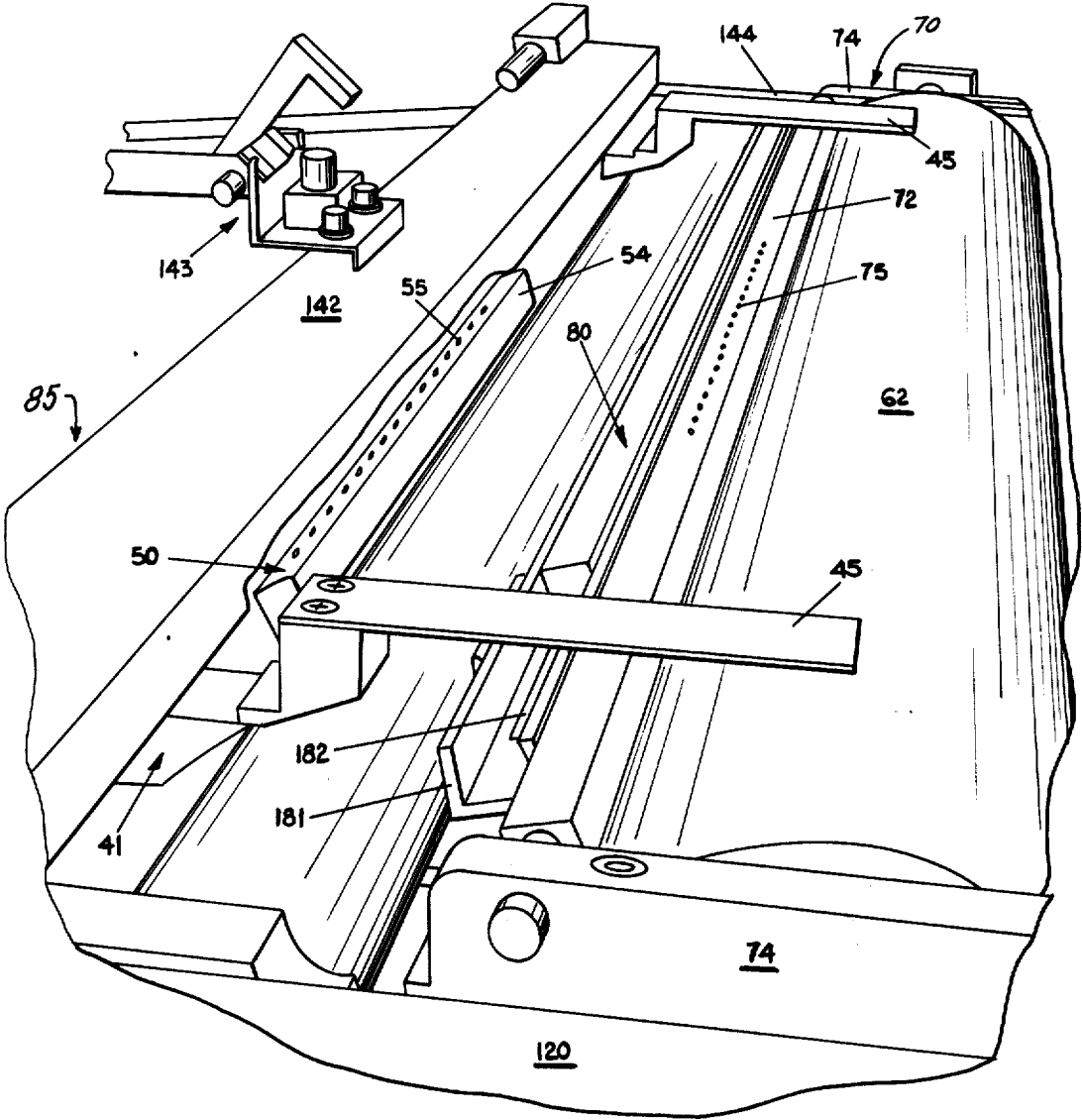
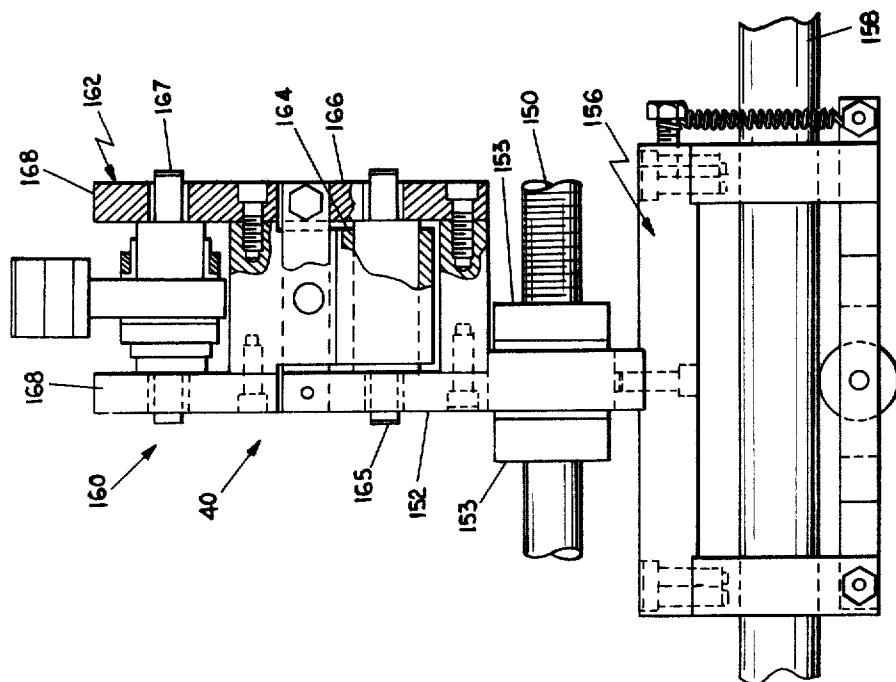
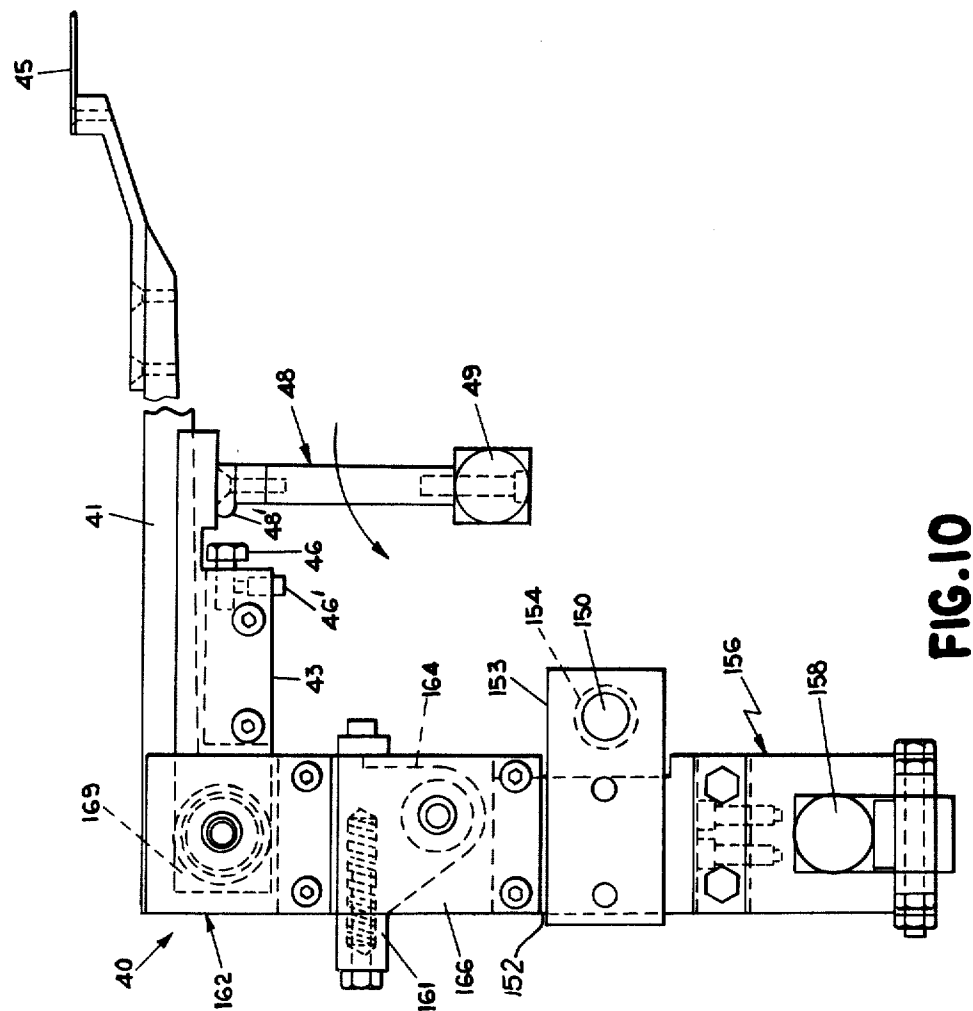


FIG. 9



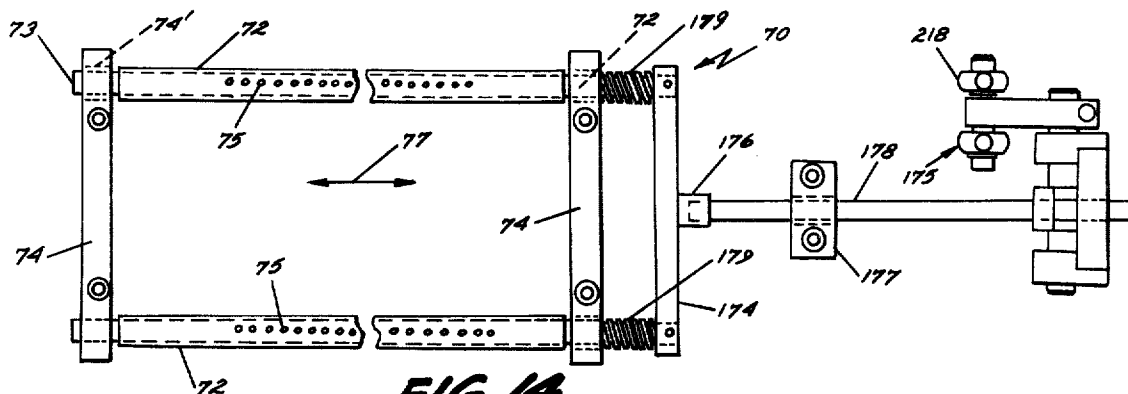


FIG. 14.

