July 1, 1958 G. E. RYCKMAN 2,841,075

ARTICLE DECORATING APPARATUS

Filed June 20, 1957 7 Sheets-Sheet 1

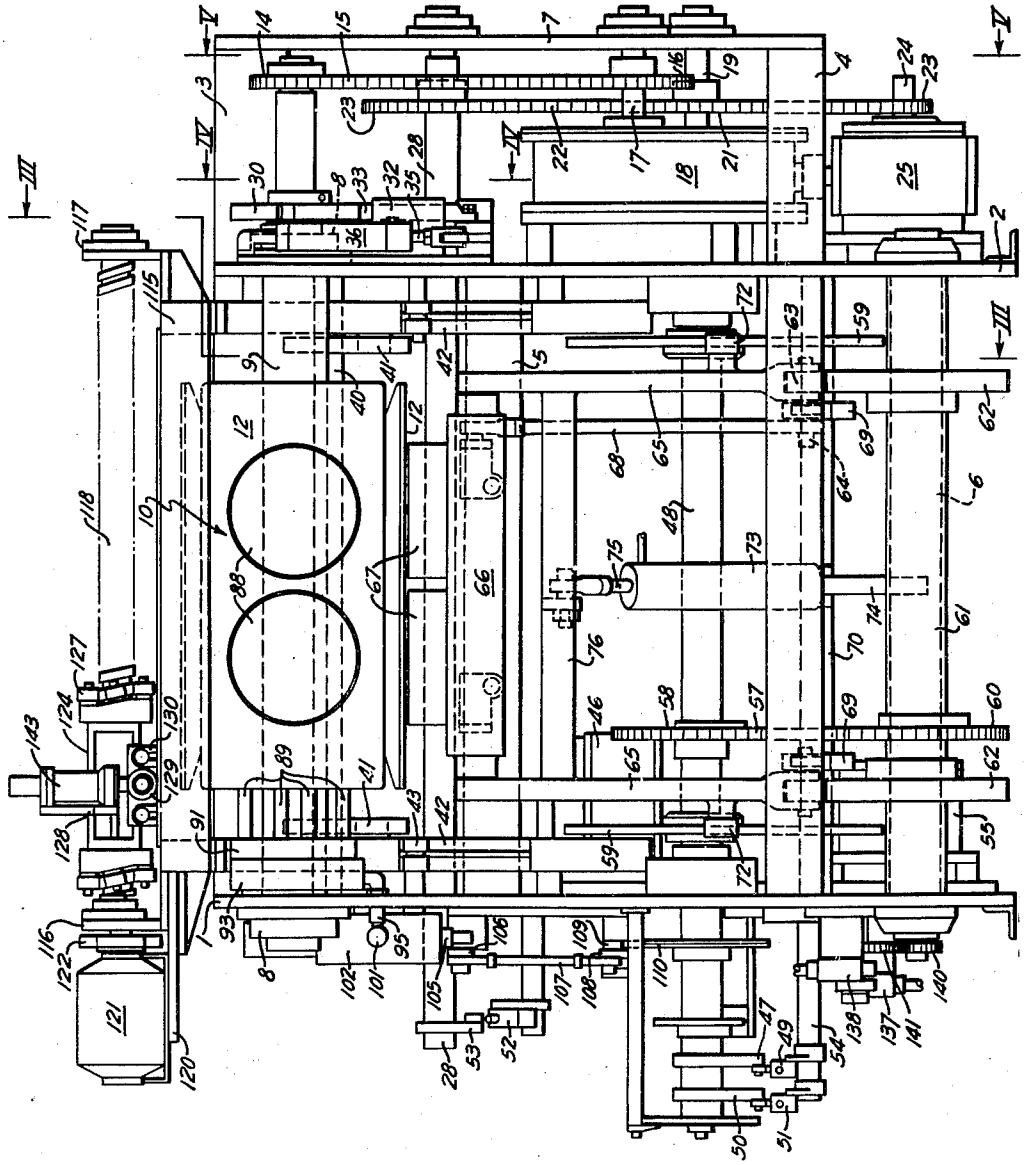


Fig. 1

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Fig. 3

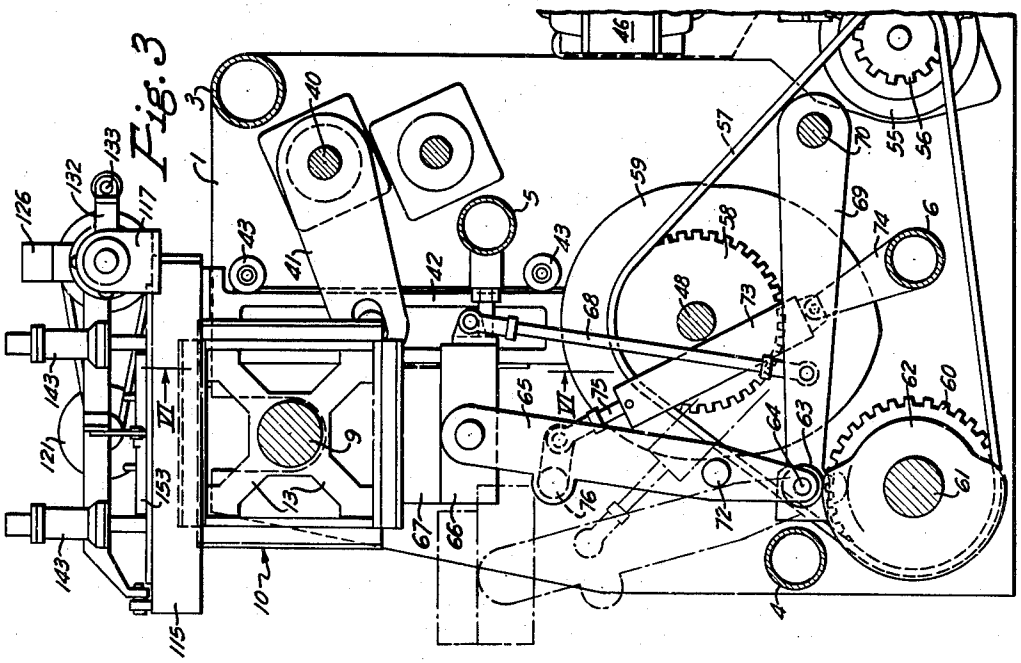
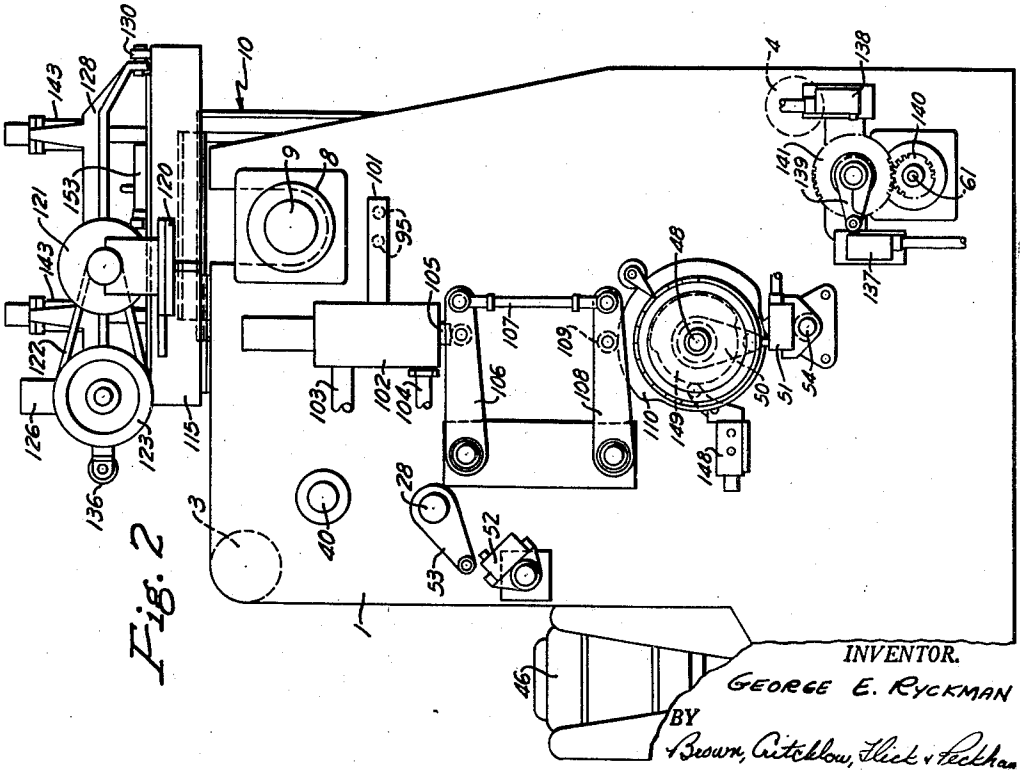


