United States Patent

[11] 3,543,680

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[21] Appl. No. **704,408**
[22] Filed **Feb. 9, 1968**
[45] Patented **Dec. 1, 1970**

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[54] **APPARATUS FOR IMPRINTING OBJECTS SUCH AS BOTTLES AND THE LIKE**
7 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **101/40,** 101/123, 101/126, 101/313, 101/363; 198/162; 118/240, 118/243, 118/263

[51] **Int. Cl.** **B41f 17/18,** B41l 13/12

[50] **Field of Search** ..... 101/123, 126, 114, 51, 35, 38—40, 335, 294, 304, 308, 313; 118/240, 243, 263; 198/160, 162, 165

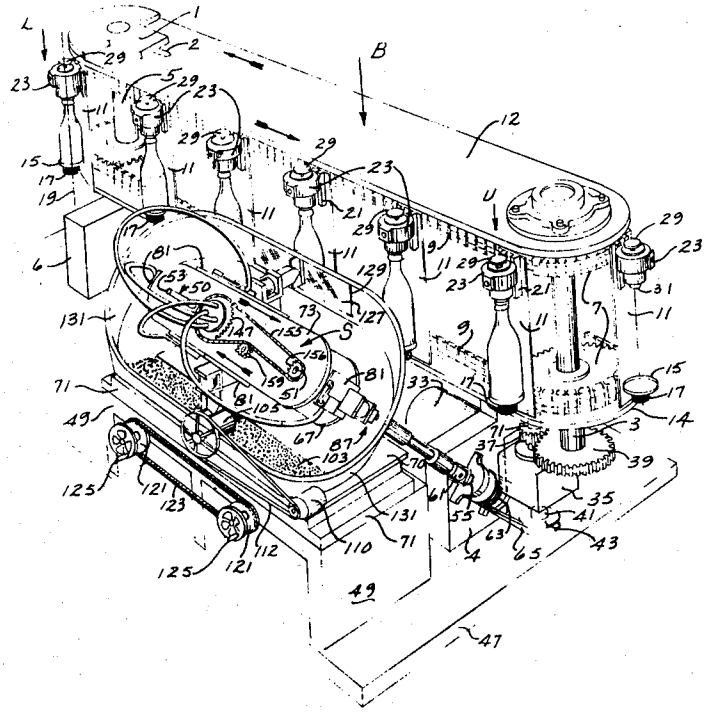
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Primary Examiner—William B. Penn
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ABSTRACT: A first circulating conveyor moves squeegees along a closed path over a first part of which they proceed over a pool of color with their striking edges moving in a first plane to receive color from the top of a drum which dips into the pool. Then the squeegees move over a second part of the path wherein the striking edges move in a second plane which is at a substantial angle to the first plane so as to be presented for wiping movements along one side of a stencil which is also at a substantial angle to the first plane. This forces color through the stencil for application to bottles which rotate on their axes and are rolled in contact along the other side of the stencil. The speeds of the bottle contacts and of the striking edges are equal. The axes of the bottles are conveyed in a plane which is also at a substantial angle to said first plane. While moving along the second part of the path the squeegees partake of transverse movements to and from the face of the stencil to begin and terminate wiping movements in engagement therewith.



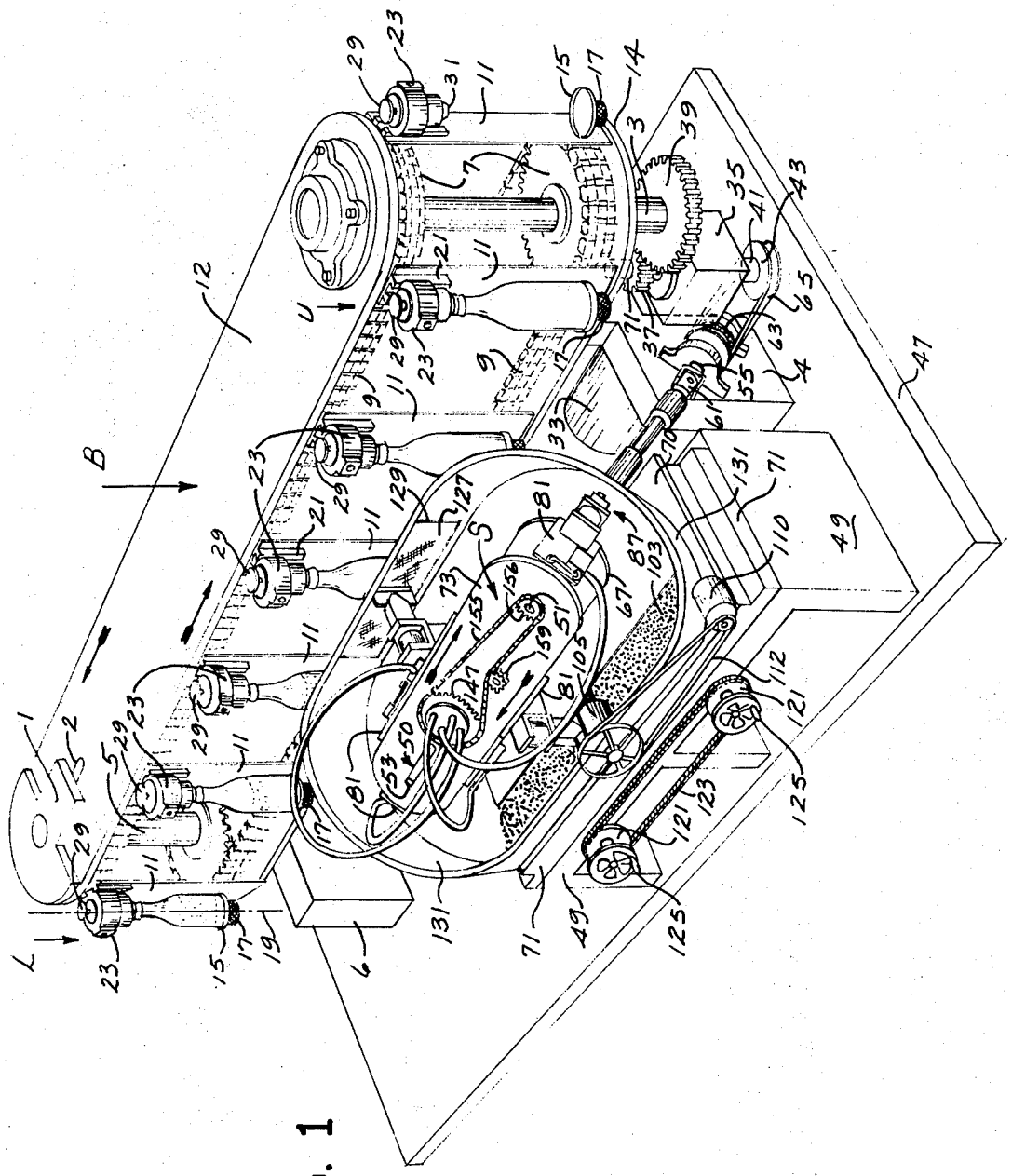


FIG. 1

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Attorneys.