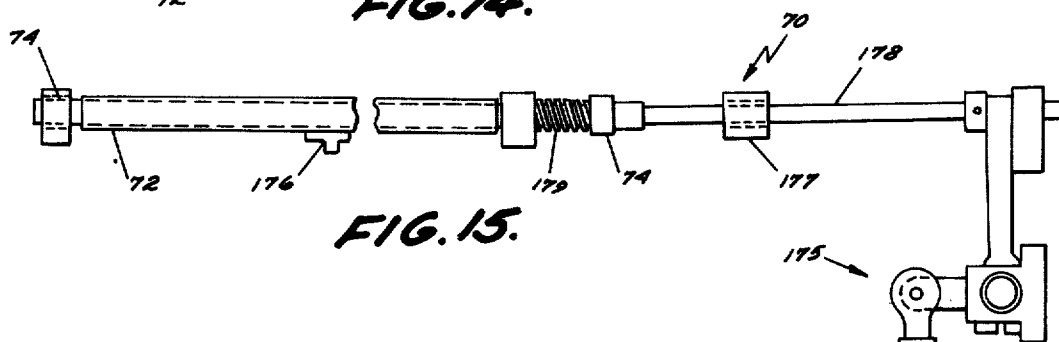


FIG. 15.

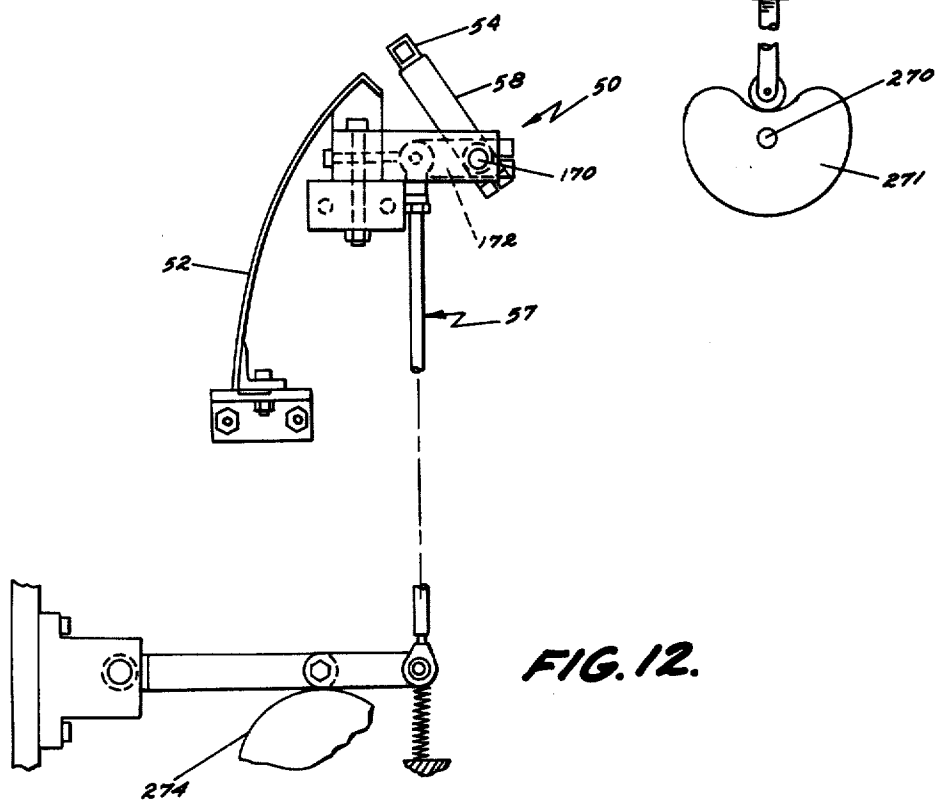


FIG. 12.

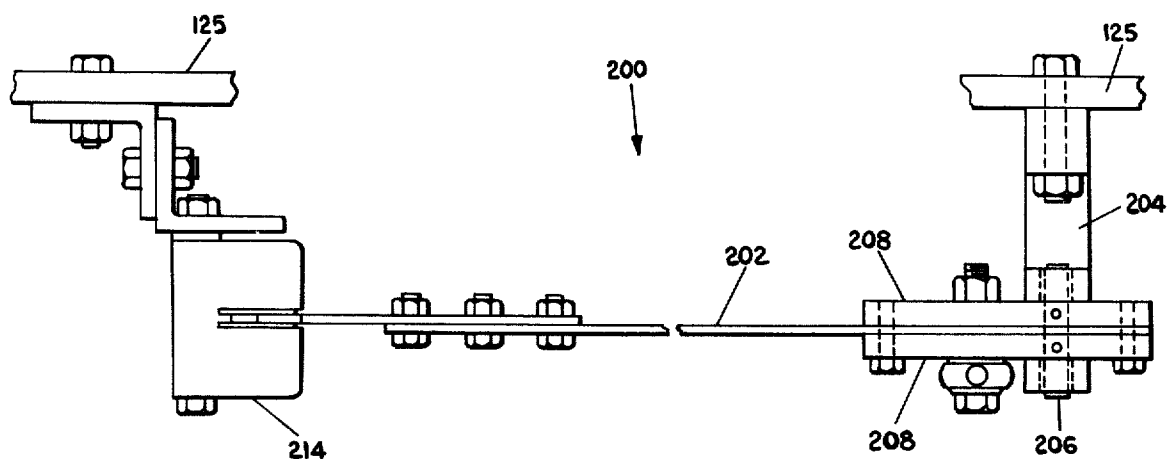


FIG. 16

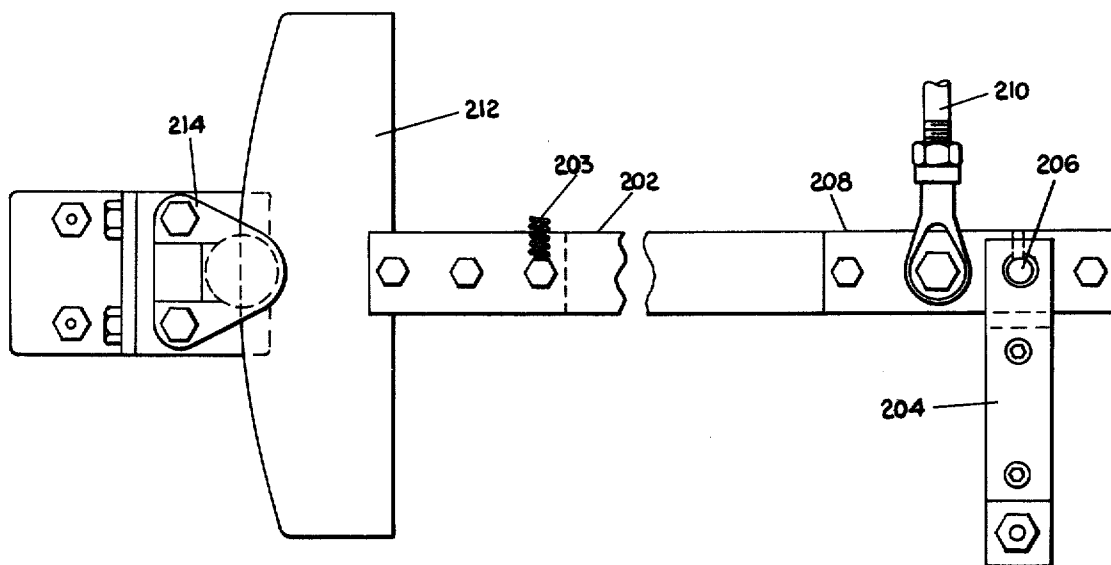
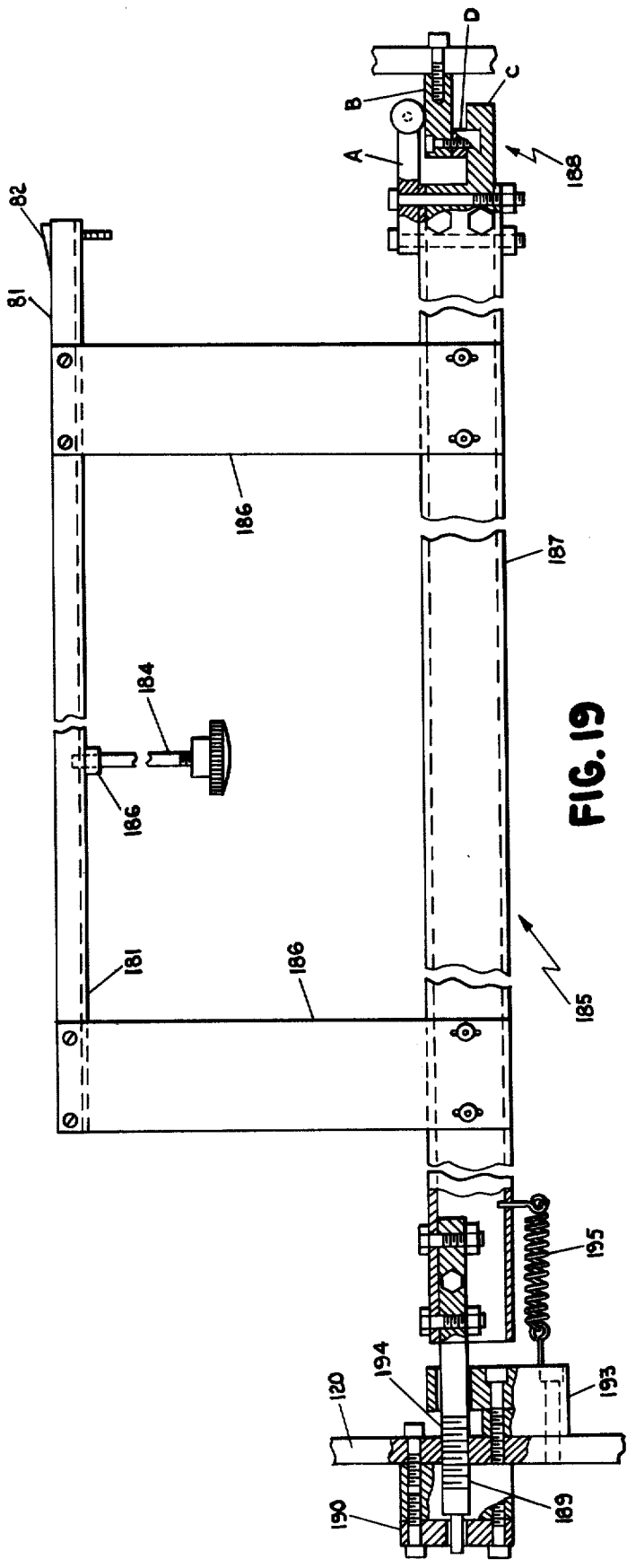
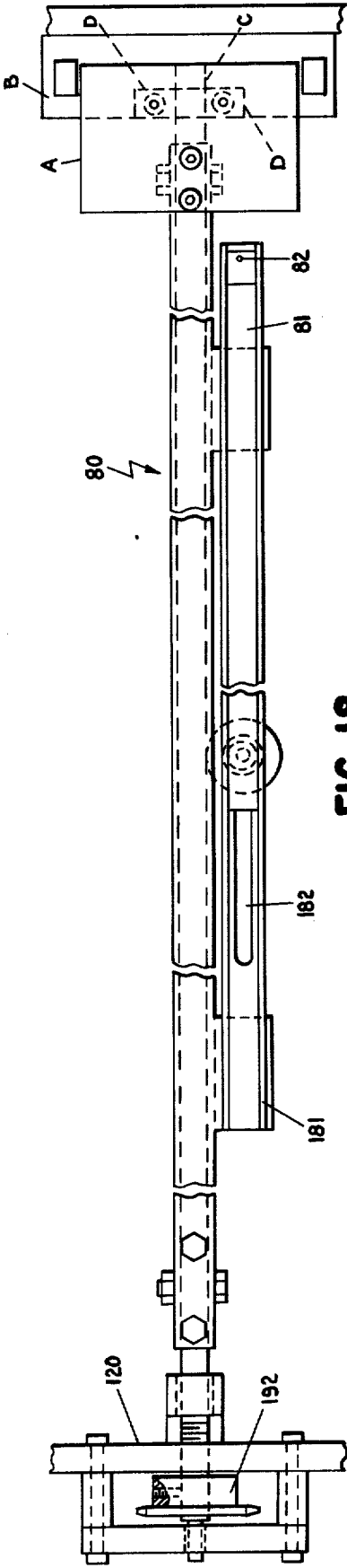