Fig. 2



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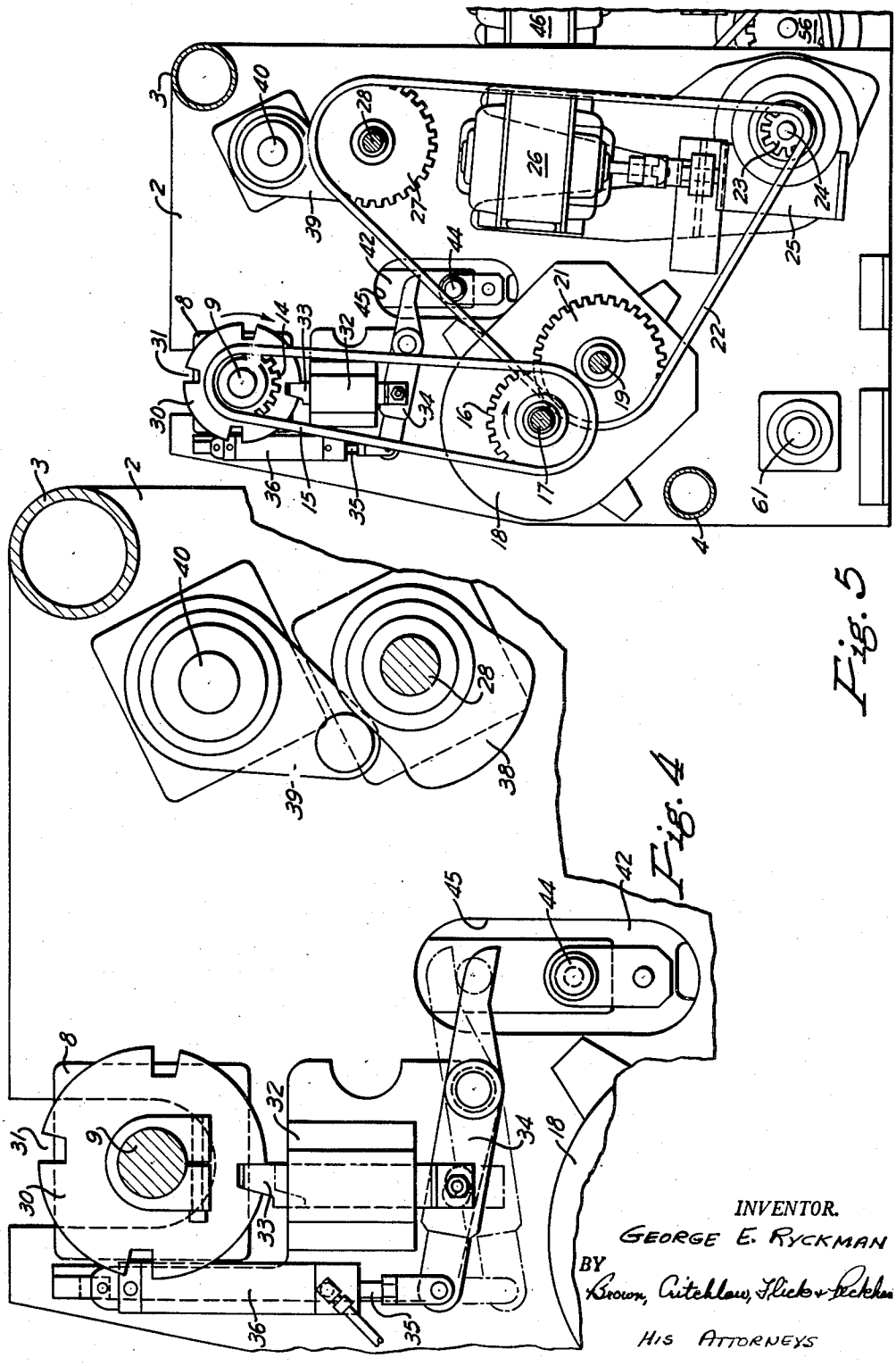


Fig. 5

Fig. 4

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ARTICLE DECORATING APPARATUS