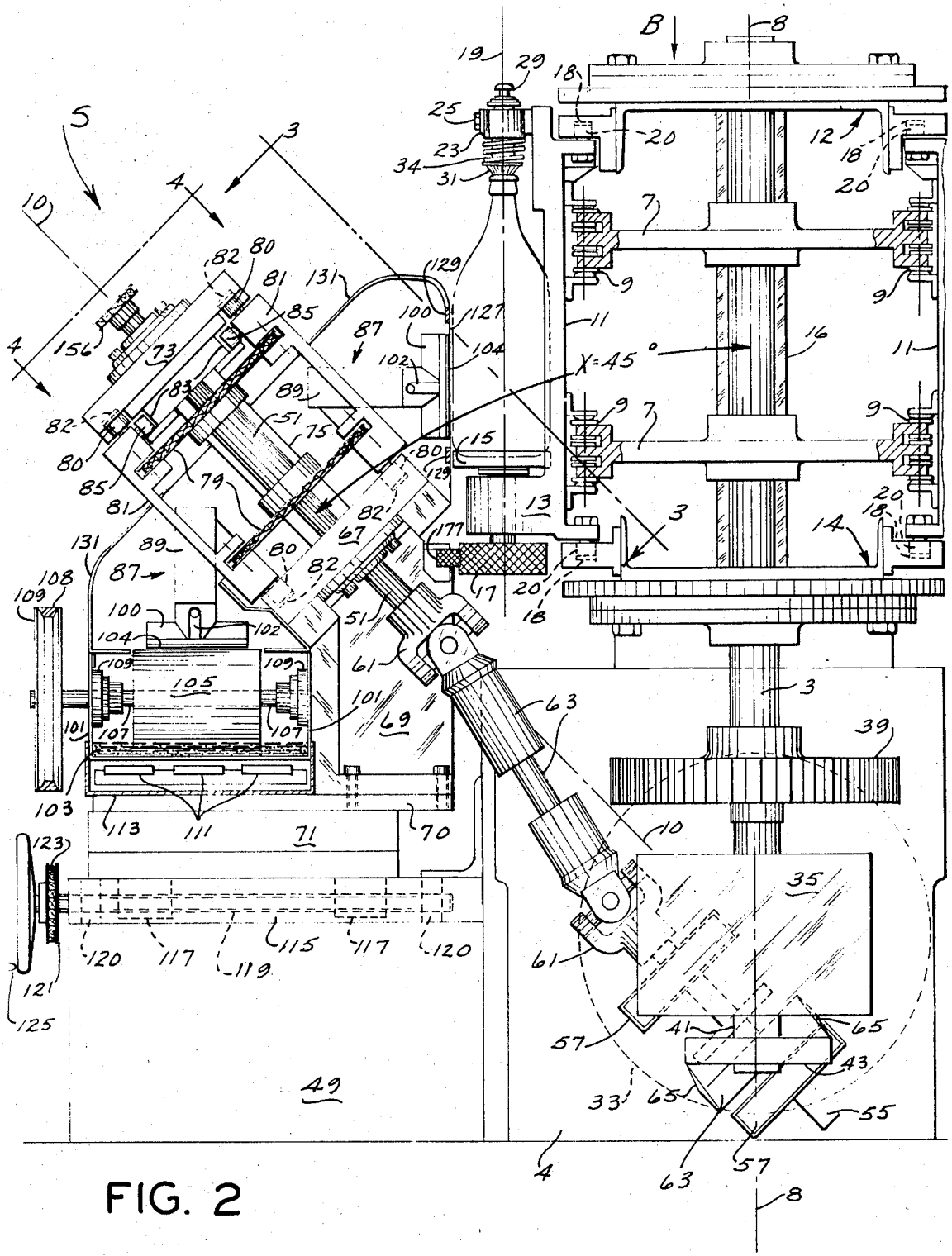

B
8
19
29
18
25
23
34
31
20
12
18
20
5
3
4
10
7
9
11
16
X=45°
82
80
81
131
85
87
100
129
127
104
102
156
73
83
89
51
75
79
15
13
177
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61
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FIG. 2

