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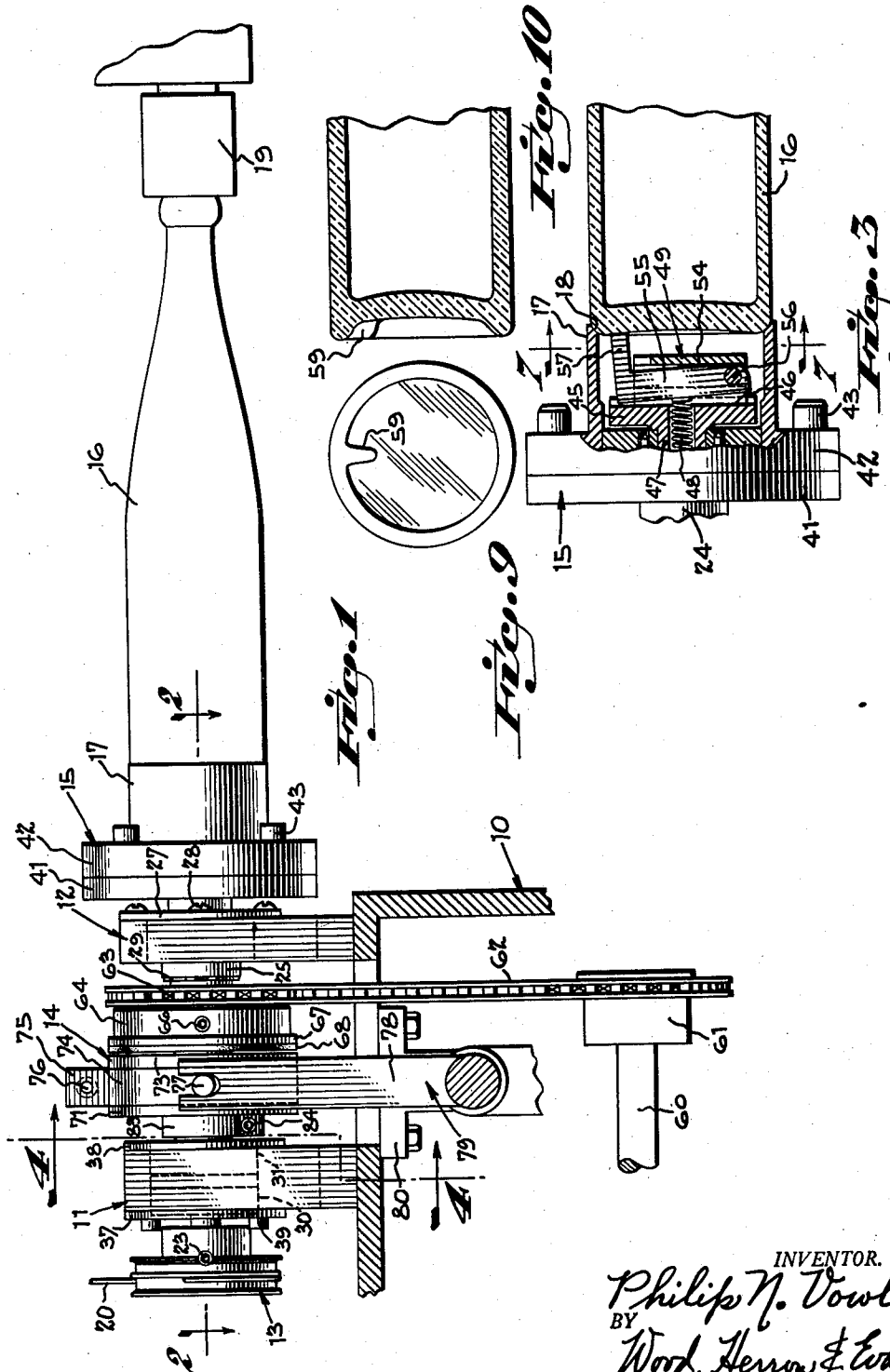
P. N. VOWLES