FIG. 17



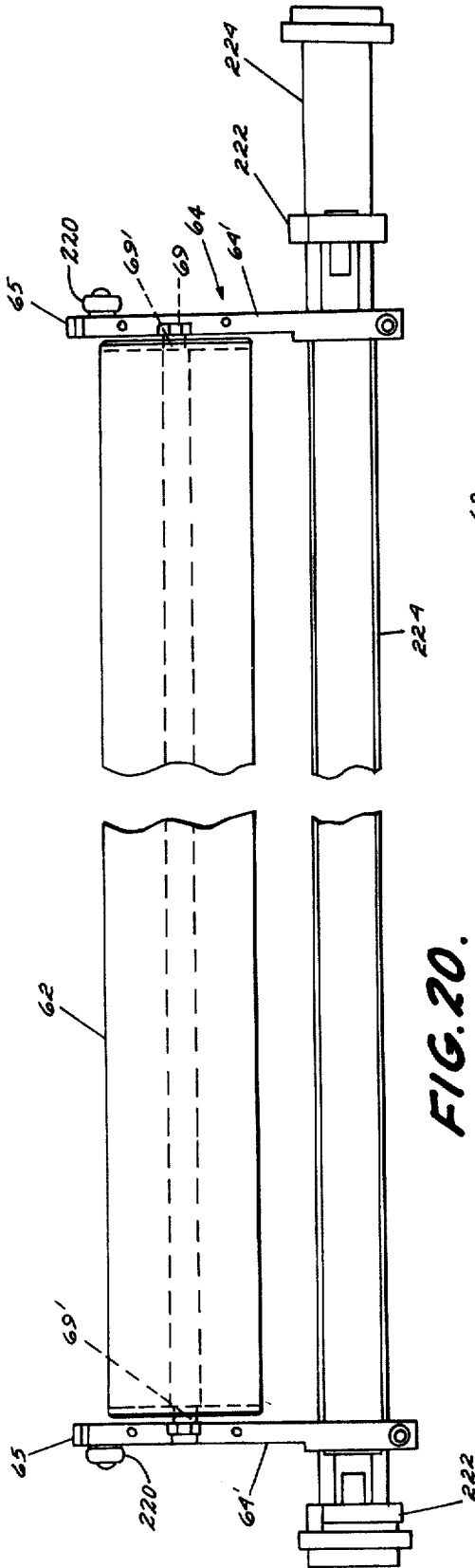


FIG. 20.

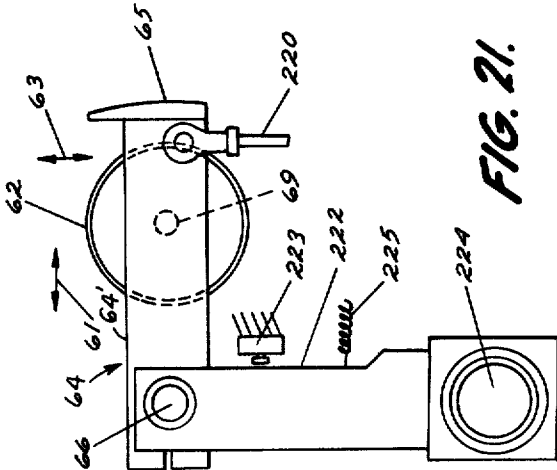


FIG. 21.

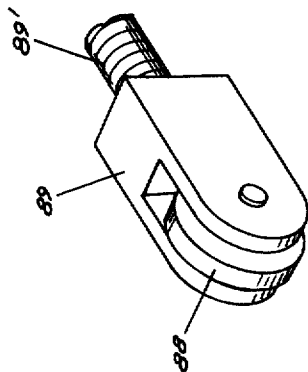
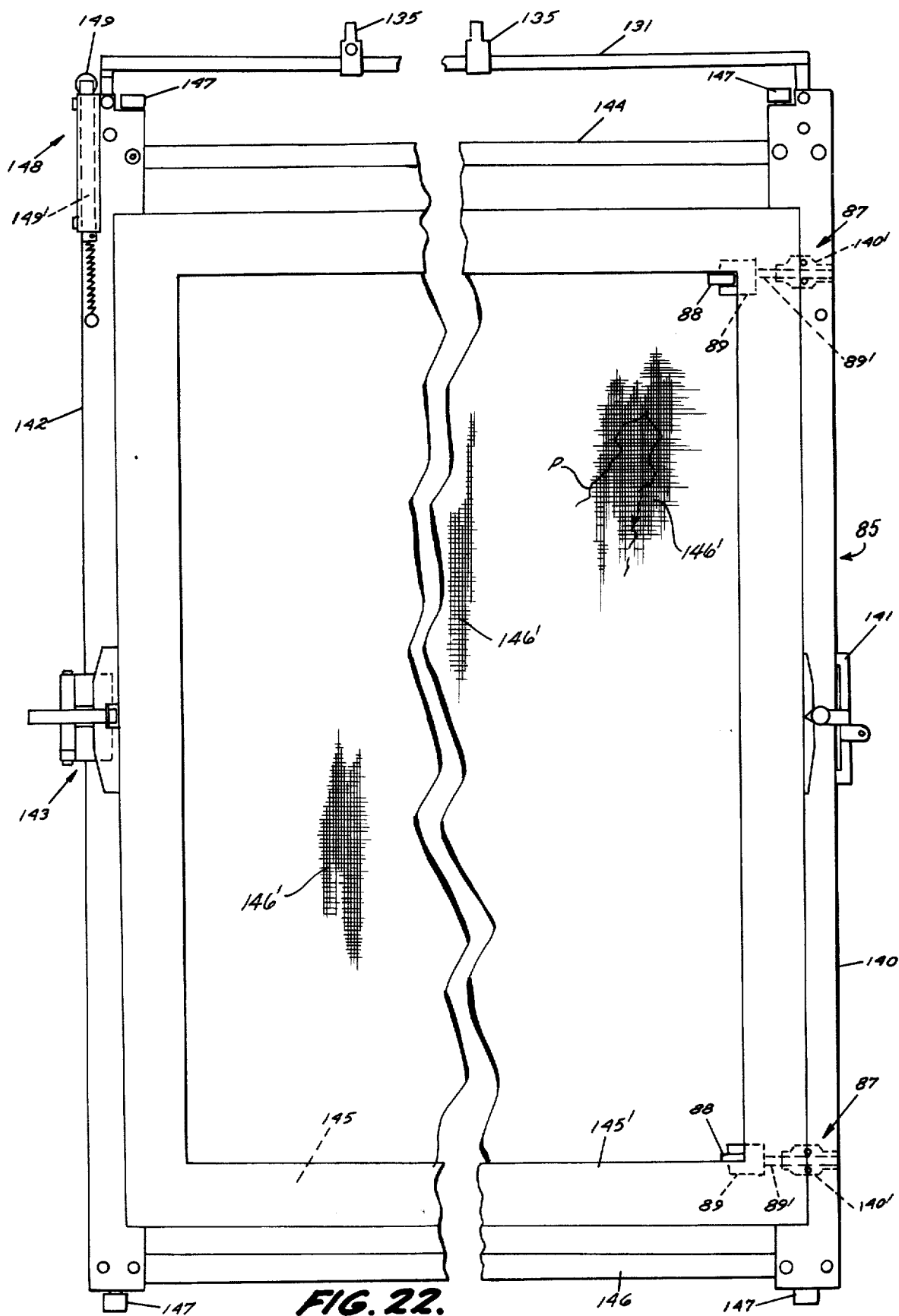


FIG. 22A.