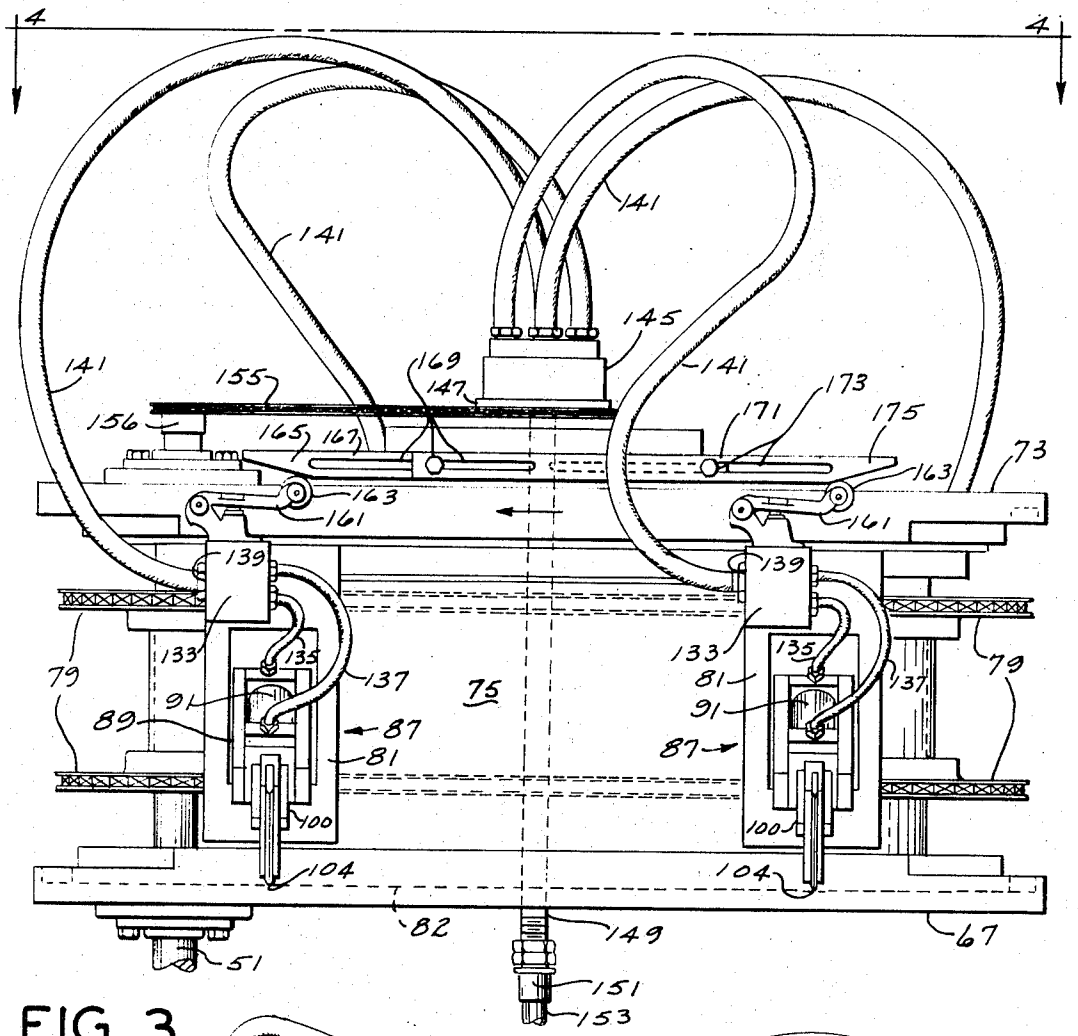

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4
141
145
155
169
147
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165
167
171
173
175
163
161
73
139
133
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91
89
87
81
75
100
104
82
149
67
51
151
153

FIG. 3

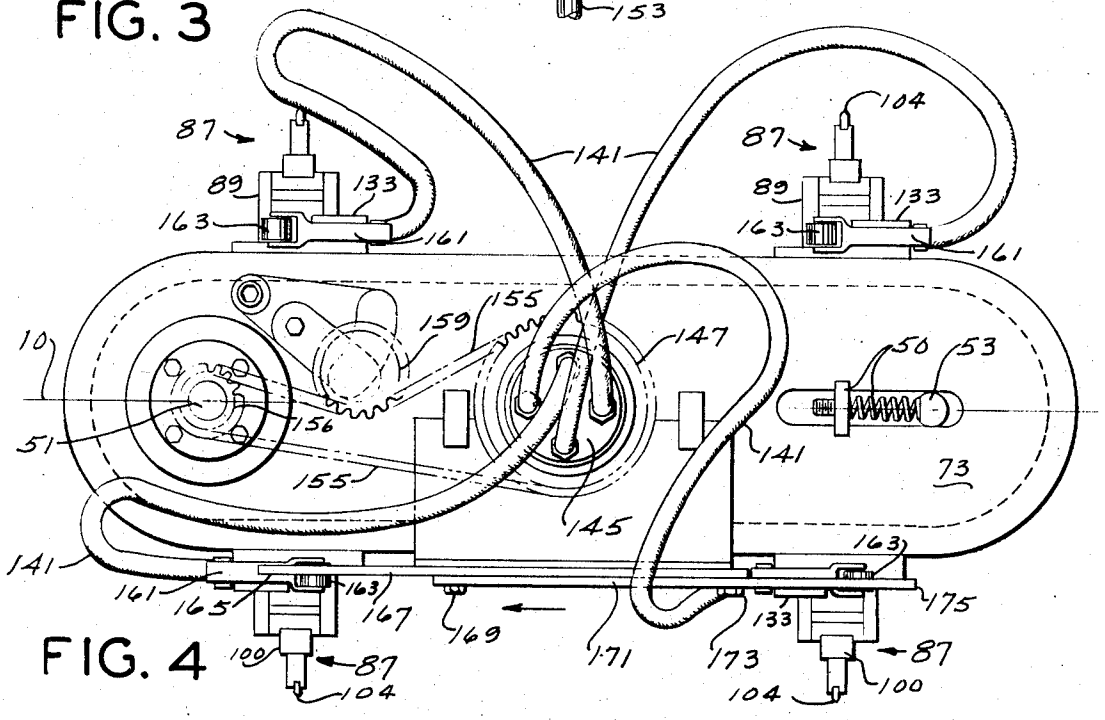

87
89
133
163
161
141
104
10
159
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147
50
53
156
51
73
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171
173
100