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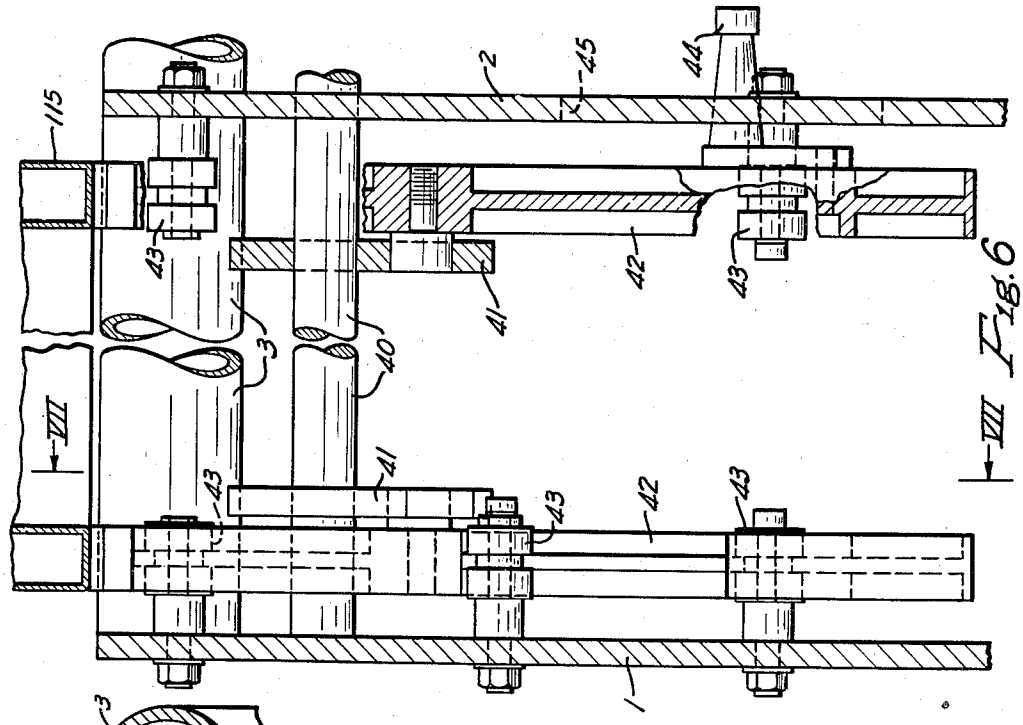


Fig. 6

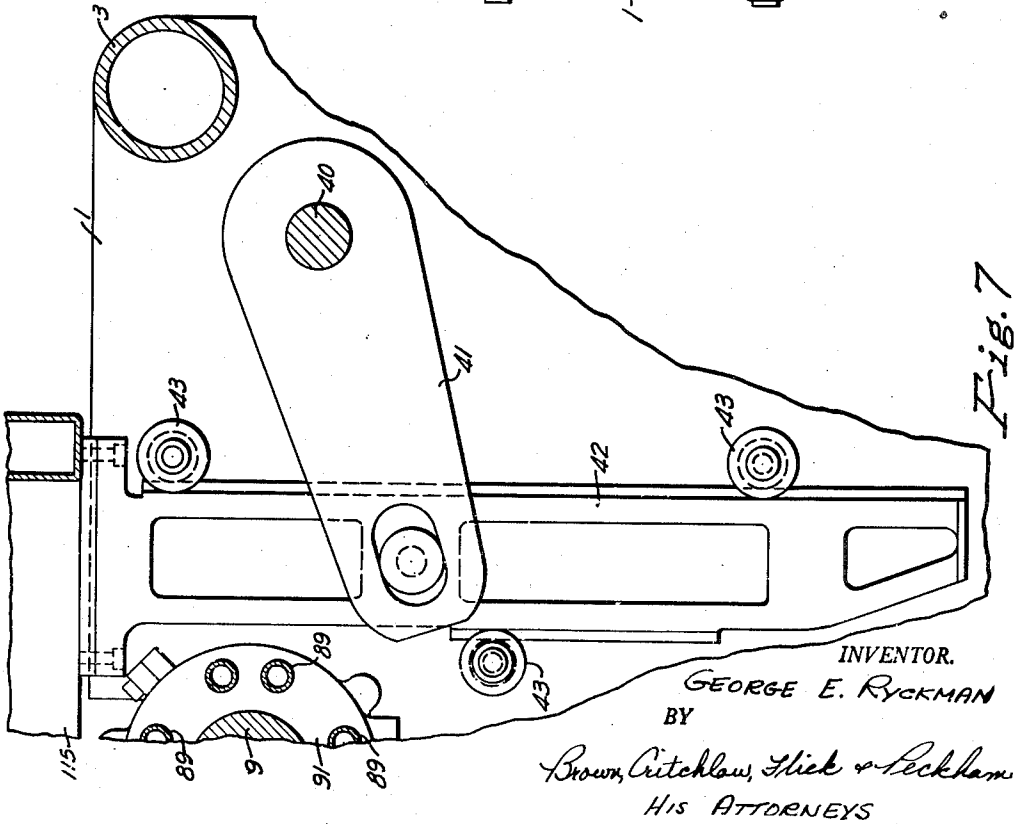


Fig. 7

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ARTICLE DECORATING APPARATUS

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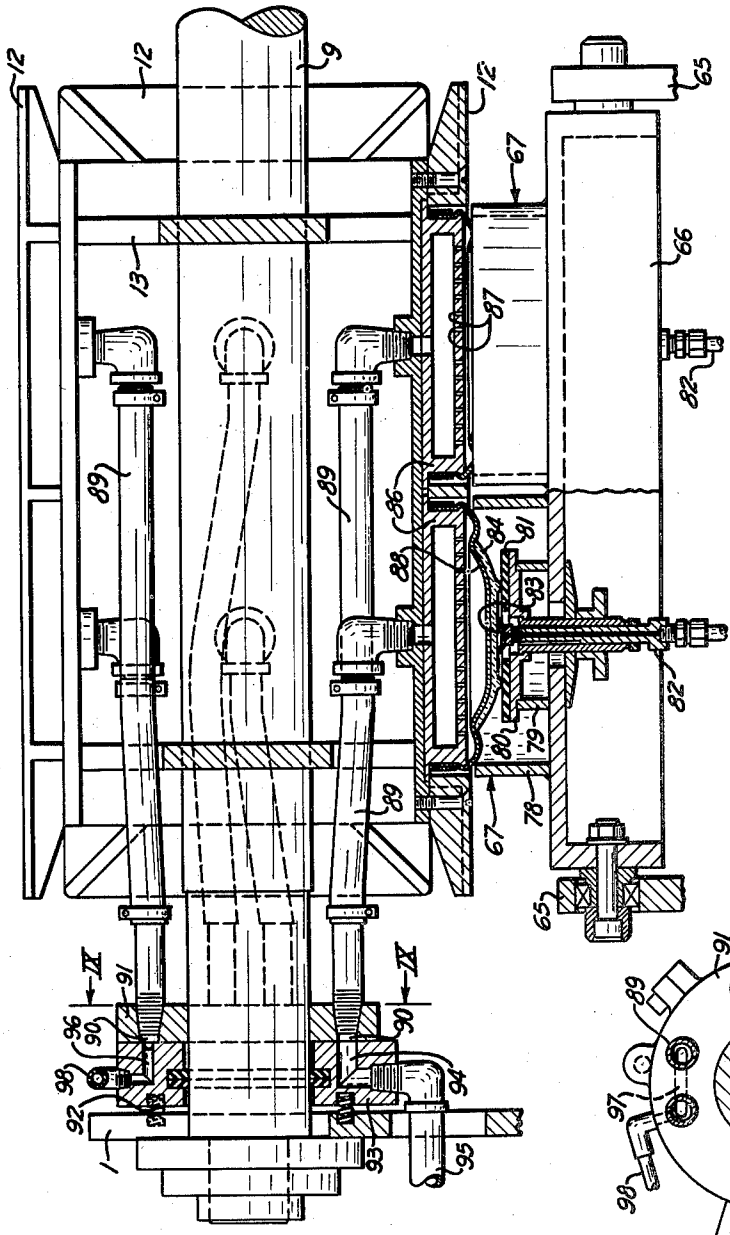