2,882,818

REGISTRATION APPARATUS FOR STENCIL DECORATING MACHINES

Filed April 18, 1957

2 Sheets-Sheet 1



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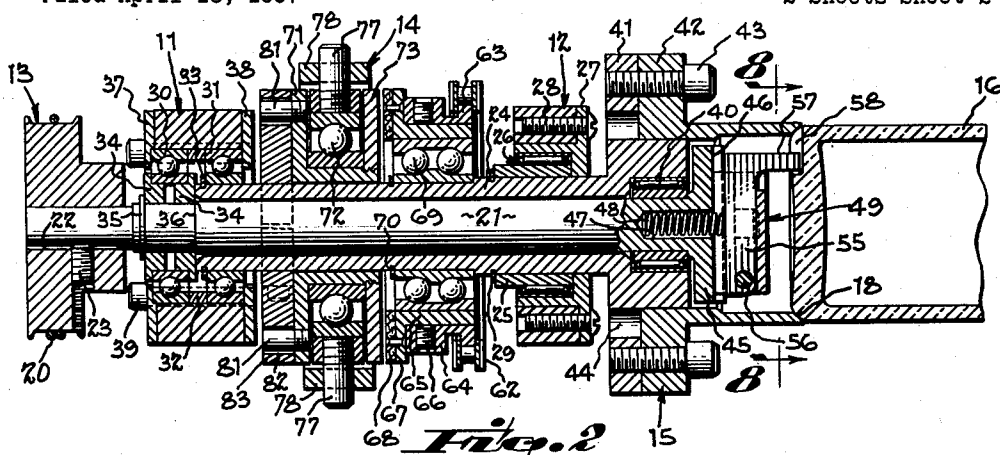
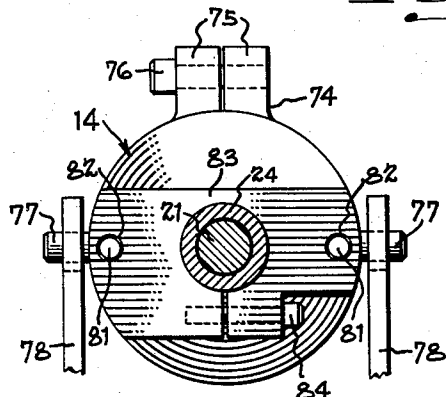
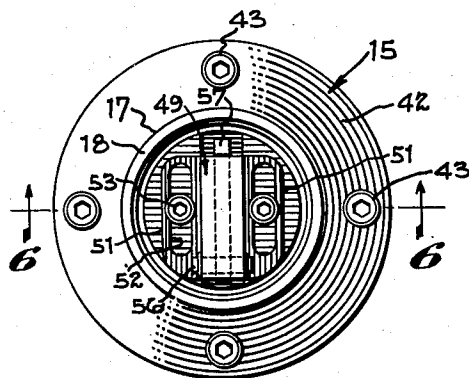
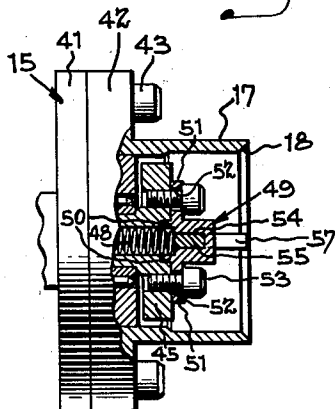
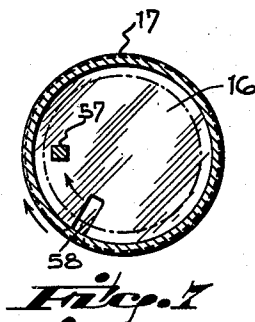
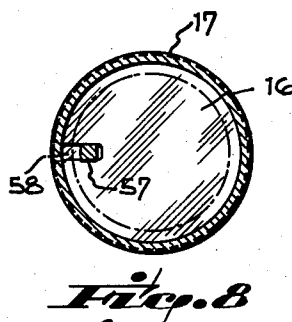
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REGISTRATION APPARATUS FOR STENCIL DECORATING MACHINES

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2 Sheets-Sheet 2



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1

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REGISTRATION APPARATUS FOR STENCIL DECORATING MACHINES

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Application April 18, 1957, Serial No. 653,603

8 Claims. (Cl. 101—126)

This invention relates to stencil decorating machines for applying color compositions to the surfaces of bottles and other articles of manufacture. In the operation of these machines, a fine mesh screen is used which has closed non-design areas and open design areas. To stencil a bottle, for example, the bottle is mounted horizontally in a chuck for rotation about its central axis. The screen is disposed just above the bottle and it is arranged for movement across the bottle in a horizontal plane. During such movement a squeegee presses the screen against the side of the bottle and decorating material on the upper surface of the screen is forced down through the open design areas of the screen onto the bottle by the squeegee.