FIG. 4

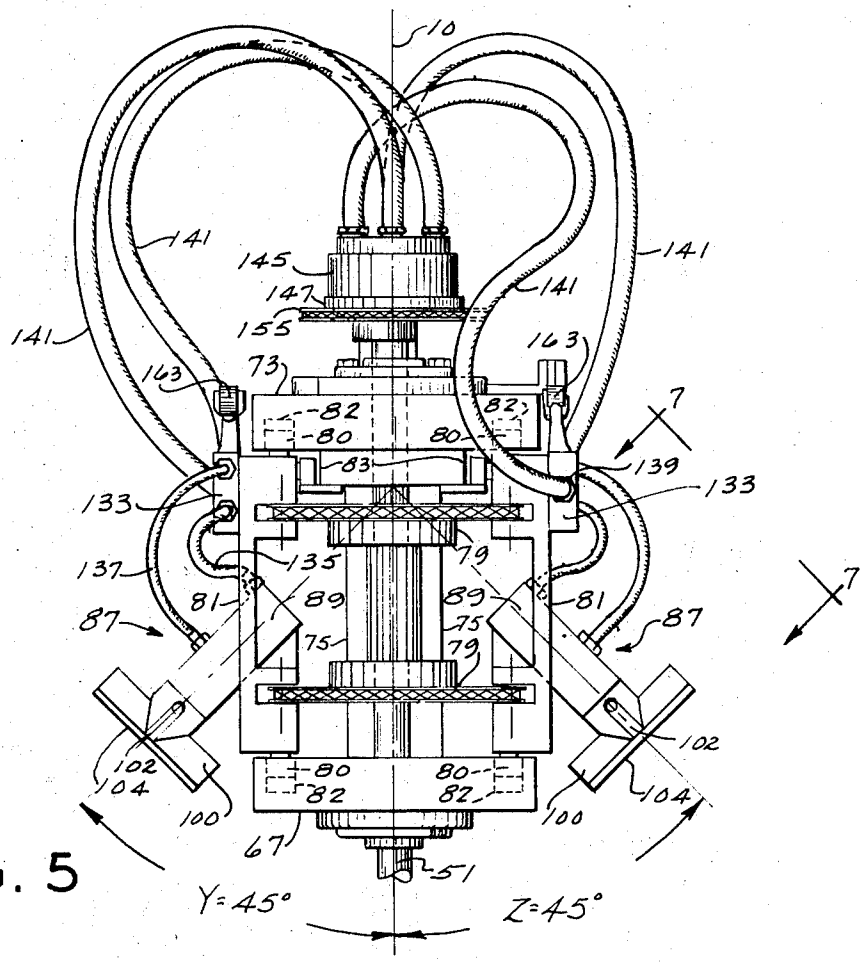

10
141
145
147
155
163
73
82
80
83
139
133
135
137
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89
81
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75
102
104
100
67
51
Y=45°
Z=45°
7

FIG. 5

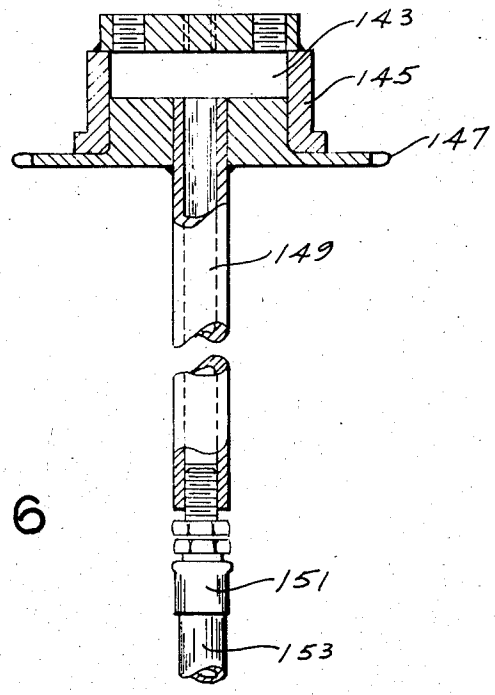

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147
149
151
153

FIG. 6

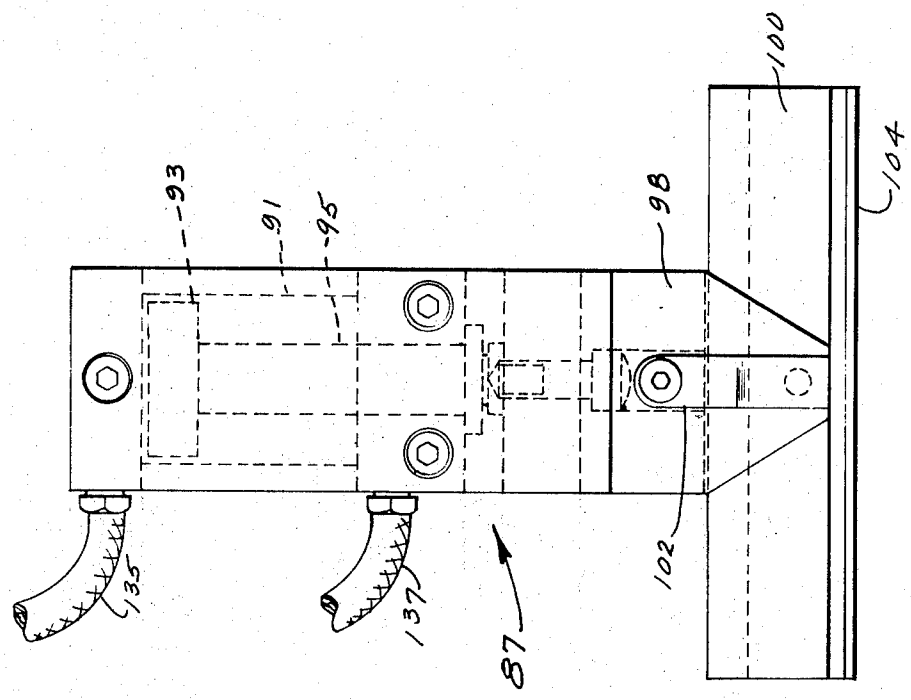

100
104
93
91
95
98
135
137
87
102

FIG. 8

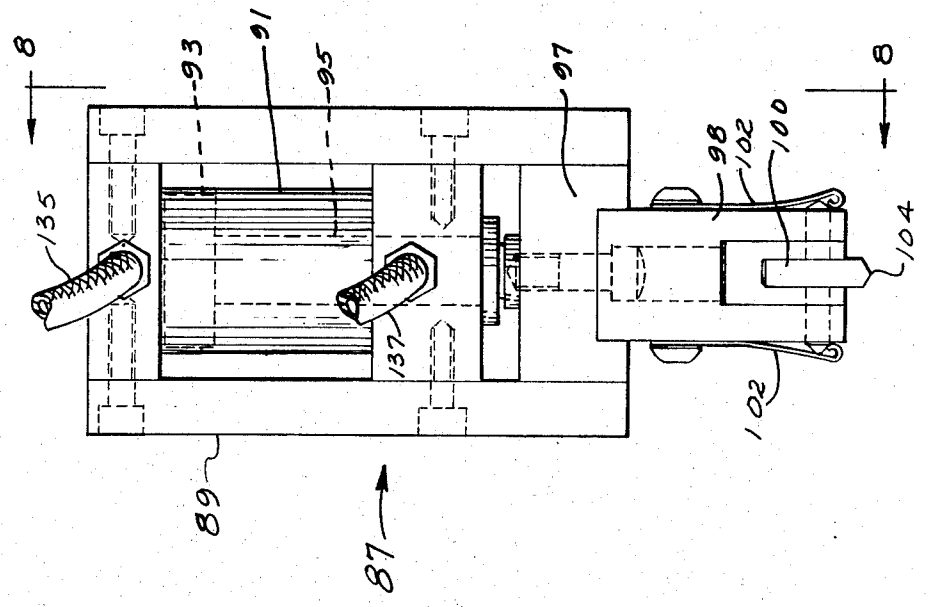

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93
91
95
97
98
102
100
8
135
137
104
89
87
102