Fig. 8

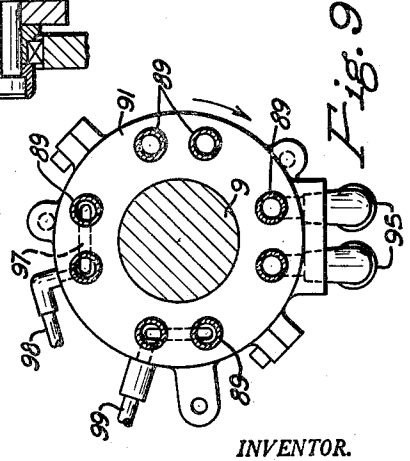


Fig. 9

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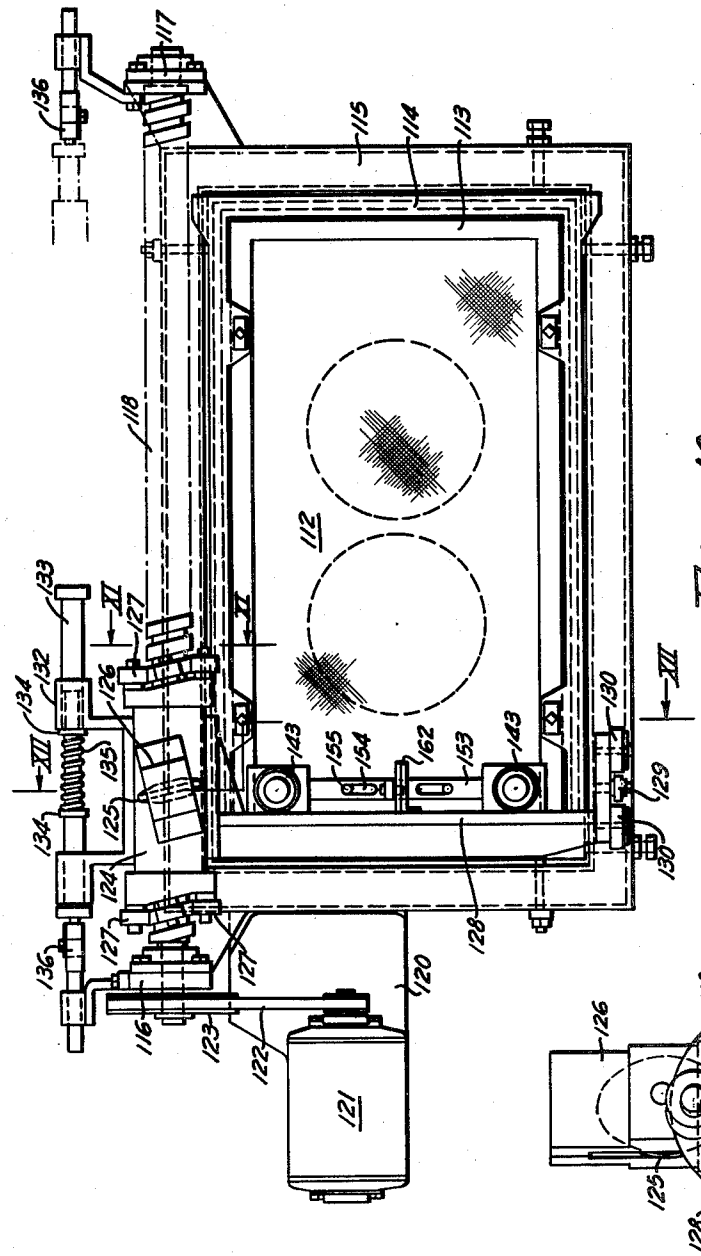


Fig. 10

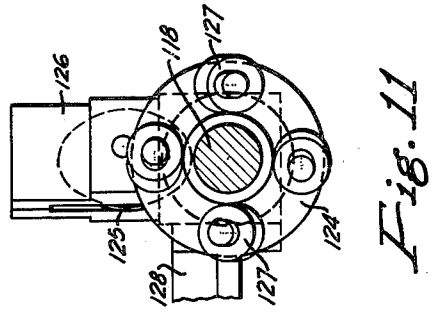


Fig. 11

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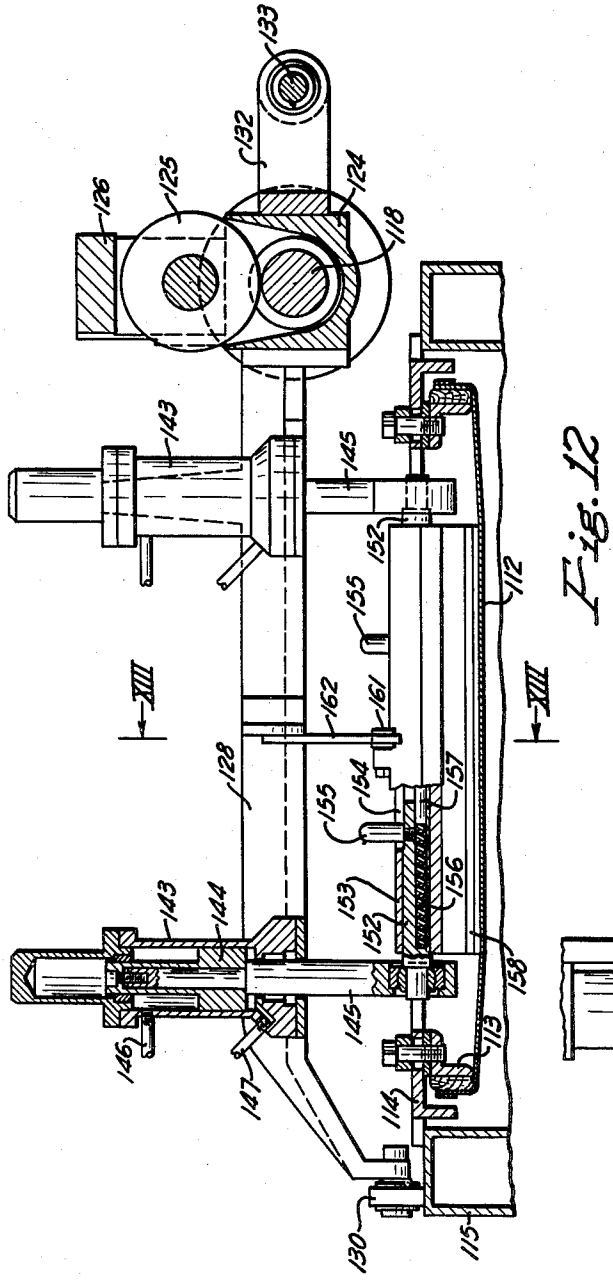