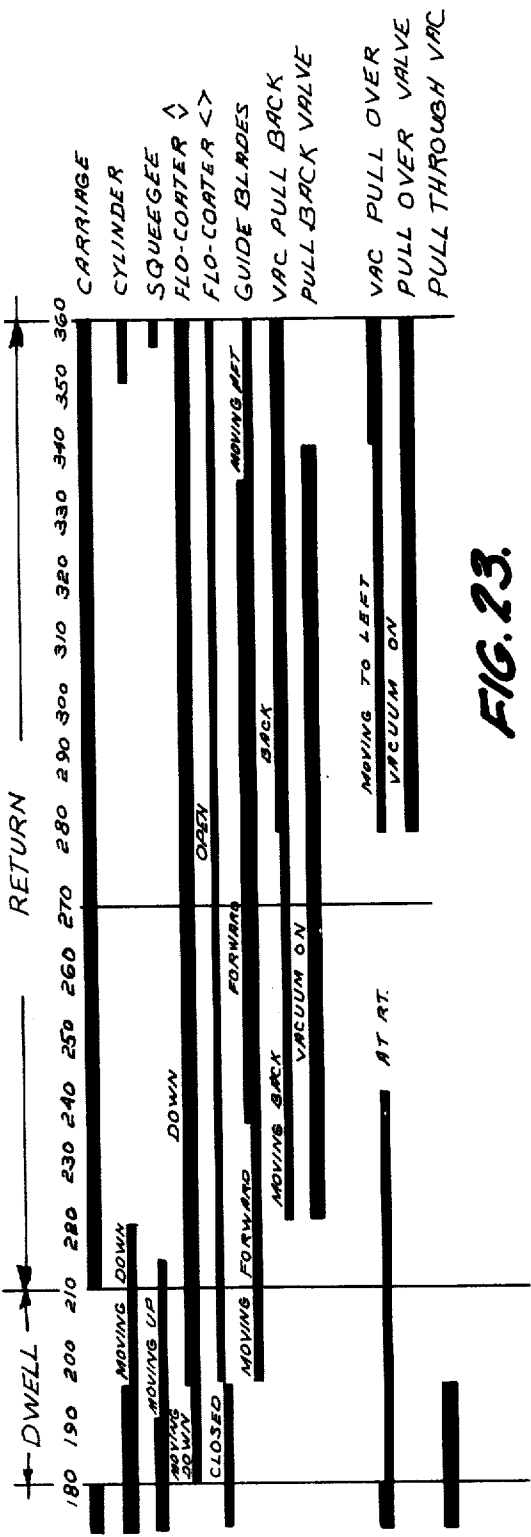
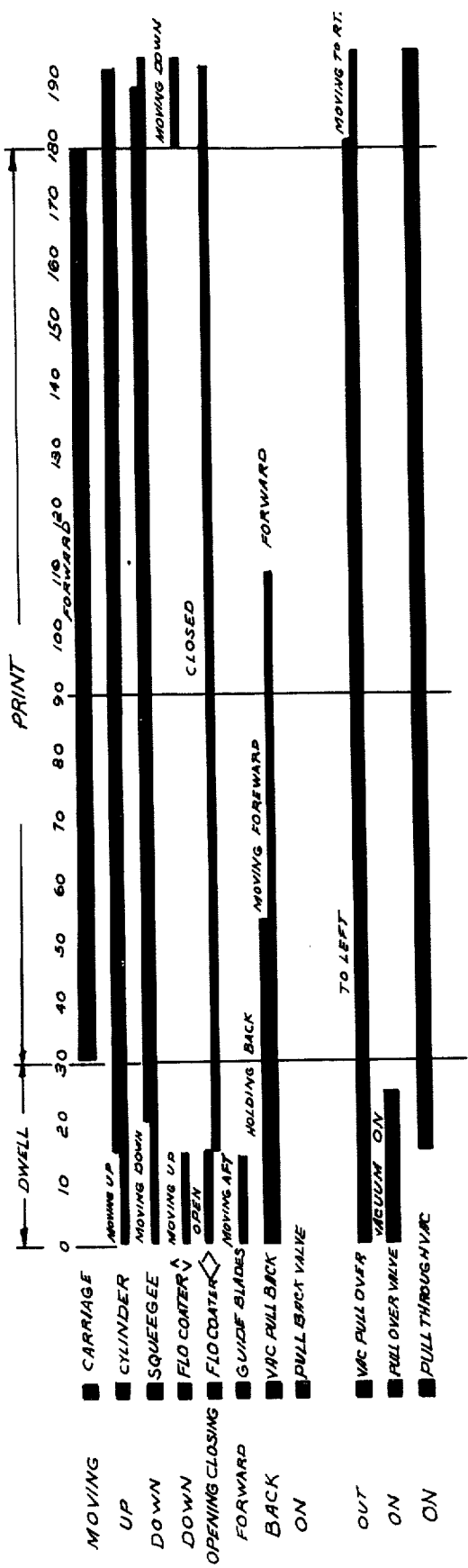


FIG. 23.

WEB REGISTRATION WITH WEB PULL-BACK AND SKEWING MEANS

BACKGROUND OF THE INVENTION

The present invention relates to a high-speed screen printing press and particularly to improvements in the printing station incorporated therein.

It is well known that stencil screen printing produces very high quality prints which can be multiple color. When producing prints of multiple color, several screens are generally successively employed thereby necessitating the reproducible registration of the screen holding frame to the printing stock employed. A screen printing press for providing high-speed multi-color prints on a continuous web is described in my co-pending application entitled **PRINTING PRESS AND WEB REGISTRY SYSTEM** filed on July 2, 1970 now U.S. Pat. No. 3,779,160 issued on Dec. 18, 1973, and assigned to the present assignee. In that system, registration tabs are positioned on each printing area of the continuous web before feeding the web into the printing station. A pair of pusher arms contacts the tabs and feeds the web into the printing station a predetermined distance to provide registration of the web to a printing cylinder. A vertically movable stencil screen frame is lowered into contact with the web and the relatively large diameter (18 inches) printing cylinder is driven together with the screen frame to advance the web and frame over the print cylinder as a squeegee contacts the screen thereby forming the print.

Although the system described therein performs well for print speeds in excess of those previously available, at even higher printing speeds (for example, in excess of 16 prints per minute), the pusher arm tends to overfeed the web into the print station potentially causing slight registration errors. Also, the relatively heavy stencil frame mechanism which is vertically reciprocated, required expensive heavy-duty drive mechanism to overcome the inertia of the frame during high-speed operation. These problems tending to limit the speed of operation of the press have been overcome by the design of the present system.

When screen printing on a continuous web, it has been discovered that when the web is registered to be straight (i.e., the sides of the web parallel to the advancing motion of the web), it tends to creep toward one side or the other of the print cylinder during the printing stroke. This is believed to result since the frictional contact between the web and the print cylinder or the screen is not uniform across the web or if the web is not perfectly straight. This lateral shifting of the web during the printing stroke is random and can occur in either direction (i.e., left or right) and in varying amounts thereby leading to registration inaccuracies when successive printing stations are employed. It has been discovered that by registering the web in each printing station at a predetermined skew angle relative to the direction of motion of the web, the creeping action can be controlled to always occur in a predetermined direction and in a predetermined amount. This eliminates the random web movement which causes registration errors when straight registration of the web in the printing station is employed.

SUMMARY OF THE INVENTION

A printing press embodying the present invention overcomes the difficulties encountered in earlier print-

ing systems by providing a web registration system which rapidly advances the web adjacent its final registration point during the printing stroke and then draws the web an incremental distance into registration during the return stroke of the press such that it is skewed slightly. Additionally, the screen frame is reciprocated only in one plane during a printing cycle thereby eliminating motion of the frame which imposes limitations on the ultimate speed of the press. The necessary contact between the screen and web is achieved in the present system by providing a small diameter printing cylinder which is relatively lightweight and which is movable into and out of contact with the web.

The printing press of the present invention provides improved side registration for the skewed web as well as means for separating the web from the screen after the print is made and while the screen and web are advancing over the print cylinder. The printing cylinder is resiliently movable and includes cylinder stops such that the screen frame carriage can be accurately registered to the cylinder by the abutment of the frame holding carriage against the cylinder stops.

Apparatus embodying the broader aspects of the novel concepts described and claimed herein include means for aligning a continuous web in a printing station in skewed registration to provide controlled lateral motion of the web during printing. Apparatus embodying other aspects of the novel concepts described and claimed herein include a horizontally reciprocating screen frame carriage which contacts a resiliently movable printing cylinder frame to provide registration of the screen to the print cylinder.

Apparatus embodying still other aspects of the novel concepts described and claimed herein include a screen frame carriage which is movable in the direction of the web movement and which achieves screen-to-web contact by means of a printing cylinder movable into and out of contact with the web. Such apparatus also may include means for separating the web from the screen after printing.

It is an object of the present invention to provide an improved high-speed screen printing press employing novel registration means.

An additional object of the present invention is to provide an improved method of high-speed screen printing on continuous web stock.

Still a further object of the present invention is to provide registration means for registering a continuous web in a skewed manner in a printing press to control the direction of lateral movement of the web during the printing stroke.

Still a further object of the present invention is to provide a simplified and improved printing station whereupon the screen frame is reciprocated in only one plane and the printing cylinder is moved to provide the necessary contact between the printing web and the screen.

Still a further object of the present invention is to provide means for separating the printing web from the screen as the printed web advances past the printing cylinder.

These and other objects of the present invention will become apparent upon reading the following description thereof together with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side elevational view of the printing apparatus of this invention;

FIG. 2 is a schematic plan view of the apparatus shown in FIG. 1;

FIG. 3 is a fragmentary perspective view of the tab applicator portion of the printing apparatus;

FIG. 4 is a fragmentary perspective view of the web feeding table of the printing apparatus;

FIG. 5 is a schematic side elevational view of the printing station portion of the invention;

FIG. 6 is a schematic plan view of a portion of the apparatus shown in FIG. 5;

FIG. 7 is a fragmentary perspective view of the printing station taken from the rear side;

FIG. 8 is an enlarged fragmentary front perspective view of the printing station;

FIG. 9 is an enlarged front perspective view as seen in the direction of arrow 9 in FIG. 8;

FIG. 10 is a fragmentary side elevational view of the guide blade assembly portion of the registration means;

FIG. 11 is a fragmentary end elevational view partially in cross section of the assembly shown in FIG. 10;

FIG. 12 is a fragmentary side elevational view of the web pull-back subassembly of the registration means;

FIG. 13 is a plan view of the apparatus shown in FIG. 12;

FIG. 14 is a plan view partly broken away of the side pull-over subassembly of the web registration means;

FIG. 15 is a front elevational view partly broken away of the subassembly shown in FIG. 14;

FIG. 16 is a fragmentary, partly broken away plan view of the braking means employed with the subassembly shown in FIGS. 14 and 15;

FIG. 17 is a fragmentary and partly broken away side elevational view of the apparatus shown in FIG. 16;

FIG. 18 is a fragmentary and partly broken away plan view of the web sensing means employed with the registration means;

FIG. 19 is a fragmentary, partly broken away front elevational view of the apparatus shown in FIG. 18 and partly shown in cross section;

FIG. 20 is a plan view of the printing cylinder subassembly;

FIG. 21 is a fragmentary side elevational view of the apparatus shown in FIG. 20;

FIG. 22 is a plan view of the screen frame carriage;

FIG. 22A is a detail enlarged perspective view of one of the adjustable roller stops mounted on the screen frame; and

FIG. 23 is a timing diagram in bar graph form illustrating the operation of the various components during a printing cycle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now specifically to FIGS. 1 and 2, a screen printing press 10 is illustrated and employs, in the preferred embodiment of this invention, a conventional flip-over roll stand subassembly 12 on which is mounted a suitable roll R of web stock W. The invention has application to printing stock other than web stock and is not necessarily limited thereto. The web stock passes over a conventional unwinding wheel subassembly 14 into a conditioning dryer subassembly 16

and then to a tab application subassembly 18 shown in detail in FIG. 3.