FIG. 7

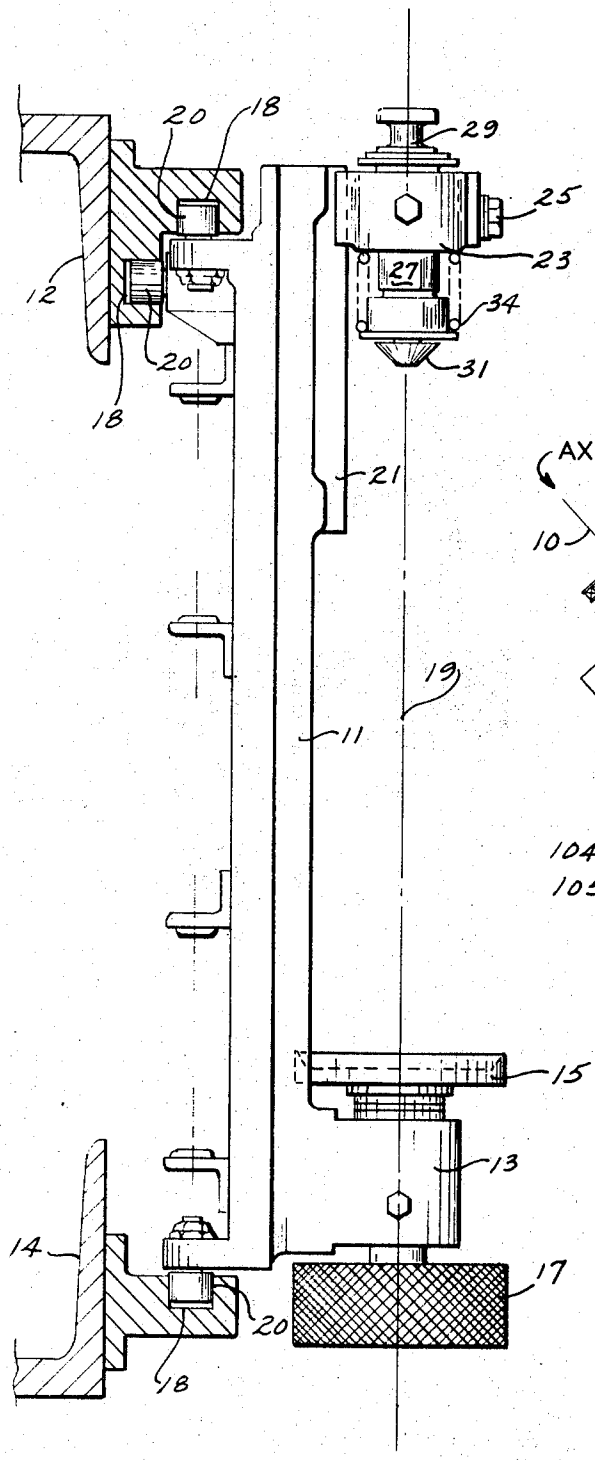

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FIG. 9

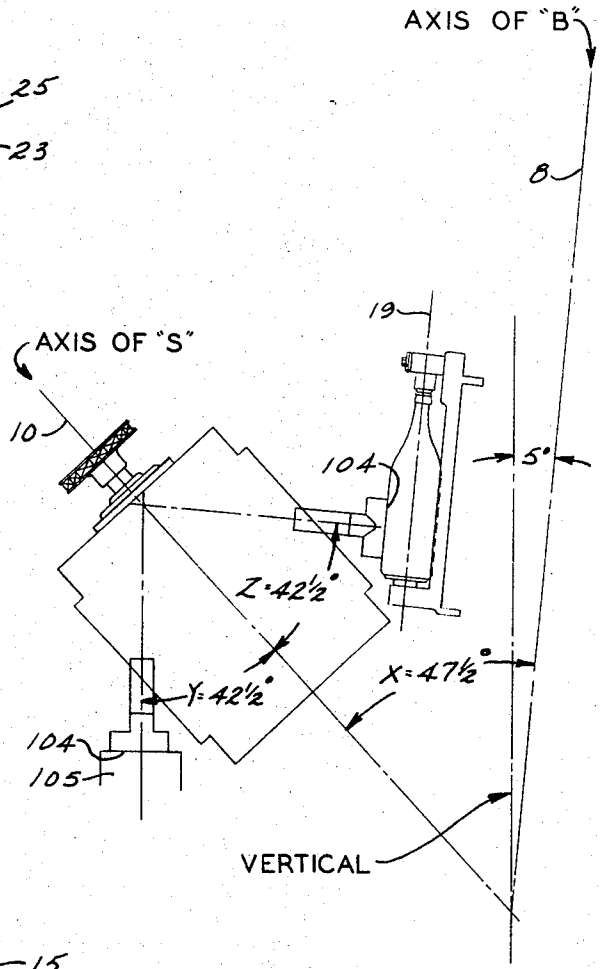

AXIS OF "B"
8
19
AXIS OF "S"
10
104
5°
Z=42½°
X=47½°
Y=42½°
104
105
VERTICAL

FIG. 10

APPARATUS FOR IMPRINTING OBJECTS SUCH AS BOTTLES AND THE LIKE

BACKGROUND OF THE INVENTION

The invention is an improvement upon apparatus such as set forth, for example, in U.S. Pat. Nos. 2,718,847; 2,767,647 and 3,237,555. It is preferred to advance bottles to be stenciled, in vertical positions because, among other things of the simplicity with which bottles may be loaded and unloaded by more or less conventional apparatus. This preference, however, involves problems of evenly applying coloring to vertical squeegees when in color-receiving positions.