Fig. 12

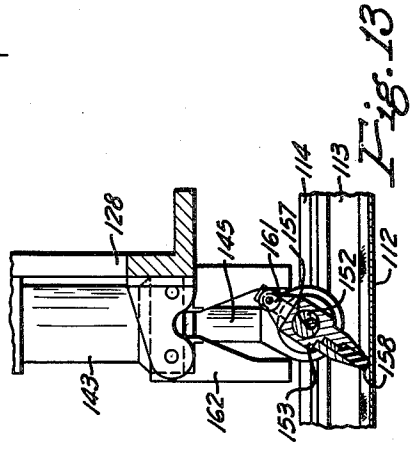


Fig. 13

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United States Patent Office

2,841,075

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2,841,075

ARTICLE DECORATING APPARATUS

George Edward Ryckman, East Liverpool, Ohio, assignor to The Homer Laughlin China Company, Newell, W. Va., a corporation of Delaware

Application June 20, 1957, Serial No. 667,001

21 Claims. (Cl. 101—41)

This invention relates to apparatus for decorating articles, especially dinnerware, and more particularly to apparatus using the offset system of applying colored decorations.

One method of applying colored decorations to dinnerware is to silk screen a design onto a flexible diaphragm and then press the diaphragm against the ware to transfer the design to it. Certain apparatus now in use for this purpose requires the operator to do the silk screening by hand, then move the printed diaphragm into engagement with a piece of ware, and then operate controls to clamp the diaphragm in place and to first inflate it and then deflate it, followed by releasing it from the ware. It will be seen that only one piece of ware can be decorated at a time with such apparatus, and that the rate of production depends entirely upon how fast the operator can work. While she is silk screening the diaphragm, no ware-decorating can take place, and while decorating is being done it is not possible for the operator to silk screen a diaphragm. The production rate of such a machine is therefore quite low, with the result that the cost of decorating is relatively high.

It is among the objects of this invention to provide apparatus which automatically applies a decoration to a diaphragm and then presses the diaphragm against an article to be decorated, which applies color to the diaphragm more evenly than heretofore, and which decorates articles more rapidly than is possible with the same general type of apparatus now in use.

In accordance with this invention, elastic diaphragms are mounted at diametrically opposite points on a turret that is rotatable on a horizontal axis. The turret normally is held stationary with a diaphragm located at its bottom. Above the turret there is a color-applying device for applying color to the diaphragm at the top of the turret. Normally disposed in front of the turret is an article-receiving chuck, and means are provided for moving the chuck back beneath the turret and then up toward it and then down and forward again. While the chuck is raised beneath the turret, the bottom diaphragm is inflated to press it against an article on the chuck. After the decorated article has been moved away from the turret, the color applying device is raised and the turret is rotated in order to index a color-carrying diaphragm to the bottom of the turret. While the turret is rotating, decorated articles can be removed from the chucks and undecorated articles placed on them. Preferably, the turret also carries diaphragms at its opposite sides as well as at its top and bottom. Also, for increased production there may be two diaphragms at each station.

While the bottom diaphragms are decorating two articles simultaneously, colored designs are being applied to the top diaphragms, such as by a silk screen.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

Fig. 1 is a front elevation of the apparatus, showing it in article-decorating position;

Fig. 2 is a view of the left end;

Fig. 3 is a cross section taken on the line III—III of Fig. 1;

Fig. 4 is an enlarged fragmentary cross section taken on the line IV—IV of Fig. 1;

Fig. 5 is a cross section taken on the line V—V of Fig. 1;

Fig. 6 is an enlarged fragmentary longitudinal section taken on the line VI—VI of Fig. 3;

Fig. 7 is a fragmentary cross section taken on the line VII—VII of Fig. 6;

Fig. 8 is an enlarged front view, partly broken away in section, of the turret and chucks in printing position;

Fig. 9 is a cross section taken on the line IX—IX of Fig. 8;

Fig. 10 is a plan view of the color-applying device;

Fig. 11 is an enlarged cross section taken on the line XI—XI of Fig. 10;

Fig. 12 is an enlarged cross section taken on the line XII—XII of Fig. 10 just before the squeegee is raised; and

Fig. 13 is a fragmentary longitudinal section taken on the line XIII—XIII of Fig. 12.

Referring to Figs. 1, 3 and 5 of the drawings, the frame of the machine is formed primarily from a pair of upright end panels 1 and 2 rigidly connected by horizontal tubular braces 3, 4, 5 and 6. Braces 3 and 4 extend through the right-hand panel 2 and support a vertical bearing plate 7. Journaled in bearings 8, supported by the upper front corner portions of the end panels, is a horizontal shaft 9 on which a turret 10 is rigidly mounted. The turret preferably has four side plates 12 supported 90° apart by spokes 13 radiating from the shaft. The turret shaft projects from the right-hand panel nearly to the bearing plate, and its outer end carries a sprocket 14 that is connected by a chain 15 to a sprocket 16 driven by the output shaft 17 of a conventional Geneva drive mechanism 18. The input shaft 19 of the Geneva is rotated continuously, while the machine is in operation, by a sprocket 21 driven by a chain 22 that extends around a sprocket 23 mounted on the drive shaft 24 of a speed reducing unit 25 that is operated by an electric motor 26 supported by the adjoining end panel 2. The chain also extends around and drives a sprocket 27 keyed on an upper cam shaft 28 extending through the end panels.

The Geneva is designed to index the turret 90° at regular intervals. As it is necessary that the turret be held very firmly in each of its positions, a locking mechanism is provided which includes a disc 30 rigidly mounted on turret shaft 9, and which contains four radial notches 31 spaced 90° apart, as shown in Figs. 4 and 5. Mounted on the end panel below the disc is a bracket 32, in which a shot bolt 33 can slide vertically. The projecting lower end of the bolt is pivotally connected to a lever 34 that is pivotally supported by the panel beside the bolt. In order to normally hold the projecting upper end of the bolt in one of the disc notches, the front end of the lever is pivotally connected to the lower end of a piston rod 35 that extends up into a fluid pressure cylinder 36 mounted on the end panel. Air pressure is maintained in the cylinder beneath the piston therein to hold the front end of the lever in its upper position and thereby hold the bolt in the disc notch.

Just before the turret is indexed, a cam 38 (Fig. 4) on cam shaft 28 swings upward a short arm 39 that is mounted on a rocker shaft 40, whereby a pair of longer arms 41 on the shaft between the panels will raise a pair of vertical guide bars 42 that travel between rollers 43 pro-

jecting from the panels, as shown in Figs. 6 and 7. The right-hand slide has a pin 44 projecting from its lower end and through a vertical slot 45 in the panel 2. The outer end of the pin will engage and lift the rear end of lever 34 and thereby pull the shot bolt down out of disc 30 so that the disc and turret shaft can be rotated by the Geneva. Before the following notch has been rotated down into position above the shot bolt 33 the lever will be raised by the descending pin 44, and piston rod 35 therefore will pull the bolt up against the disc, where it will snap into the descending notch as soon as the notch arrives. This will lock the turret in the next position. Guide bars 42 also serve to raise the decoration-applying device to be described later, so that it will not interfere with indexing of the turret.