Subassembly 18 comprises a pair of applicators 18' and 18'' (FIG. 3) which apply registration contacts such as tabs T (FIG. 2) at spaced intervals along the web W which correspond to individual print areas. The tabs T are preferably secured to the web by pressure and/or heat activatable adhesive on the tabs. The individual tabs may be flat, configured, and of varying dimensions to suit the particular type of web stock involved and provide the desired rear edged surface area. In some instances, it may be possible to employ a single tab with a greater width than those illustrated. Normally, however, a pair of relatively small tabs are applied on opposite sides of the center line of the web stock as shown in FIG. 2. The use of these tabs for registering the web in a skewed manner is described more fully below.

The tab applicators 18' and 18'' are laterally mounted to a threaded support bar 11 extending transversely to the direction of web movement and rotatably mounted on end support plates 13. The applicators are powered for tab application through a transverse rotational drive shaft 15 driven by suitable power means (not shown). Shaft 15 has spur gears 17 thereon engaging spur gears 19 on the applicators. The applicators apply tabs at intervals (i.e., at controlled, spaced longitudinal distances) along web W, however, this spacing is not critical as will be understood more fully hereinafter. The applicators include a spool 5 on which is wound the tape which forms the tabs and which is advanced into a combined cutter and applicator 23 which is actuated intermittently to accurately cut a section of the tape forming a tab and apply the tab so formed onto the edges of the web W. The construction and operation of the tabbers 18' and 18'' is described in greater detail in the copending application identified above and incorporated by reference herein.

Once the tabs T have been applied to the web, the web is advanced by a web infeed subassembly 20 which is shown in FIG. 4. The infeed subassembly 20 comprises a reciprocating vacuum plate 30 which has a plurality of web gripping apertures 32 on the top surface thereof. Plate 30 is coupled to a pair of carriage arms 34 (one shown in FIG. 4) which are slidably mounted on a pair of fixed longitudinally extending shafts 35 and reciprocated by the first arm 36 coupled to a yoke 38 pivotally mounted to the side wall 125 of the printing press and having an interconnecting arm 39 extending to the screen frame holding carriage 85 as described below. Thus, the reciprocating vacuum plate 30 moves in phase with the screen frame carriage to advance the web during the print stroke.

During the return stroke of the printing apparatus, the vacuum applied to plate 30 is shut off to permit the plate to freely slide under the web to the right as viewed in FIG. 4. A pair of guide wires 31 provide guided support for the web and are coupled at their left ends to a semicircular guide plate 33 which provides a smooth transition for the web into a slack loop 21 (FIG. 1). The right ends of wires 31 are supported on suitable fixed structure (not shown). The web infeed subassembly 20 thereby advances approximately the same amount of web material employed for each print frame during the printing stroke to maintain the slack loop 21 such that the web can be easily advanced into the printing station by the movement of the screen in contact with the web

as it passes over the print cylinder as described below.

As seen in FIGS. 1 and 2, the web then advances to a first printing station 25 which includes a printing cylinder subassembly 22 and registration means 28 as well as a squeegee and flow coater assembly 24. The various components of the printing station 25 are discussed with reference to FIGS. 5 and 6 below. Once the web advances through the printing station 25, it passes over a first drying station 26 and thence through a second slack loop 21' to a second printing station 25' which is identical to station 25 but which employs a stencil screen and ink for applying a second color to the print. Station 25' precedes a second drying station 26' and web W continues through one or more additional printing stations, as required, and which are identical to stations 25 and 25' and which also include a drying stage. By such arrangement, the desired end print is achieved.

As seen in FIG. 2, each printing station 25 includes a stencil screen infeed subassembly 27 positioned adjacent the front side of the printing apparatus and a stencil screen outfeed assembly 29 positioned adjacent the rear side of the printing station. The components of each printing station are shown schematically in FIGS. 5 and 6. A detailed description of the construction and interrelationship of the components, as shown in FIGS. 7 through 22, follows the brief description of FIGS. 5 and 6.

Each of the printing stations 25 includes the following subassemblies as shown in FIGS. 5 and 6. On the input side of each printing station there is positioned a guide blade assembly 40 which is reciprocally driven, as indicated by arrow 41, forwardly against an adjustable stop 48, also movable in a direction indicated by arrow 42, such that guide means such as the guide fingers 45 which contact the rear edges of the registration tabs are removed forwardly during the registration portion of each printing cycle to be on top of the printing cylinder area, as shown in FIG. 6, and rearwardly by means of the linkage assembly 47 driven by a common cam shaft 270 and a cam 272 thereon out of the way during the printing stroke of each printing cycle. The adjustable stop 48 limits the forward motion of the fingers such that the desired registration along the longitudinal direction (i.e., the direction of motion of the web) can be selected. As seen in FIG. 6, the arms 45 are set with leading edges spaced an incremental distance as discussed below with reference to FIGS. 10 and 11, such that the tabs shown as T₁ and T₂ for the print frame within the printing station cause the web W to be skewed (upwardly from left to right in FIG. 6) as the web is drawn rearwardly (to the left in FIG. 5) by means of a vacuum operated pull-back assembly 50.

The pull-back (or draw-back) assembly 50 includes an arcuate guide segment 52 which provides a smooth transition for the web from the slack loop 21 into the print station 25 and an arcuately movable vacuum rod 54 movable in a direction indicated by the arrow 53. Rod 54 is reciprocated also by the camshaft 270 by means of a cam 274 thereon and suitable interconnecting linkage 57. A detailed description of the operation of the guide blade assembly 40 and the vacuum pull-back assembly 50 is presented under the section entitled OPERATION below.

Forward of the vacuum pull-back assembly 50 is the print cylinder assembly 60 which includes a freely rotatable cylinder 62 supported at either end by means of a frame assembly 64. Frame 64 includes a pair of fixed

cylinder stops 65 on the forward or leading edges thereof and is vertically movable (as indicated by the arrow 63) by means of a linkage assembly 67 actuated by a cam 276 on camshaft 270. Frame 64 is coupled to a pivot shaft 66 and pivot arm 222 pivotally mounted at its lower end to the machine frame by pivot shaft 224 (FIGS. 5 and 21) and movable thereby forwardly and rearwardly (i.e., in a direction indicated by arrow 61). A bias spring 225 resiliently urges the cylinder subassembly 60 forwardly.

A side pull-over subassembly 70 (FIG. 6) for laterally registering the web includes a pair of pull-over arms 72 supported at opposite ends by means of frame members 74. Members 72 are movable in a direction indicated by the arrow 71 and include a plurality of apertures 75 which contact the lower surface of the web and, when a vacuum is applied to arms 72, secure the web to the arms and laterally shift the web until the edge of the web, as seen in FIG. 6, contacts sensing means 80. As seen in FIG. 5, pivot shaft 66, sensing means 80 together with the print cylinder 62 and pull-over arms 72, provide a curved support surface for the web W as it passes through the printing station 25 thereby preventing crimping or other folding of the web material during the printing process. With the aid of the various registration and guide members, therefore, the smooth, curved path of travel of the web is maintained even though a small diameter print cylinder is used.

Positioned on the printing station 25, as described in detail with reference to FIGS. 7 through 9, is the printing frame carriage assembly 85 (shown schematically in FIG. 5) which is interconnected to the feeding table assembly 20 by rod 39. As will be described in detail hereinafter, the carriage assembly 85 includes adjustable roller stops 87 on either side which contact the stops 65 on the leading edge of each side of carriage frame 64 to provide registration between the print frame held by carriage 85 and print cylinder 62. Assemblies 40, 50, 60 and 70 operate in conjunction with the tabs and the sensing means 80 to provide longitudinal and lateral registration of the web to the print cylinder.

Carriage assembly 85 is reciprocated in a horizontal plane in directions indicated by arrow 83 through print and return strokes. The advancement of web W into the print station during the printing stroke is sufficient to overfeed the web slightly (i.e., approximately 1/4 inch) such that the tabs will be slightly ahead of the guide blades 45 when the blades are positioned in their forward (i.e., registration) position. The vacuum pull-back assembly 50 is then actuated to return the web until the tabs contact the guide fingers 45 and skew the web in the desired position.

The printing station 25 further includes a flow coater and squeegee assembly 90 which is coupled to the camshaft 270 by means of suitable interconnecting linkages and a cam on the shaft (not shown in the figure). This assembly operates somewhat similarly to the flow coater and squeegee assembly described in detail in our copending application identified above. Assembly 90 further includes inking means for the screen which is identical to that described in the copending application.

At the exit end (right end in FIG. 5) and slightly below the print cylinder assembly, there is a vacuum pull-through cylinder assembly 100 which serves the dual purpose of aiding in drawing the web through the

printing station when a print is being made or when the print station is not being operated but a successive station is operated, and separating the web from the screen during the printing stroke. The vacuum pull-through assembly 100 includes a vacuum drum 102 having a plurality of apertures 104 therein which are in communication with a vacuum pump to hold the lower surface of the web against the rotating drum 102 as the web is advanced through the printing station. It is noted here that the cylinder 102 is driven by the same drive mechanism which drives the carriage assembly 85 which is now described in detail with reference to FIGS. 7 through 9.

As seen in FIGS. 7, 8 and 9, the printing press includes a front wall 120 and a rear wall 125 between which are positioned and supported the various components of the system. As seen in FIGS. 7 and 8, a conventional Floyd drive mechanism 130 is employed to actuate the screen frame carriage 85 which reciprocates fore and aft on a pair of carriage guide plates 132 positioned along the top edge of the sides of the printing press. The Floyd drive mechanism selectively rotates a drive shaft 134, as seen in FIG. 8, which extends between the side walls of the press and has gear means 136 at each end (one shown) which engage gear means 137 associated with the vacuum pull-through cylinder assembly 100. Gear 137 is in turn coupled to a rack 138 mounted to each side of the carriage frame and having downwardly depending gear teeth which engage gear 137.

As the Floyd drive rotates shaft 135, the vacuum cylinder 102 and the screen frame carriage move simultaneously in a direction to advance the web during the printing stroke and return the carriage during the return stroke when shaft 134 reverses rotation. The Floyd drive mechanism together with its actuation arm coupled to the carriage to control the drive is described in greater detail in the copending application identified above.

As seen in FIG. 22, the carriage 85 comprises a generally rectangular frame having front and rear members 140 and 142, respectively, joined by side members 144 and 146. A frame holding recess 145 extends around the inner periphery of the carriage and is adapted to receive a screen frame 145'. A stencil screen 146' made of silk or stainless steel mesh is held by frame 145'. Stencil screen 146' includes a printing pattern P formed on the screen by conventional techniques.

Screen carriage 85 includes a frame hook 141 mounted on member 140 and a latching mechanism 143 is positioned on the opposite end member 142. Members 141 and 143 insure that screen frame 145' is securely held within recess 145 of the carriage during the motion of the press.