SUMMARY

The invention solves the problems formerly existing by angling a squeegee conveyor relative to a nonhorizontal, preferably vertical bottle conveyor, so that while the striking plane of application of coloring to the stencil is preferably upright, the plane of application of color to the striking portions of the squeegees is horizontal. This results in even stenciling at high speeds by a comparatively simple machine.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view broadly illustrating apparatus embodying the invention, various details being omitted for clarity;

FIG. 2 is a transverse view partly in section of a tilted squeegee conveyor (some parts shown elsewhere being omitted for clarity) and showing parts of a related vertical bottle conveyor;

FIG. 3 is a face view of the tilted squeegee conveyor per se, as viewed from plane 3–3 of FIG. 2, certain bottle conveyor and stencil parts extending across the plane being removed;

FIG. 4 is a plan view of FIG. 3, being viewed across planes 4–4 of FIGS. 2 and 3;

FIG. 5 is a left-end view of FIGS. 3 and 4;

FIG. 6 is a vertical section through an air distributor manifold;

FIG. 7 is a plan view of squeegee reciprocating apparatus, as viewed from line 7–7 of FIG. 5;

FIG. 8 is a right side elevation of FIG. 7;

FIG. 9 is a view partially in section further illustrating a bottle-carrying platen; and

FIG. 10 diagrammatically illustrates certain dimensional variations.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, letter B indicates a conventional bottle conveyor, except that it is vertically disposed, its vertical position being determined by its vertical drive shaft 3 and its vertical idler shaft 5. Its supports are numbered 4 and 6 carried on a base 47. It has upper and lower plate members 12 and 14 forming bearings for shafts 3 and 5. Members 12 and 14 are connected by a wall 16 (FIG. 2). Shafts 3 and 5 support sprockets 7 which carry suitable conveyor chains 9. Conventional chain tensioning means is indicated at 1. Pinned to conveyor chains are spaced platens 11, one of which is illustrated in more detail in FIG. 9. Members 14 and 12 include tracks 18 for rollers 20 on the platens 11. These are best shown in FIGS. 2 and 9, being omitted from FIG. 1 because of its small scale. At the lower end of each platen is a bracket 13 (FIG. 9) forming a bearing for a rotatable bottle support 15 and an attached knurled disk 17. Thus a moving bottle carried on the support 15 may be turned by disk 17 about a vertical axis 19 about which the bottle was shaped. At the upper end of each platen 11 is a grooved part 21 slidably supporting a bottle clutch 23. Clutch 23 may be adjusted and clamped at any suitable elevation by suitable clamping means 25. Further details in this regard are not required, being known. Vertically slidable in each member 23 is a sliding bolt 27 having an operating button 29

to provide means to raise and lower it. At the lower end of the bolt 27 is resilient rotatable nose piece 31 for entering into and frictionally engaging within a bottle neck to clutch it. A spring 34 biases the bolt 27 downward into clutching position. The bolt 27 is raised to admit the bottle mouth beneath the nose piece 31 and, upon release, the spring 34 drives the nose 31 into the bottle neck to chuck it for translation in a rotatable position on support 15.

At numeral 33 (FIGS. 1 and 2) is shown a driving motor which, through a gear reduction unit 35, continuously drives a shaft 41 carrying a pinion 37 meshing with a gear 39 on the drive shaft 3 of the conveyor 1. Shaft 41 also supports a lower toothed pulley 43. The platens 11 circulate continuously in the direction shown by the darts in FIG. 1, the bottles moving from a loading station at the left as at L to an unloading station at the right as at U. Loading and unloading apparatuses are not shown being any suitable ones of known types, or under certain circumstances these operations may be performed manually.

At 49 is indicated a support for an angled squeegee-supporting chain conveyor S which has a drive shaft 51 and an idler shaft 53. These shafts 51 and 53 and consequently the conveyor S are angled, preferably at 45°, as best shown in FIGS. 1 and 2. Conventional chain-tensioning means is indicated at 50 (FIG. 1).

In FIG. 2 numeral 8 indicates the vertical plane of the bottle conveyor and 10 indicates the angled 45° plane of the squeegee conveyor. Drive shaft 51 of conveyor S is driven from a parallel shaft 55 mounted in bearings 57 on the support 4. Universal joints 61 having an axially splined connection 63 between them effect a 1:1 drive connection between shafts 55 and 51. The shaft 55 carries a toothed pulley 63 which by a toothed, twisted timing belt 65 is connected with the toothed pulley 43 on shaft 41. Thus the drive shaft 3 of the vertical bottle conveyor 1, and the drive shaft 51 of the squeegee conveyor S, are driven in synchronism.

As will be seen from FIGS. 2—5, a base portion 67 of squeegee conveyor S is carried on a bracket 69 which in turn is supported upon a plate 70, the latter being connected to a traverse carriage 71 transversely slidable on the support 49. The top head of the squeegee conveyor S is lettered 73 and is connected with the base 67 by means of a center wall 75. At 79 are shown sprocket and chain connections between shafts 51 and 53. The chains of these connections carry platens 81. Grooves 82 in the base 67 and head 73 contain guide rollers 80 as shown extending from the platens 81. Additional grooves 83 contain axially supporting rollers 85. Upon rotation of drive shaft 51 the angled platens 81 will circulate in the direction shown by the darts on conveyor S in FIG. 1.

Carried on each angled platen 81 is a squeegee assembly 87 illustrated more in detail and orthogonally in FIGS. 5—8. Each squeegee assembly 87 comprises a bracket 89 attached to its respective platen 81. Each also includes an air cylinder 91 in which is a double-acting piston 93 for driving a piston rod 95. Attached to each piston rod is a crosshead 97 which carries a holder 98 for transversely disposed squeegee blade 100 held between spring clips 102. Each blade has a resilient striking edge 104. A slight amount of pivoting of the blade is allowed.

The center lines of the air cylinders 91 are directed at 45° angles Y and Z (FIGS. 5 and 2) with respect to the plane 10 of conveyor S, where as shown, the angle X between planes 8 and 10 is 45°. Thus as indicated in FIG. 1 when a squeegee assembly 87 travels to the left on conveyor S, the striking edge 104 of its squeegee blade 100 will be substantially vertically disposed; whereas when it is on the bottom side of conveyor S, its edge 104 will be substantially horizontal disposed (FIGS. 1 and 2). Other intermediate less critical blade angles occur as the platens 81 move around the ends of the conveyor S.