It will be seen from the description thus far that electric motor 26 drives only the turret shaft 9 and the upper cam shaft 28, which raises and lowers guide bars 42. Another electric motor 46, which is mounted on the back of the machine near the left-hand end panel 1, drives the mechanism for moving articles into and out of decorating position. This motor operates only while motor 26 is inactive, except that the latter is energized automatically just before motor 46 stops. Motor 46 has to be started by the machine operator to initiate each cycle of operations, but both motors stop automatically. After the machine has been started, an arm 47 on the projecting left-hand end of a central cam shaft 48 strikes and closes a switch 49 when the shaft has turned about 350°. This switch starts motor 26. As shaft 48 completes 360° of rotation, another arm 50 (Figs. 1 and 2) on it strikes a switch 51 that opens the circuit to motor 46. Motor 26 operates until a switch 52, supported from end panel 1, is tripped by an arm 53 mounted on the end of upper cam shaft 28, whereupon the entire machine comes to rest, ready to start another cycle as soon as the operator starts motor 46 again. The two switches 49 and 51 are mounted on a rod 54 projecting from panel 1 below shaft 48. As shown in Fig. 3, the shaft is driven from motor 46 through a speed reducing unit 55, a sprocket 56, a chain 57 and a sprocket 58 on the shaft 48, which also carries a pair of large cams 59.

Chain 57 also extends around another sprocket 60 mounted on a bottom cam shaft 61 that carries a pair of small cams 62. Resting on these small cams are rollers 63 that are mounted on pins 64 extending through forks in the lower ends of a pair of upwardly extending levers 65. The upper ends of these levers are pivotally connected to the opposite ends of a table 66, on which a pair of chucks 67 are mounted. The back of the table is connected at one end to the upper end of a link 68 that is parallel to the lever 65 in front of it and has its lower end pivotally connected to one of a pair of substantially horizontal arms 69. The front ends of these two arms are pivotally mounted on the pins 64 projecting from levers 65. The rear ends of the arms are mounted on a rock shaft 70 journaled in the end panels.

The link 68 and the parallel levers 65 support table 66 in horizontal position at all times but permit it to be swung back and forth. Each lever supports at one side a roller 72 which engages the front of one of the large cams 59. These rollers are held against the cams at all times by means of an air pressure mechanism that includes a cylinder 73 which has its lower end pivotally connected to a bracket 74 mounted on cross brace 6 of the machine. A piston rod 75 extends out of the upper end of the cylinder and is pivotally connected to the back of a horizontal cross member 76 that rigidly connects the two levers 65. Air pressure is maintained in the upper part of the cylinder to urge the piston rod downwardly, but the air can be compressed still more when the large cams swing levers forward. It will be seen that as the upper ends of the levers swing forward, they move the table forward. At the same time, the small cams 62 allow the front ends of arms 69 and levers 65 to descend, so that in its front position (dotted lines in Fig. 3) the table will be at a lower level than in its rear position.

As shown in Fig. 8, each of the chucks 67 on the table includes a metal ring 78 welded to the top of the table. In the center of this ring, there is a smaller ring 79, on which a flat plate 80 is mounted. This plate is covered by a rubber pad 81. Extending through the plate and the pad, as well as down through the table, is a suction pipe 82, the upper end of which carries a small suction cup 83. When a piece of ware, such as a dinnerplate 84, is placed on the chuck and against the cup, air exhausted from within the cup holds the plate firmly in position on the chuck until atmospheric pressure is restored to the suction cup. Pipe 82 is flexibly connected with a vacuum source (not shown) timed to hold ware on the chuck only during traverse and decorating. Ware is placed on the chucks and centered thereon by an operator while the table is in its front position. Decorated ware is removed from the chucks in the same position. Since motor 26 is not operating while motor 46 is causing the table to move, the table swings back under the turret, up, down and then forward again only while the turret is stationary.

Each of the side plates 12 of the turret is provided with two longitudinally spaced openings, in each of which there is a hollow circular box 86, as shown in Fig. 8. The outer walls of the boxes are provided with a plurality of air holes 87 and are slightly depressed from the surface of the surrounding plate. Clamped around each box is the skirt of an elastic diaphragm 88 that is stretched across the perforated wall. The inner walls of the boxes are provided with central openings that are connected by pipes 89 with openings 90 through a flange 91 rigidly mounted on turret shaft 9 at one end of the turret. Pressed against the outer face of the flange by coil springs 92 is a non-rotatable collar 93. This collar is provided with top and bottom and front pairs of circumferentially spaced passages, with which the openings 90 in the flange 91 periodically register as the turret is indexed. The passages extend radially outward through the collar, and the lower pair 94 are connected by pipes 95 with sources of air pressure and suction alternately. The pair of passages 96 at the top of the machine are connected together by a groove 97 in the face of the collar, and one of these passages is connected by a pipe 98 to a constant vacuum source. Another suction pipe 99, connected to the same source, is connected to one of the passages at the front of the collar, as shown in Fig. 9.

The lower pipes 95 are connected to a common pipe 101 projecting from the center of a valve 102 mounted on the outside of end panel 1, as shown in Figs. 1 and 2. The top of the valve is connected by an inlet pipe 103 with a source of air pressure, and by a lower pipe 104 with a source of vacuum. The movable member 105 of the valve extends below it and is pivotally connected to horizontal arm 106, the rear end of which is pivotally mounted on the panel. The front end of the arm is connected by a vertical link 107 to a similar arm 108 below it. The lower arm carries a roller 109 that rides on a cam 110 mounted on the projecting end of the middle cam shaft 48. As this cam rotates, it operates the valve to alternately admit air under pressure to, and withdraw air from, the two perforated boxes 86 that happen to be at the bottom of the turret. At the same time, air is withdrawn through suction pipes 98 and 99 from the front and upper boxes to draw their diaphragms tightly against their perforated outer walls.

While the turret 10 is stationary, decorative designs are applied to the two diaphragms 88 at the top of the turret. This is done by a silk screening mechanism that will now be described. The term "silk screening" is intended to cover any type of stenciling operation, regardless of the material of which the screen is made. The screen 112, shown in Figs. 10, 12 and 13, is supported above the turret by means of a frame 113 that is detach-

ably fastened to the bottom of a metal frame 114 resting on top of a rectangular support 115 rigidly mounted on top of the vertical guide bars 42. Secured to the opposite ends of the back of the rectangular support are bearing brackets 116 and 117, in which the opposite ends of a horizontal traversing screw 118 are journaled.