A roller 147 is positioned at each corner of the carriage and rides on the upper surface of the carriage guide plates 132, as seen in FIG. 7, to movable support the carriage on the press. As seen in FIG. 8, the carriage is held in vertical registration to the carriage guide plates 132 by means of a carriage hold-down block 133 with rollers 133' which contact the top surfaces of the carriage side walls 144 and 146. Blocks 133 are securely bolted to the carriage guide plates 132.

To prevent lateral shifting of the carriage 85 even a slight amount during its motion, a spring loaded guide wheel assembly 148 is mounted to one corner of the carriage as seen in FIG. 22. Assembly 148 includes a

roller 149 mounted on a spring-held shaft 149' and which contacts the outer surface of guide rail 132 (FIG. 7) to provide a resilient holding force which holds the carriage toward the rear wall of the press.

The carriage also includes a rod 131 extending along member 144 and including fixed stops 135 thereon for tripping the Floyd drive actuating rod to reverse the drive at the ends of travel of the carriage. The adjustable roller stops 87 (FIGS. 5, 22 and 22A) for registering the carriage to the print cylinder each comprise a roller 88 (FIG. 22A) mounted in block 89 with a rearwardly extending shaft 98' adjustably secured to the underside of member 140 at opposite ends by a mounting block 140' as seen in FIG. 22. The shafts 89' are suitably held in an adjusted position to the block by suitable locking means (not shown). Stops 87 are positioned interior to the racks 138 so as not to interfere with the motion of the carriage and depend downwardly and rearwardly to contact the cylinder stops 65 (FIGS. 5 and 21) on the print cylinder frame. The rollers 88 allow cylinder stops 65 to move up freely at the beginning of the print stroke while maintaining the screen in registration with the print cylinder. The carriage gear racks 138 are securely bolted to the underside of the carriage side members 144 and 146 (FIG. 8).

Thus, it is seen that the Floyd drive mechanism actuates the carriage and vacuum pull-through cylinder 85 and 102, respectively, to advance the web during a printing stroke and returns the carriage to a starting position after the printing stroke. The carriage is shown in FIGS. 7, 8 and 9 in its forwardmost position at the end of a printing stroke. During the printing stroke, the carriage frame 85 advances in the direction indicated by the arrow 85' in FIG. 7 while simultaneously, vacuum is applied to the rotating vacuum cylinder 102 of the vacuum pull-through assembly 100 by means of vacuum hoses 101 coupled to fixed end assemblies 105.

Cylinder 102 is rotated by shaft 103 extending there-through and between the side walls of the press. Assemblies 105 include discs 106 with bushings permitting the shaft 103 to rotate cylinder 102 while assemblies 105 remain stationary and anchored to the press frame by means of a bracket 105' (FIG. 8). Between discs 106 are support rods 107, one of which communicates (i.e., is hollow) with the vacuum hoses 101 to apply vacuum to cylinder 102 through a sliding seal positioned between the cylinder and each of the inner discs 106. The uppermost support rod 107 of each assembly 105 communicates with a row of apertures 104 in cylinder 102 thereby applying vacuum to the two topmost rows of apertures 104 which are in contact with the web as the cylinder 102 rotates during the printing stroke. In this manner, the vacuum source is most effectively utilized by only actuating the two rows of apertures in the vacuum cylinder which are actually in contact with the web.

During the return stroke of the printing cycle, a valve disconnects the vacuum source from cylinder 102 such that as the cylinder rotates in a counterclockwise direction (in FIG. 8) and the carriage returns to its starting position for the next printing frame, the vacuum cylinder does not interfere with the registration of the new frame of web material.

Having described the screen frame carriage and vacuum pull-through assemblies, a description of the remaining elements of the printing station including the

registration means is now presented. As seen in FIG. 7, the guide blade assembly 40 (also shown schematically in FIGS. 5 and 6) is positioned rearwardly of the printing station and is movably supported on a threaded shaft 150 (FIGS. 10 and 11). Shaft 150 extends between the side walls 120 and 125 of the press and is supported in a rotatable manner with one end of the shaft extending outwardly to permit its rotation for moving the pair of guide blade assemblies 40 inwardly or outwardly for different width webs in use. The blade arm 41 extends under the rear carriage frame member 142 and then upward, as seen in FIG. 9, to position the blades on top of print cylinder 62.

The guide blade assembly includes a lower frame member 152 (FIGS. 10 and 11) which is coupled to shaft 150 by means of plates 153 attached to either side. The plates 153 of one of the assemblies have a left-hand threaded aperture 154 while the other assembly plate apertures are right-hand threaded such that as shaft 150 is rotated, assemblies move toward or away from each other. A carriage assembly 156 is coupled to the bottom of frame member 152 and in turn is slidably secured to a shaft 158 which is oscillated by the cam 272 and linkage mechanism 47 shown in FIG. 5. This alternately moves the guide blades 45 forwardly until assembly 40 contacts stop 48' during the return stroke of the press, and retracts blades 45 rearwardly out of the way of the printing cylinder during the printing stroke of the press. Carriage 156 is designed to slide along shaft 158 to permit the spacing adjustment of the guide blade assemblies while simultaneously clamping to shaft 158 such that as the shaft oscillates, the frame member 152 will oscillate to move blades 45.

The fore and aft motion of the guide blades 45 is accomplished by means of a yoke assembly 160 coupling a guide blade arm 41 to the frame member 152. Assembly 160 comprises a Y-shaped upper member 162 having a downwardly depending central member 164 pivotally coupled by means of pin 165 between frame member 152 and an L-shaped section 166 forming a U-connector as shown in FIG. 11. Coupled between the upper arms 168 of Y-shaped member 160 is a second pivot pin 167 to which is mounted in a pivotal fashion the end 169 of guide blade arm 41.

The guide blade arm 41 includes a downwardly depending shoulder 43 having an adjustable stop 46 and lock means 46' therefor which is adapted to contact a rounded stop portion 48' of the movable stop 48. Stop 48 comprises an arm attached to a movable shaft 49 to permit adjustment of the forward motion of guide blade arms 41 while the press is in operation. It is noted here that the skewing effect of the tab registration is achieved by adjusting the stops 46 on each of the guide blade assemblies 40 independently such that as the shaft 158 rotates thereby moving the stops 46 of each guide blade assembly 40 against the single stop 48', the blades 45 on the assemblies will be moved in the desired relationship and spaced one in advance of another by an incremental distance indicated by the symbol Δ as shown in FIG. 6. Stop 46 on the movable guide blade assembly is securely held against stop member 48' by means of a bias spring 161 which urges Y member 162 forwardly in a resilient manner thereby holding the assemblies against an adjustable stop.

The yoke assembly 160 and pivot connection 167 allows the blades 45 to rest lightly against the web and pass the tabs as the web is advanced. Blades 45 remain

in contact with the web during the movement of the blades and the ends of blades 45 contact the rear edge of tabs T as the web is drawn rearwardly during registration.

To effect registration in the longitudinal direction and in a skewed manner, during the print stroke; the web is advanced slightly more than a print frame by the normal overtravel of the print carriage during printing. During the return stroke when the print cylinder is lowered and guide blades 45 are advanced by cam 272; the vacuum pull-back subassembly 50 is operated to draw the web rearwardly until tabs T seat against the guide blades. The relative position of the vacuum pull-back assembly 50 to the remaining components is shown in FIGS. 8 and 9. The detailed construction of the pull-back assembly is shown in FIGS. 12 and 13 and is now discussed.

The vacuum pull-back assembly 50 comprises a hollow rectangular bar 54 having a plurality of apertures 55 along the top surface thereof as shown in FIG. 13. The ends of bar 54 are sealed and a vacuum hose (not shown) is coupled to a central coupling 56 which is attached to the lower surface of the bar and communicates with the interior thereof. Bar 54 is supported by a pair of arms 58 attached at one end to the bar and at the opposite end to an axle 170 which is rotatably and slidably mounted to fixed brackets 172 suitably attached to a frame member of the press. Axle 170 is free to slide between the braces 172 in a direction indicated by arrow 173 in FIG. 13 and is biased in a centrally located position by means of a pair of springs 175 positioned between each arm 58 and brace 172.

This mounting arrangement permits rod 54 to shift laterally during registration. Shaft 170 is rotated rearwardly by the linkage mechanism 57 driven by a cam 274 during the registration portion of each printing cycle. In this manner, the bar grips web W and draws it rearwardly. As seen in FIG. 6, tab T₁ will contact the slightly forwardly projecting guide blade of assembly 40 nearest the front wall 120 of the press. This stops movement of the web at tab T₁. As bar 54 continues rearwardly in an arc, the web can pivot slightly about the tab T₁ until tab T₂ contacts its associated guide blade stopping the web in a slightly skewed position which is controlled. The skewing of the web is shown in FIG. 6 in an exaggerated manner for the sake of illustration of the principle. In the preferred embodiment, a skew angle within $\frac{1}{4}^{\circ}$ to $\frac{1}{2}^{\circ}$ was employed, although in other embodiments, this angle could lie in a wider range. The vacuum is continuously applied to bar 54 to hold the web in the skewed position until the printing stroke begins. Once the web tabs are pulled against the blades, the side pull-over subassembly 70 is activated to provide lateral registration of the skewed web. This assembly is described in detail together with sensing means 80 with reference to FIGS. 14 through 19.

Initially, it is noted that the relative positioning of the vacuum pull-over mechanism 70 and the sensing means 80 is clearly shown in FIGS. 7, 8 and 9. The specific construction features, however, are shown in FIGS. 14 through 19 now discussed. Lateral registration means 70, 80 includes a pair of hollow rectangular bars 72 having sealed rounded ends 73 which slidably extend into apertures 74' in end support members 74 attached to the frame 64 of the printing cylinder 62. Bars 72 can shift laterally, therefore, between members 74 as indicated by arrow 77 in FIG. 14. A vacuum connection

176' (FIG. 15) provides coupling of a vacuum hose (not shown) to each bar 72 such that when activated, the web is held to the bars.

Members 74 space the bars 72 on either side of the print cylinder 62 as seen in FIGS. 5 and 8. The right end of the rounded portion 73 of member 72 is fixedly attached to a cross member 174 which is slidably contacted by the tip 176 of a drive shaft 178 supported by sleeve 177 positioned on the frame of the press as shown in FIG. 7. This connection accommodates the vertical motion of member 174 (when the print cylinder moves and down) to the vertically fixed shaft 178.