For precise work, two relationships are critical. First, the bottle must be oriented or registered initially with respect to the screen such that the design is applied at the desired place on the circumference of the bottle; and, second, rolling contact between the bottle and the under surface of the screen must be maintained during the movement of the screen. The latter relationship is critical because any deviation from a rolling contact between the under surface of the screen and the surface of the bottle results in a smearing of the design applied to the bottle.

The first relationship is particularly critical in multi-color stencil decorating wherein two or more screens are used successively to apply different parts of an overall design onto a bottle. That is, the first screen may apply a background color, the second a foreground color or lettering etc. The problem is to properly orient the bottle each time that it is presented to a screen so that the successively applied parts or colors of the design are aligned or registered with the first. Even in the application of a single color design to a bottle, it is highly desirable to orient the bottle initially relative to the screen since most bottles have mold marks upon them which extend from top to bottom on opposite sides. These marks or ridges are scarcely discernible to the casual observer, but they are sufficiently large to interfere with the precise screening of decorations over them. Hence, the bottle should be presented to the screen such that the design is applied between these marks.

The present invention is concerned primarily with these two relationships and it is directed particularly to an improved registration apparatus in which a bottle or other article to be decorated is first precisely oriented with respect to the screen and then held in this relationship during screening under conditions which insure that the rolling contact to which reference has been made is precisely maintained.

The apparatus of this invention constitutes an improvement and a substantial simplification over registration devices disclosed in U.S. Letters Patent No. 2,721,516 and No. 2,762,299. The machine of Patent No. 2,721,516 applies colors successively to bottles. In this disclosure a small index lug is provided on the side of the base of each one of the bottles. Registration devices, one

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at each screen in the machine, are provided to orient a bottle such that the lug on it is in the same relative position at each one of the screens. U.S. Patent No. 2,762,299 discloses an improved registration device including a finger which can be used with bottles having either a lug or a notch in the sides of their bases to serve as a means to orient bottles with respect to stencil screens.

In the operation of the machine of Patent 2,721,516 and in the operation of the registration device of Patent 2,762,299 the bottle is first chucked so that it can rotate about its longitudinal axis. The finger of the registration apparatus is moved into contact with the side of the base of the bottle and the chuck rotated to bring the lug or notch into contact with the finger. The contact stops the rotation of the bottle at a point where the desired area is in place to be screened. In order to achieve rolling contact between the bottle and screen, the chuck is rotated during screen movement by means of a cable which is attached at its opposite ends to extensions of the ends of the screen. Between the two ends, the cable is wrapped tightly around a cylindrical drum which is the exact size of the cylindrical part of the bottle to be decorated. The drum is adapted to be connected to the chuck through a clutch. Hence, with the clutch engaged, the chuck is rotated by means of the cable, and since the drum is the same size as the bottle, rolling contact should be obtained. However, the connection from drum to clutch is through the clutch and this means synchronizing the clutch with the other components of the machine and providing a clutch which is positive in its action, since no slippage can be tolerated. Furthermore, since the lug or notch is on the side of the base of the bottle, the registration finger must be moved to a position out of the way of the screen prior to the time screening commences. For this purpose, in the patents to which reference has been made, a cam operated reach arm is provided for shifting the registration finger between a position to the rear of the plane of the chuck face and a position forward of the plane of the chuck face. Thus, in a cycle of operation, after the bottle has been chucked, the tool is moved into lug or notch intercepting position and the clutch is shifted to engage the chuck to a drive source (other than the drum and cable) which rotates it to bring the lug or notch into engagement with the registration finger. As soon as the lug or notch is intercepted by the finger, the clutch is shifted to disconnect the chuck from the initial drive source and connect it in driving engagement to the drum about which the screen cable is wound. Before screening can commence, the tool or finger must be moved to the position at the rear of the plane of the face of the chuck so that it is out of the way of the screen and out of its lug or notch intercepting position. At this time the squeegee descends, the screen is moved, and the decoration is applied to the bottle. At the end of the screen stroke the squeegee raises, the clutch disengages the chuck from the drum drive and the decorated bottle may be removed from the chucking device.