Projecting from the left-hand end of the support is a larger bracket 120, on which an electric reversing motor 121 is mounted. This motor is connected by a belt 122 to a pulley 123 that turns the traversing screw. Surrounding the screw is a barrel 124, provided in its top with an opening, through which extends a tapered roller 125 that is journaled in a bearing 126 mounted on top of the barrel. The roller extends down between the threads of the barrel in engagement therewith. Each end of the barrel carries four circumferentially spaced rollers 127 (Fig. 11) that engage the crests of the flat screw threads to guide the barrel. An arm 128, secured to the barrel, extends across the frames and carries a roller 129 at its outer or front end, which rolls along the front of the frame support 115. A pair of magnets 130, also carried by the cross arm, help to hold the roller firmly in engagement with the support. It will be seen that as the barrel rotates, the barrel is compelled to move along it from one end to the other, and that the arm is carried along with the barrel.

As shown in Fig. 10, a U-shaped bracket 132 projects from the back of the barrel and has a horizontal plunger 133 slidably mounted in the rear ends of its parallel legs. The central portion of the plunger is reduced in diameter, and a pair of collars 134 are slidably mounted on the reduced portion, where they are urged apart by a coil spring 135. Supported behind bearing brackets 116 and 117 are electric limit switches 136 in line with plunger 133 and electrically connected with motor 121 in such a manner as to shut it off and brake it when either switch is engaged by the plunger. The sliding mounting of the plunger, and the coil spring on it, permit barrel 124 to continue to move a short distance along the screw after either limit switch has been tripped, because the screw will not stop rotating the moment the plunger engages a switch and it stopped by it. This provision for overtravel of the screw and barrel prevents possible damage to the machine. The barrel is shown at rest in Fig. 10, while the dotted line portion of plunger 133 shows it just as it trips the right-hand limit switch but before the screw has come to a stop. The electric circuit to motor 121 is reestablished periodically by the closing of either switch 137 or 138 mounted on end panel 1, depending on which switch 136 was opened last. Switches 137 and 138 are actuated by an arm 139 driven by gears 140 and 141 from lower cam shaft 60.

Mounted on cross arm 128 are two vertical cylinders 143, in each of which there is a piston 144 that has a rod 145 extending down toward the screen, as shown in Fig. 12. Air pressure is admitted through flexible hoses 146 and 147 alternately to the upper and lower ends of the cylinders. Air pressure to these hoses is controlled by a valve 148 actuated by a cam 149 on shaft 48 beyond panel 1. Rotatably mounted in the lower ends of the piston rods are the outer ends of a pair of aligned horizontal shafts 152. These shafts are slidably mounted in the opposite ends of a bar 153 provided in its top with a pair of longitudinal slots 154, through each of which projects a stem 155 secured to the inner end of the underlying shaft so that the shafts can be pulled toward each other to release them from the piston rods. The shafts are urged apart by coil spring 156 disposed in longitudinal bores in the shafts and compressed against the opposite ends of a rod 157 slidably mounted in the shafts. Secured to the lower part of the bar is a rubber squeegee 158 that projects below its lower edge into contact with the screen. As shown in Fig. 13, the lower position of the bar is such that it and the squeegee will have to be inclined, with the squeegee at the trailing edge of the bar, while they are being moved along the screen. The squeegee is thrust down against the screen by regulated and timed air pressure on top of pistons 144. The squeegee traverse screw, being driven by induction motor 121, will move the squeegee smoothly and at a uniform speed along the screen in spite of variations in drag on the squeegee. This avoids lines of thick and thin color in the print on the ware, which are caused when a squeegee is not moved at a uniform speed.

After the squeegee has been drawn from one end of the screen to the other and motor 121 has stopped, fluid pressure is admitted to the lower ends of the two cylinders 143 to lift the squeegee away from the screen. As it rises, a roller 161 on top of the bar rides up into a vertically slotted cam 162 suspended from the cross arm. The cam surface engaging the rising roller causes the squeegee bar to swing into vertical position. When the vertical squeegee is lowered onto the screen again, it will engage the screen on the side of the pool of color opposite to the side from which it left the screen. As soon as cross arm 128 starts to travel toward the opposite end of the screen, the squeegee will be tilted and pulled along the screen in an inclined position behind the pool of color. The color pool will thus be shuttled back and forth along the screen until used up.

The operation of this apparatus will now be summarized. With the machine idle and the ware chucks in their forward position shown in dotted lines in Fig. 3, the operator places a piece of ware on each chuck. At this time the decorating screen is in its lower position close to the top diaphragms on the turret, and the squeegee is in raised position away from the screen. The operator then starts motor 46 by pressing a button (not shown). The vacuum at the chucks comes on to hold the ware securely, and cam shafts 48 and 61 start to turn. This causes the chuck table to be swung back beneath the turret and then raised until the ware is directly below the lower diaphragms. At this moment air pressure is admitted behind the lower diaphragms to press them against the ware and thereby print decorations on the ware. The chucks are then lowered and swung forward and the air is exhausted from behind the lower diaphragms to draw them up tight against the perforated boxes that support them. When the chucks reach their front positions, the vacuum therein shuts off so that the printed ware can be lifted from the chucks and placed in a rack.

Simultaneously with the operations just described, the squeegee blade is lowered onto the screen and then is moved toward the opposite end of the screen by the traversing screw. As the squeegee travels over the screen, it prints a design on the two diaphragms beneath it. The squeegee stops at the opposite end of the screen and then is raised out of engagement with it. By this time, cam shaft 48 has completed a full revolution, thereby starting motor 26 and stopping motor 46. Motor 26 causes the screen unit to be raised, shot bolt 33 to be pulled out of disc 30, and the turret to be indexed 90° to swing the lower pair of diaphragms up in front of the operator. The screen then descends again and the shot bolt locks the turret in its new position. Since upper cam shaft 40 has now completed a full revolution, it trips switch 52 to stop motor 26. The entire machine is now at rest and must be restarted by the operator to begin a new cycle for decorating two more pieces of ware.

While the upper diaphragms are being printed and the lower diaphragms are decorating ware, the operator wipes off the front pair of diaphragms, and another person behind the machine may inspect the designs carried by the rear of diaphragms. While the screen unit is moving vertically and the turret is being indexed, the operator removes decorated ware from the chucks.

By using a four-sided turret, four functions may be carried on simultaneously. That is, the top diaphragms are

printed, the back diaphragms are inspected, the lower diaphragms are decorating the ware and the front diaphragms are cleaned. The resulting saving in time over the manually operated machine presently in use means a high rate of production. The mechanical locking of the turret in each position by the shot bolt insures exact registration of all prints, especially since the diaphragms are drawn tightly against the perforated boxes by suction to hold the diaphragms securely while they are being wiped off and printed.

By slowly lifting the squeegee from the diaphragms immediately after it has traversed the screen, high quality squeegee prints are provided. There is precise control of squeegee pressure against the screen by means of the air pressure applied to the cylinders above it. It will be seen that the squeegee is also capable of a floating action to take care of any diaphragm variations. Since all the operator has to do is start the machine and load and unload it, the decorations printed on the ware are extremely uniform.