A pair of springs 179 are fitted between the right side member 74 and the movable cross piece 174 to bias the assembly 70 toward the right side in FIGS. 14 and 15. Drive rod 178 is actuated by camshaft 270 having a suitable cam 271 thereon which contact linkage mechanism 175 to draw the bar 72 to the left in FIG. 14 prior to lateral registration during which time vacuum is applied to the bar 72. The springs 179 force the bars toward the right which pull the web to the right until sensing means 80 detect the edge of the web. Braking means 200 is then actuated to lock the lateral position of the bars 72 in the web registered position.

The braking mechanism 200, shown in FIGS. 16 and 17, comprises a pendulum arm 202 pivotally mounted at one end to the rear frame member 125 of the press by means of a mounting bracket 204 and a pivot pin 206. Reinforcing braces 208 straddle this end and a linkage 210 is coupled at one end to the reinforcement braces 208 and extends upwardly to connect at the opposite end to the linkage 175 (seen in FIG. 14). The left end of pendulum arm 202, as seen in FIG. 17, has a brake shoe 212 positioned thereon which moves between brake shoes of a caliper brake assembly 214 fixedly positioned to wall 125. The caliper brake assembly 214 is pneumatically actuated by a suitable actuation valve in turn controlled by the sensing means 80 when it detects the edge of the web. A spring 203 (FIG. 17) counters the pendulum weight by providing an upward resilient force.

The web sensing means is shown in detail in FIGS. 18 and 19 and comprises an adjustable hollow sensing rod 81 with a sensing aperture 82 at one end for detecting the edge of the web. Bar 81 is movable within a U-channel member 181 positioned immediately adjacent and rearward the rear bar 72, as shown in FIG. 9, and having a slotted aperture 182 in the bottom thereof which permits a course adjustment shaft 184 (FIGS. 18 and 19) to extend therethrough. Shaft 184 is threadably coupled at one end to the rod 81 and has a shoulder 186 which contacts the bottom surface of channel member 181 such that the sensing aperture 82 can be positioned where desired laterally along the print cylinder 62. For different width printing stock, the course adjustment 184 is usually employed.

To provide fine adjustment of the sensing means, the U-channel 181 is mounted to a carriage assembly 185 by means of a pair of arms 186 as seen in FIGS. 18 and 19. Carriage 185 is supported at the right end in FIG. 19 (i.e., to the rear wall of the printing press) by means of a roller and guide assembly 188 which permits the beam 187 of carriage 85 to shift laterally. On the left end (i.e., toward the front wall of the printing press), a threaded shaft 189 extends through a threaded aperture in the front plate 120 of the press and is supported at the left end by a bracket assembly 190. A sprocket

192 is positioned on the shaft 189 and suitable drive means for the sprocket 192 provide rotational motion of shaft 198 which in turn moves to the left or right in FIGS. 18 and 19 and contacts a rod stop 194 positioned on the end of beam 187. Movement of adjustment screw 189 effects movement of the U-channel 181 and, therefore, the sensing bar 81 which is secured thereto by means of shoulder 186. A bias spring 195 holds contact member 194 in secure contact to the right end of screw 189 and a bushing assembly 193 supports rod 194 to permit longitudinal motion of the carriage as screw 189 is rotated.

As the cam 271 (FIG. 15) releases the vacuum pull-over arms 72 such that springs 179 draw the web toward aperture 82 of sensing means 80, the sensing means detects the edge of the web and controls the braking means coupled to the drive linkage 175 for the side pull-over assembly. This locks the lateral position of the arms 72 thereby fixing the skewed web position in a laterally registered position selected by the position of sensing aperture 82. Since the pull-back rod 54 (FIG. 13) is spring-mounted to be freely shiftable, it does not interfere with the lateral motion of the web during side registration.

The print cylinder assembly 60, shown schematically in FIGS. 5 and 6, is shown in greater detail in FIGS. 20 and 21. The relative positioning of the print cylinder 62 with respect to the registration means and the vacuum pull-through cylinder is clearly shown in FIGS. 7, 8 and 9.

Assembly 60 includes frame 64 with end members 64' (FIGS. 20 and 21) which are fixedly attached to a pivot shaft 66 at one end thereof and which support a cylinder axle 69 for print or back-up cylinder 62 as seen in the figures. Shaft 66 serves the dual purpose of providing a web support, as seen in the schematic diagram of FIG. 5, such that a smooth arc is provided for the web as it travels through the printing station. Cylinder 62 is rotatably mounted on axle 69 by suitable bearing assemblies 69'. It is noted here that the free-wheeling cylinder 62 is approximately 4 inches in diameter, as is the vacuum pull-through cylinder 102. This construction is substantially different from the 18 inch diameter driven cylinder employed in the system described in the above-identified compending application.

The reduced size, and therefore weight of cylinder 62, permits its vertical reciprocation which is achieved by means of a pair of connecting links 220 coupled at one end to the end of each member 64, as seen in the FIGS. 20 and 21, and extending downwardly, as seen in the schematic of FIG. 5, to contact the cam 276 on camshaft 270. Cam 276 actuates arm 220 to raise cylinder 62 approximately $\frac{3}{8}$ inch during the printing stroke of each cycle of printing and lowers the cylinder during the return or registration portion of each printing cycle.

This is accomplished by the pivoting motion of cylinder 62 about pivot shaft 66 which in turn is supported by a pair of vertical arms 222 having upper ends coupled in rotational engagement to shaft 66 at opposite ends thereof and lower ends securely coupled to opposite ends of a second pivot shaft 224. Since the printing screen is spaced approximately $\frac{1}{4}$ inch above the web during registration, and the print cylinder is spaced approximately $\frac{1}{8}$ inch below the web during this time, the $\frac{3}{8}$ inch upper travel of the cylinder is effective to press the web against the printing screen and squeegee therebehind to effect the necessary printing contact. The

movement of the carriage 85 by the Floyd drive pulls the web over the cylinder 62 thereby rotating the free-wheeling cylinder.

Arms 222 and shaft 224 also permit the print cylinder 62 to be moved rearwardly slightly when the screen frame carriage stops 87 (FIGS. 5 and 22) contact the print cylinder stops 65. Stops 65 are shoes mounted on the leading edge of each of the end members 64 as seen in FIGS. 20 and 21. Bias spring 225 holds the cylinder assembly in a normally forward position. It is noted here that the horizontal motion of the cylinder is limited to a relatively small amount (i.e., a few thousandths of an inch) sufficient to permit the accurate registration of the frame holding carriage to the print cylinder. The horizontal rearward motion of the print cylinder assembly also provides the dual function of providing shock absorbing action by virtue of the resilient biasing of spring 225 which normally holds arm 222 into contact with an adjustable stop 223 (FIG. 21) which determines the forward position of the print cylinder. Thus, as the carriage moves rearwardly during the registration of each printing cycle, the impact of the carriage to the print cylinder frame is absorbed by the rearward motion of the resiliently biased print cylinder assembly.

As mentioned briefly above, the inking supply for the screen frame is provided by an assembly which fits on the inking supply rack 230, shown in FIG. 7, and which is substantially the same as described in the copending application identified above. Within housing 235 (FIG. 7) positioned slightly above and behind the printing station 25 is mounted the mechanism for controlling the removable squeegee and flow coater. The drive mechanism for the squeegee and flow coater are substantially the same as that described in the copending application with the exception that the squeegee (which moves vertically) is coupled to a squeegee control arm 237 (FIG. 7) which moves vertically slightly less than in the prior system. This results since, in the present printing press, the screen frame moves horizontally only and not vertically and the squeegee need be moved upwardly only an amount sufficient to clear the printing screen during the return stroke of carriage 85.

The flow coater control arm 239 is reciprocated vertically to be raised out of contact with the printing screen during the printing stroke. The flow coater arm 239 (FIG. 7) also reciprocates in a horizontal direction in the same manner as discussed in my previous application. Both of the control arms 237 and 239 are driven by suitable cams on camshaft 270.

Shaft 270 includes a plurality of cams which are configured to control the interrelated motion of the various moving components of the press in a cyclical fashion to achieve the printing and registration portions of each printing cycle of operation. Not only does the cam 270 control the mechanical motion of many of the components, it also actuates the various vacuum valves necessary to achieve the desired web registration as well as separation of the web from the printing screen. A cycle of operation of the printing press with a description of the control effected by the camshaft 270 is presented below with reference to FIG. 23.

OPERATION

Initially, in referring to the bar graph of FIG. 23, it is seen that there exists a dwell period of 30° between the print and return strokes of the carriage (i.e., the print

and registration portions of each cycle). For the purposes of initiating a description of a cycle of operation, it is assumed that the web is properly registered and a print cycle is beginning at the 30° point indicated in FIG. 23. At this time, the Floyd drive mechanism begins moving the screen frame carriage 85 forwardly as indicated by the shaded portion of FIG. 23 adjacent the now labeled carriage. At the same time, the print cylinder is raised to its printing position and the squeegee is lowered into the printing position and is in contact with the upper side of the printing screen to force ink applied to the screen through the printing pattern and onto the web. The flow coater is in a raised position at this time.

During the advancement of the carriage, the feed table 20 advances web material into the slack loop 21 (FIG. 1) to maintain the loop as the web advances through the printing station. During the print stroke, the guide blades 45 are retracted out of the way of the print cylinder and the vacuum pull-back rod 54 is in its rearward position with no vacuum applied thereto. The vacuum pull-over rods 72 are to the left side (i.e., rear of the press) and are held in this position by the braking mechanism 200. Vacuum is not applied to the pull-over arms at this time since the web is held between the screen and the printing cylinder. The vacuum is applied, however, to the pull-through vacuum cylinder 102 as indicated by the bottom shaded line of FIG. 23.

As the Floyd drive mechanism moves the carriage forwardly to the end of the print stroke at the 180° point, the vacuum pull-back arm 54 is allowed to move forwardly so as not to interfere with the web motion. As the carriage approaches the end of the print stroke, the web has moved through the printing station a distance approximately ¼ inch farther than the actual printed frame such that tabs T₁ and T₂, as seen in FIG. 6, are slightly forwardly of the guide blades when moved to their forward position.

During the dwell period of 30° (i.e., 180°–210°) between the print and return strokes of the cylinder, the flow coater moves down into position and the brake for the vacuum pull-over rods is released and lateral registration rods 72 are moved toward the front of the printing press. The print cylinder begins moving down while the squeegee moves upwardly. The guide blades 45 begin moving forwardly. The vacuum pull-back rod 54 is forward at this time and in a position to pull the web rearwardly when actuated. The vacuum applied to cylinder 102 is cut off at approximately the 200° point.

During the registration portion of each printing cycle, (i.e., 210°–360°), the carriage is returned while the printing cylinder is lowered and the squeegee is in a raised position. The flow coater is lowered to spread applied ink uniformly across the surface of the screen as the carriage moves rearwardly to the initial position. The guide blades reach their forward position at approximately the 235° portion of the cycle and the vacuum pull-back rod 54 and the valve actuating the vacuum thereto are actuated such that the web is drawn rearwardly to cause the tabs T₁ and T₂ to abut against the guide fingers 45 of the guide blade assembly thereby skewing the web as shown in FIG. 6 and described above.