Referring again to FIG. 2, underneath the conveyor S is located a container 101 for a pool of color 103, into which dips a transfer drum 105, carried on a shaft 107. The shaft and drum are rotated by a pulley 109 driven by a belt drive 108 ex-

tending from a driving motor 110. The edges 104 of the squeegee blades 100 being at this time horizontal, graze the top of the roller 105 to receive color therefrom. Heaters 111 are provided below the container 101 to maintain proper consistency of the color.

The container 101 is supported by a bracket 113 on member 70. Carriage 71 is transversely slidable in suitable guides in a base 115. Member 70 carries the motor 110. The carriage 71 includes threaded lugs 117 for screws 119 carried in bearings 120. Equal sprockets 121 on the screws 119 are connected by a chain 123. Handles 125 on the sprockets 121 provide means for an operator to drive both screws 119 simultaneously so that the carriage 71 may be transversely adjusted. This transversely adjusts the position of conveyor S with respect to the conveyor B. The purpose of this is to transversely adjust the vertical plane of an upright stencil sheet 127 carried with the conveyor S. The stencil sheet 127 is served by the moving squeegee assemblies 87. Thus the stencil 127 may be brought into close tangential proximity with respect to the sides of bottles under translation by the conveyor 1. The stencil is preferably though not necessarily of the silk screen variety. It is vertically supported and tensioned in a suitable framework 129 in the usual manner requiring no further description in that regard. The framework 129 is carried on one flat side of a suitably supported twisted guard fence 131 which extends around the twisted path of the squeegees 100. The fence 131 is supported in part on the top of the color reservoir 101.

In view of the above it will be seen that each squeegee 100 is carried in a path in which its resilient color-striking edge moves in a range substantially vertically parallel to the stencil 127 then twisting downwardly and into a substantially horizontal position for contact with the roll 105 from which it picks up color. Then it returns by a twisting path back to the vertical range. The purpose of the double-acting pistons 93 is to advance and retract the squeegee striking edges 104 to and from the stencil 127 in their range of movements while vertical. The manner of effecting advance and retractive movements follows, referring to FIGS. 3—8. Carried on each platen 81 is an air valve 133 having air connections 135 and 137 with opposite ends of the cylinders 91. Inlet connections for the valves 133 are shown at 139. The valves 133 are of the usual four-way type whereby air under pressure at each inlet 139 may be sent to one end or the other of the cylinder 91, the other end being connected to a suitable exhaust opening in valve 133. Air under pressure is brought to each inlet connection 139 by means of an air hose 141. Each hose 141 leads to an air distributor chamber 143 formed by a hollow rotating head 145 with which is connected a sprocket 147 (FIG. 6). Connected to the head 145 is an inlet pipe 149 which rotates therewith. A swivel connection 151 is provided between the pipe 149 and an air pressure supply pipe 153. The sprocket 147 (FIG. 4) is driven by a chain 155 from a drive sprocket 156 carried on the drive shaft 51 of the conveyor S. Thus the distributor chamber 145 is caused to perform one complete rotation each time that a squeegee assembly 87 makes one complete circuit around the squeegee conveyor. The hoses 141 are of sufficient length to provide enough slack so that they compensate for the various distances that the valve inlets 139 circulate around the centrally positioned rotating distributor head 145. Thus the valves 133 are at all times supplied with air under pressure at their inlets 139. A swinging idler sprocket 159 serves to maintain proper tension in the chain 155 which extends between sprocket 156 on shaft 51 and the sprocket 147.

Each valve 133 is actuated by a pivoted lever 161 carrying a follower roller 163. Each roller 163 engages a cam 175 forming one end of an adjustable cam bar 171. As a roller 163 rides along the bottom of bar 171 it also comes into engagement with a bottom of a second cam bar 167 having a second cam 165 at its end. Slot-and-bolt connections 169 and 173 are provided for adjusting the cam bars 167 and 175. These slot-and-bolt connections permit adjustments of the cams 165 and 175 relative to the path of the follower so that as a squeegee assembly 87 approaches the screen 127 air is admitted behind its piston to advance its squeegee striking edge 104 transversely into pressure engagement with the stencil 127. This initiates the color striking part of its movement across the stencil 127. The strike is terminated as its roller 163 rides off at cam 165. This resets the respective valve 133 so as to release air from behind the piston 93 and to supply air to its other side thereby to withdraw the squeegee from the screen.

The timing of the drives for the conveyors B and S is such that bottles consecutively roll on lines along one side of the stencil 127 coextensive with movements of edges 104 of the squeegees on the other side of the stencil. In the process the squeegees successively press the stencil against the bottles. The striking speeds along the stencil are equal to the speeds of rolling contact between bottles and the stencil. In order that a bottle may roll on the stencil as it passes it, the knurled wheel 17 connected with its support 15 engages a friction strip 177 mounted beneath the screen 127 (see FIGS. 2 and 9).

Operation is as follows:

When the motor 33 is excited it synchronously drives the vertical bottle conveyor B and the angled squeegee conveyor S. The driving train for the bottle conveyor B extends through the speed reduction unit 35 to shaft 41, then through gears 37 and 39 to the drive shaft 3 of this conveyor B. Another train starts with the motor 33 and extends through the gear reduction unit 35 to the pulley 43, timing belt 65, pulley 63, shaft 55, universal joints 61 and the splined connection 63 with the drive shaft 51 of the sloping squeegee conveyor S. The motor 110 is also excited to rotate the color transfer drum 105 independently.

Bottles are successively loaded on the rotary supports 15 as they pass the appropriate loading station, for example at or ahead of L. They then advance to the farthest end of the printing screen 127 at which point their respective knurled rollers 17 engage the resilient strip 177 which starts the bottles rolling substantially tangently with respect to the bottle-conveyor side of the stencil. The squeegees, having received color in their horizontal positions from the drum 105, advance to their vertical positions moving in the direction of the plane of the stencil 127. As each squeegee reaches the stencil its striking edge has been supplied with color and has assumed a vertical position.