I claim:

1. Article decorating apparatus comprising a turret rotatable on a horizontal axis, elastic diaphragms mounted on the turret at circumferentially spaced points, means normally holding the turret stationary with a diaphragm at its bottom, a color-applying device above the turret for applying a design to a diaphragm at the top of the turret, an article-receiving chuck normally spaced from the turret, means for moving the chuck toward and away from said bottom diaphragm, means for inflating the bottom diaphragm to press it against an article on the chuck moved toward that diaphragm, means for raising said color-applying device, and means for rotating the turret while said color-applying device is elevated and the chuck is removed from the turret, whereby to index a color-carrying diaphragm to the bottom of the turret.

2. Decorating apparatus according to claim 1, in which said turret-holding means comprises a disc rigidly connected with the turret for rotation therewith, the disc being provided with a plurality of circumferentially spaced radial notches, means normally projecting into one of said notches to hold the disc and turret stationary, and means for withdrawing said projecting means from the disc notch to permit the turret to be turned by said rotating means.

3. Decorating apparatus according to claim 1, in which said turret-holding means comprises a disc rigidly connected with the turret for rotation therewith, the disc being provided with a plurality of circumferentially spaced radial notches, a shot bolt normally projecting into one of said notches to hold the disc and turret stationary, and means actuated by the initial movement of said rotating means for withdrawing the shot bolt from the disc notch to allow the rotating means to turn the turret.

4. Decorating apparatus according to claim 1, in which said turret-holding means comprises a disc rigidly connected with the turret for rotation therewith, the disc being provided with a plurality of circumferentially spaced radial notches, a locking member normally projecting into one of said notches to hold the disc and turret stationary, means actuated by said rotating means for operating said color-applying device raising means and withdrawing said locking member from the disc notch to allow said rotating means to turn the turret.

5. Decorating apparatus according to claim 1, in which said chuck-moving means comprises spaced parallel front and rear links maintaining the chuck in horizontal position, means for swinging the links and chucks forward and backward, and means connected with the links for moving them vertically.

6. Decorating apparatus according to claim 1, in which said chuck-moving means comprises a horizontal chuck support, links pivotally connected at their upper ends to said support, a rocker arm pivotally connected to the lower ends of the links, means for swinging the rocker arm up and down to raise and lower the chuck, and means for swinging said support forward and backward.

7. Decorating apparatus according to claim 1, in which said chuck-moving means comprises a horizontal chuck support, spaced parallel front and rear links pivotally connected at their upper ends to said support, a rocker arm pivotally connected to the lower ends of the links, a rotary cam for swinging the rocker arm up and down to raise and lower said support, and means for swinging said support back and forth.

8. Decorating apparatus according to claim 1, in which said color-applying device raising means comprises a pair of vertical bars depending from said device, rocker arms having one end pivotally connected to said bars, a rocker shaft secured to the other ends of the arms, and means for rocking said shaft to raise and lower said device.

9. Decorating apparatus according to claim 1, in which said color-applying device and chuck-moving means are operated by the same electric motor, and said color-applying device raising means and turret-rotating means are operated by a second electric motor.

10. Decorating apparatus according to claim 1, in which elastic diaphragms are mounted on said turret 90° apart, whereby a diaphragm at the front of the stationary turret can be cleaned while a diaphragm at the bottom of the turret is decorating an article.

11. Decorating apparatus according to claim, 1, including means for producing sub-atmospheric pressure behind the top diaphragm to hold it rigidly in place while it is being colored.

12. Decorating apparatus according to claim 1, in which the turret is provided with circular air chambers provided with perforated outer faces, and the diaphragms cover said faces and are sealed around the sides of the chambers.

13. Decorating apparatus according to claim 1, in which said color-applying device includes a decorating screen, a squeegee engaging the top of the screen, and means for moving the squeegee back and forth across the screen.

14. Decorating apparatus according to claim 1, in which said color-applying device includes a decorating screen, a squeegee engaging the top of the screen, a screw journaled beside the screen, means for rotating the screw in first one direction and then the opposite direction, and means threaded on the screw and connected to the squeegee for moving the squeegee over the screen.

15. Decorating apparatus according to claim 1, in which said color-applying device includes a decorating screen, a squeegee engaging the top of the screen, means for moving the squeegee back and forth across the screen, means urging the squeegee down against the screen in an inclined position with its lower edge trailing its upper edge, and means for raising the squeegee into vertical position at the end of each stroke so that when it is lowered against the screen again and started toward the opposite end of the screen the lower edge will again trail the upper edge.

16. Decorating apparatus according to claim 1, in which the turret is provided with circular chambers provided with perforated outer faces, the diaphragms cover said faces and are sealed around the sides of the chambers, and means are provided for periodically evacuating said chambers to pull the diaphragms tightly against said perforated faces.

17. Decorating apparatus according to claim 1, in which said color-applying device includes a decorating screen, a squeegee engaging the top of the screen, fluid pressure actuated means supporting the squeegee and adapted to raise and lower it, and means supporting said fluid pressure means and movable back and forth across the screen to move the squeegee along the screen.

18. Decorating apparatus according to claim 1, in which said color-applying device includes a decorating

screen, a squeegee engaging the top of the screen, a screw journaled beside the screen, means for rotating the screw in first one direction and then the opposite direction, a member threaded on the screw and movable axially by the rotating screw, an arm secured to said member and extending across the screen, a pair of spaced fluid pressure cylinders mounted on the arm above opposite sides of the screen, piston rods projection down from said cylinders, and means connecting the opposite ends of the squeegee to the lower ends of said rods.

19. Decorating apparatus according to claim 1, in which said color-applying device includes a decorating screen, a squeegee engaging the top of the screen, a screw journaled beside the screen, a reversing motor for rotating the screw in first one direction and then the opposite direction, means threaded on the screw and connected to the squeegee for moving the squeegee over the screen, a limit switch at each end of the screw for stopping and reversing said motor, and means carried by said threaded means for actuating said switches alternately.

20. Decorating apparatus according to claim 19, in

said switch-actuating means include an axially movable plunger, and a spring resisting the movement of the plunger.

21. Article decorating apparatus comprising a turret rotatable on a horizontal axis, elastic diaphragms mounted on the turret at circumferentially spaced points, means normally holding the turret stationary with a diaphragm at its bottom, a color-applying device adjacent the turret for applying a design to another diaphragm on the turret above the level of the bottom diaphragm, an article-receiving chuck normally spaced from the turret, means for moving the chuck toward and away from said bottom diaphragm, means for inflating the bottom diaphragm to press it against an article on the chuck moved toward that diaphragm, maens for moving said color-applying device away from the turret, and means for rotating the turret while said color-applying device and chuck are moved away from the turret, whereby to index a color-carrying diaphragm to the bottom of the turret.

No references cited.