Approximately midway through the registration cycle and after the web is drawn rearwardly and is held in this position by the vacuum pull-back assembly, the vacuum pull-over assembly is actuated and moves lat-

erally (to the rear of the press) to draw the web to the side until it is detected by the sensing means. It is noted here that the vacuum on the pull-back valve remains on until approximately the end of the registration cycle and the vacuum is continuously applied to the pull-over rods 72 until the cylinder has been raised and the squeegee is lowered thereby assuring that the web is securely held in the registered position by the print cylinder and squeegee before the registration means are de-actuated.

With the web longitudinally registered and held, the guide blades are moved rearwardly (at approximately the 330° portion of the cycle) such that during the dwell interval between the return and print strokes of the carriage, the guide blades have been moved out of the way and do not interfere with the contact between the screen and the web. Also, the flow coater is raised and the inking valves turned off while, at the same time, the squeegee is moved down and the vacuum to cylinder 102 is again actuated.

Thus, the web and printing components of the system are in a position to initiate a print cycle as the Floyd drive mechanism again advances the carriage 85 through another printing stroke. With this construction, very high-speed screen printing of multicolor frames can be achieved on a continuous web passing through successive identical print stations.

Although the invention has particular application to screen printing on web stock, it is understood that other operations can be performed on the registered stock, including slitting, scoring, embossing, and that other printing stock can be employed as can other printing processes. Also, the specific design of the registration means and other components of the system may vary from those described in the preferred embodiment. It will become apparent to those skilled in the art that these and other modifications to the preferred embodiment described can be made by those skilled in the art without departing from the spirit or scope of the present invention as defined by the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A printing press for printing on a web having registration tabs at spaced intervals along its length, said apparatus comprising:

advancing means for advancing a web of printing material into a printing station such that a registration tab thereon is positioned slightly beyond a predetermined registration position;

guide means comprising a guide arm having an end engaging the upper surface of said web and defining a reference edge at a predetermined location in said printing station for engaging an edge of said tab during rearward motion of said web during a registration portion of each cycle of operation; and means engaging a single surface of said web in an area adjacent said registration tab for drawing said web rearwardly to move said registration tab into engagement with said reference edge of said guide arm during said registration portion of each operating cycle and for securely holding said tab against said reference edge until said web is advanced during printing thereby providing registration of said web in said printing station and in a longitudinal direction.

2. The apparatus as defined in claim 1 and further including pulling means for pulling the web laterally toward one side of said printing station, and means for controlling said pulling means to position said web in predetermined lateral registration.

3. A printing press for printing on a web having registration tabs positioned at spaced intervals along its length, said apparatus comprising:

advancing means for advancing a web of printing material into a printing station such that a registration tab thereon is positioned slightly beyond a predetermined registration position;

guide means positioned at said predetermined registration position; means for drawing said web rearwardly prior to printing, to move said registration tab into engagement with said guide means such that when said tab is seated against said guide means, a section of said web in said printing station is slightly skewed relative to the longitudinal axis of said printing station providing skewed registration of said web section, whereby said web section advances through said printing station during printing in a predetermined lateral direction.

4. A printing press for printing on a web including a plurality of spaced printing frames therealong and having a pair of registration tabs in spaced relationship adjacent each printing frame along the length of said web, said apparatus comprising:

advancing means for advancing a web of printing material into a printing station such that said pair of registration tabs are positioned slightly beyond a predetermined registration position;

guide means positioned at said predetermined registration position and including a pair of guide members spaced to contact said pair of tabs; means for drawing said web rearwardly prior to printing to move said pair of registration tabs into engagement with said guide members, such that when said web is drawn to move said pair of tabs into seating engagement with said guide members, a section of said web in said printing station is skewed relative to the longitudinal axis of said printing station providing skewed registration of said web section, whereby said web section advances through said printing station during printing in a predetermined lateral direction and distance.

5. The apparatus as defined in claim 4 wherein said means for advancing said web of printing material includes infeed means reciprocally moved in first and second directions and including means for gripping said web when moving in said first direction to advance said web into the printing station in a position in advance of the registration position, and wherein said means for drawing said web into registration comprises means contacting said web and movable to draw said web in said second direction until said registration tabs seatably engage said guide members.

6. The apparatus as defined in claim 5 and further including drive means coupled to said guide members to move said guide members to a registering position during a registration portion of each printing cycle of operation and to a retracted position during a printing portion of each operating cycle, and wherein said guide members are pivotally coupled to said drive means to permit said tabs to move past said guide members when said web is advanced in said first direction but capture

said tabs when said web is drawn in said second direction.

7. The apparatus as defined in claim 6 wherein said printing press further includes means for moving said web section laterally toward one side of said printing press and means for controlling said moving means to control the lateral registration of said web section.

8. A printing apparatus for printing frames of information on printing stock and employing a printing screen and back-up cylinder positioned at a printing station comprising:

a screen frame carriage for holding a printing screen; means for reciprocating said carriage in a single plane through print and return strokes;

a back-up cylinder movable toward said printing screen to apply pressure to printing stock positioned between said screen and said cylinder to permit advancement of said stock during said printing stroke of each cycle of operation to form a print thereon and movable away from said screen during the return stroke of said carriage; and

wherein said printing stock is continuous web material and said press includes means for registering a section of said web in said printing station between said screen and said back-up cylinder in a slightly skewed manner relative to the axis of reciprocation of said carriage and prior to printing such that as said web is advanced through said printing station during the printing stroke of said carriage, the web section moves laterally in a predetermined manner.

9. The apparatus as defined in claim 8 and further including means contacting the surface of said web adjacent said cylinder for pulling said web section away from said printing screen as said web is advanced during the printing stroke of each cycle of operation.

10. The apparatus as defined in claim 9 wherein said cylinder, said registering means and said pulling means are positioned to provide a continuous arc for supporting said web as it passes through the printing station during a cycle of operation.

11. A printing press for printing on web stock comprising:

infeed means for advancing web stock into a printing station including a printing pattern and a back-up cylinder;

means for registering a section of said web stock in said printing station between said pattern and said cylinder skewed relative to the longitudinal axis of said printing station and prior to printing; and

means for advancing said web stock between said cylinder and said pattern to form a print on said web stock section whereby due to skewing of said web stock section said section advances through said printing station during printing in a predetermined lateral direction.

12. The printing press as defined in claim 11 wherein said means for registering said web stock section comprises:

registration tabs positioned adjacent each printing frame of said web stock section at a predetermined location;

guide means positioned in said printing station for contacting the surface of said web stock on which said registration tabs are positioned; and

means for drawing said web stock in a direction such that said registration tabs seat against said guide means thereby fixing the position of said web stock

section prior to the printing of said print frame thereon.

13. The apparatus as defined in claim 12 wherein said means for registering said web stock section further includes;

means for drawing said web stock section in a lateral direction toward one side of said press;

means detecting an edge of said web stock section; and

means coupled to said drawing means for controlling said drawing means to stop the lateral movement of said web stock section once the edge of said web stock section is detected by said detecting means.

14. The apparatus as defined in claim 13 wherein said press comprises a screen printing press and wherein said advancing means includes a carriage assembly reciprocated in first and second directions corresponding to print and return strokes thereof and wherein drive means coupled to said registration means control said registration means to register said web stock section during the return stroke of said carriage.

15. The apparatus as defined in claim 14 wherein said pattern is a printing screen held by said carriage and further including means for separating said web stock section from said printing screen as said web stock is advanced during said printing stroke.

16. A method of printing a web comprising the steps of:

feeding said web into a printing station;

skewing a section of the web in said printing station at a predetermined angle relative to the longitudinal axis of said printing station;

positioning a back-up cylinder in contact with one side of said web section and a printing pattern in contact with said web section on an opposite side thereof; and

moving the web over the back-up cylinder to form a print whereby due to said skewing step, said web section moves slightly laterally through said printing station in a predetermined direction.

17. The method as defined in claim 16 including the additional steps of:

pulling the web section laterally toward one side of said printing station; and

holding the web section at a predetermined lateral position in said printing station until the moving step is initiated.

18. The method as defined in claim 16 including the additional step of pulling the web section away from the printing pattern as the web advances past the back-up cylinder.

19. In a printing press, means for advancing printing stock through a printing station such that it travels laterally in a predetermined manner during printing comprising:

means for advancing printing stock into said printing station;

means for registering said stock in said printing station skewed in relation to the longitudinal axis of said printing station; and

means for advancing said print stock between a pattern and a back-up cylinder to form a print thereon whereby due to the skewed registration of said printing stock, said printing stock moves through said printing station in a predetermined lateral direction a slight distance.

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20. The apparatus as defined in claim 19 wherein said registering means includes longitudinal and lateral registration assemblies.

21. The apparatus as defined in claim 20 wherein said longitudinal registration assembly includes:

guide means positioned in predetermined relationship to said printing stock in said printing station; and

means for positioning said printing stock in contact with said guide means to skew said stock.

22. The apparatus as defined in claim 21 wherein said positioning means includes:

a pair of spaced tabs positioned on said printing stock adjacent a printing area thereon and including an edge for contacting said guide means; and

means for pulling said stock toward said guide means such that said tabs seat against said guide means.

23. The apparatus as defined in claim 22 wherein said lateral registration assembly comprises:

means for pulling said stock toward one side of said printing station;

means for sensing an edge of said printing stock; and

control means for locking said pulling means in position when said sensing means detects the edge of said stock.

24. The apparatus as defined in claim 23 wherein said printing stock is a continuous web.

25. A screen printing press comprising:

a screen frame carriage for holding a printing screen and including a pair of carriage stops positioned thereon;

means for reciprocating said carriage through print and return strokes;

a back-up cylinder contacting printing stock positioned between the printing screen and said cylinder during the printing stroke; and

means for mounting said back-up cylinder to be resiliently biased in a forward position, said mounting means including a pair of cylinder stops positioned to be contacted by said carriage stops when said carriage reaches the end portion of the return stroke thereby registering said carriage to said back-up cylinder prior to the initiation of the print stroke and absorbing the impact of said carriage with said cylinder stops as said carriage moves rearwardly to contact said cylinder stops at the end of the return stroke of said carriage.

26. The apparatus as defined in claim 25 wherein said mounting means is movable to reciprocate said printing cylinder toward and away from said carriage such that said cylinder contacts the printing stock only during the printing stroke.

27. The apparatus as defined in claim 26 wherein said carriage stops are adjustable to adjust the registration between said carriage and said print cylinder.

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