When a squeegee assembly becomes located opposite the forward end (FIGS. 1 to 4) of the stencil 127 its valve 133 is tripped by action of its roller 163 on cam 175. Hence the squeegee edge 104 is thrust out into contact with the stencil 127 thereby pressing the stencil against a passing bottle and squeezing color to the bottle on the moving line of strike as the bottle rolls on the stencil. As each squeegee assembly reaches the closest end of the stencil its operating roller 163 rides off of cam 165 resetting the valve 133 so that the squeegee is retracted from the stencil. This again places it in a path such that when its striking edge (at this time short of color) reaches the drum 105 it is horizontal and approximately in the plane of upper line of the drum so as again to pick up color.

Proper adjustment for squeegee contact with the stencil and contact with the stencil of the bottles is obtained by adjusting one or the other of handles 125. The transverse adjustments of platform 71 do not interfere with a constant 1:1 drive ratio between shafts 55 and 51 (FIG. 2) since these shafts 55 and 51 remain at all times parallel and in the same plane while the spline connection 63 compensates for different distances between the universal joints 61.

It will be observed from FIG. 1 that the spacing between successive bottles is arranged for the use of four squeegee assemblies of the squeegee conveyor S. It is to be understood that the capacity of the machine may be increased at a given speed by increasing the number of bottles carried on the conveyor B and the number of squeegee assemblies carried on the squeegee conveyor S. Thus, for example, 12 squeegees may be used with two additional bottles mounted between each pair shown in the drawings.

From the above, it will be comprehended by those skilled in the art that the vertical plane **8** (FIG. **2**) is a preferred one of a number of other substantially vertical positions of the conveyor B which are useful and fall within the principles of the invention as claimed herein. Variations in this regard will require another value of the angle X between planes **8** and **10** with correlated changed values of the angles Y and Z. For example, if as in FIG. **10**, plane **8** were tilted back to the right by 5°, (which might be of some advantage for convenience in loading) this would require reduction of the sum of the angles (Y + Z) by 5°, or 2½° each, making each equal 42½°, in order that the striking edges **104** of the squeegees would engage the sides of the then 5° tilted (although essentially upright) bottles while at the same time having these edges **104** horizontal when supplied with color from the horizontal drum **105**. This would also require that angle X be 47½ °. Also drum **105** might in general be omitted allowing the horizontal edges **104** to descend into the horizontal color pool **103**. It is contemplated that the plane **8** may be tilted from the vertical in the range of approximately 30°, if desired. The term upright, as used herein is intended to refer to the vertical position and any position in such a range.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

We claim:

1. Apparatus for imprinting objects such as bottles or the like comprising:

a vertical conveyor having an operating plane for rotatably supporting and moving such objects in a vertical plane along a path;

a vertical stencil sheet disposed adjacent the sides of said objects as they move in said plane;

squeegees having color striking edges;

a tilted squeegee conveyor having an operating plane at a 45° angle with respect to the operating plane of the first conveyor, said tilted conveyor in an endless path circulating the color striking portions of the squeegees at 45° to its own operating plane, whereby said striking portions move in vertical aspects over a first part of the path adjacent the stencil and horizontally over a second part of the path;

means for applying color to the squeegee striking portions as they move horizontally;

engageable means cooperating between the conveyors for turning the objects in rolling contact with the stencil as they move along it;

synchronizing drive means for the conveyors for equalizing the speeds of the squeegees and the rolling speeds of the objects along the stencil; and

means for reciprocating said squeegees when vertical and moving along the stencil for additionally moving them transversely first into engagement with the stencil and thereafter into disengagement therefrom.

2. Apparatus according to claim **1** wherein said means for applying color to said striking portions comprises a horizontal pool of color below the horizontally disposed paths of the squeegees, a horizontally extending rotatable color transfer drum dipping into the pool of color, the striking portions of said squeegees operating in a plane to contact upper portions of drum above said pool.

3. Apparatus according to claim **2**, including a support for said angled squeegee conveyor, stencil, color pool and drum and means for simultaneously adjusting their transverse positions with respect to the paths of movements of said objects.

4. Apparatus according to claim **3** wherein said synchronizing drive means comprises a motor, a gear reducer, a speed reducer driven by said motor, a drive from the speed reducer to the vertical conveyor, a second drive from said speed reducer to said angled conveyor, said second drive including shafts in rotary bearing means on the vertical conveyor and on the angled conveyor, the axes of which shafts are parallel and coplanar, and spline-connected universal joints connecting said shafts.

5. Apparatus according to claim **1** including a support for said angled squeegee conveyor and the stencil, and means for adjusting the transverse position of said squeegee conveyor and stencil with respect to the paths of movement of said objects.

6. Apparatus for imprinting articles such as round bottles or the like, each having a central longitudinal axis comprising:

a stencil sheet;

squeegees, each of which has a color striking edge;

a color pool having an upper horizontal surface, rotatable means having a lower portion dipping into the pool and an upper portion above said horizontal surface for carrying up color to expose color above said surface to the squeegee striking edges;

an article conveyor of the type having first sprocket means and first endless flexible means driven thereby for rotatably supporting and advancing the articles for successive revolving engagements of the articles with said stencil sheet, said conveyor including a first pair of parallel drive and idler shafts for said first sprocket means, said first pair of shafts having center lines lying in a first plane;

an endless squeegee conveyor having second sprocket means and second endless flexible means driven thereby for advancing the squeegees along one reach adjacent the stencil sheet and along another reach over said pool, said squeegee conveyor also including a pair of parallel drive and idler shafts for said second sprocket means, said second pair of shafts having center lines lying in a second plane, said second plane extending at a substantial angle to the horizontal in a direction over the color pool;

said first plane and said second plane subtending between them an angle not less than approximately 45°, the stencil lying in a third plane extending along and between said angled first and second planes;

means on the squeegee conveyor for mounting the squeegees with their striking edges at substantially equal angles relative to said second plane of the center lines of the squeegee conveyor shafts during traverse of either of said reaches of the squeegee conveyor and engageable with said stencil sheet when traversing said one reach; and

synchronizing drive means for the conveyors for coordinating speeds along the stencil of the squeegee striking edges and the speeds of said rolling engagements of the objects with the stencil sheet.

7. Apparatus according to claim **6** including means for reciprocating said squeegees when moving along the stencil sheet for reciprocating them transversely to and from the plane of the stencil sheet for an initial engagement therewith followed by a terminal disengagement.