In this operation, it may be seen that the bottle is driven by the chuck in the registration part of the cycle. The chuck need be rotated just a little more than one complete revolution. At some time during this revolution, the finger intercepts the lug or recess, the bottle is stopped and the clutch simply slips until the drive to it is disconnected. However, in order to bring the finger into intercepting position it must be moved as previously described which necessitates an actuating cam, a reach arm and means to mount the finger for such movement. The intercepting position of the finger is completely divorced from screen movement or position and it must be pre-set relative to the screen in order to stop the bottle in a position such that the area upon it to be decorated is properly oriented with respect to the design areas of the

screen. During the decorating movement of the screen, the bottle is rotated by the chuck through the clutch from the drum and screen cable drive. The driving connection during screening is, however, an indirect one with the possibility of either the clutch or the chuck slipping to cause the design applied to the bottle to be smeared.

In the preferred embodiment of the present invention, the registration tool is in fixed relationship to the screen, thus obviating the need to pre-set it as in the case of the patents to which reference has been made. To accomplish this, the finger is disposed within the chuck annulus on a shaft which is directly keyed to the drum about which the screen cable is wound. The chuck itself is engageable to a drive from a power source within the machine through a clutch in order to rotate the bottle initially, that is, to bring it into contact with the registration finger. And, as in the case of the patented machine, the chuck is driven slightly more than 360 degrees to insure that the interception is made. However, during screening, the drive to the chuck is completely de-commissioned at the clutch, so that the chuck rotates freely. The bottle is rotated to maintain a rolling contact with respect to the screen directly from the screen through the drum, shaft and finger to which reference has been made. Thus during screening the chuck serves merely to center the bottle; the screen and bottle are directly interconnected and there can be no smearing of the design as a result of clutch or chuck slippage.

Instead of employing an index lug or notch in the side of the bottle, the present invention employs either a lug or a notch which is formed in the bottom of the bottle where it is engageable by the finger residing within the chuck. Indexing means in this location are found to have advantages over those in the side of a bottle. For one thing, a lug on the bottom is not as apt to become chipped during the routine handling of bottles as one on the side since such a lug resides within the recess customarily provided in the bottoms of bottles. Furthermore, some localities have objected to milk bottles having indexing lugs or notches located on the side upon the basis that they provide crevices which are not properly sterilized in the bottle cleaning and which are, therefore, unhygienic. The index means of this invention, either a lug or a recess, being on the bottom of the bottle is positioned where an unhygienic condition can be tolerated without danger.

Thus, the registration apparatus of this invention provides a more precise initial registration; by directly connecting the screen to the bottle true rolling contact is maintained; and, the lug or recess utilized is positioned where it is not objectionable to health authorities.

Other features and advantages of the present invention will be readily apparent to those skilled in the art from the following detailed description of the drawings in which:

Figure 1 is a side elevational view of registration apparatus incorporating the principles of the present invention. In this view a portion only of the machine is shown.

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1 showing the registration finger engaged in a notch provided in the bottom of a bottle.

Figure 3 is a fragmentary cross sectional view of the chuck showing the finger in notch intercepting position with respect to a bottle.

Figure 4 is a fragmentary cross sectional view taken on the line 4—4 of Figure 1.

Figure 5 is a front elevational view looking into the open end of the chuck.

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 5.

Figure 7 is a fragmentary cross sectional view taken on the line 7—7 of Figure 3.

Figure 8 is a fragmentary cross sectional view taken on the line 8—8 of Figure 2.

Figure 9 is an elevational view of the bottom of a bottle in which a lug indexing device is employed.

Figure 10 is a fragmentary cross sectional view through the bottle of Figure 9.

In the drawings, the bed of a stencil decorating machine is shown diagrammatically only at 10. Two mounting brackets 11 and 12 are secured to the top of the bed by means such as bolts. These mounting brackets provide journals for the other parts of the registration apparatus which includes in general a cable driven drum 13, a clutch 14, and a chuck assembly 15. All of these parts are disposed upon a common axis which is also common to the longitudinal axis of the chucked bottle such as the one shown at 16. In the instance shown, the chuck comprises a cylindrical sleeve 17 having an outer rim configured as shown at 18 to receive and seat the lower rounded edge of the bottle. The bottle is held against its seat in the chuck by means of a mouthpiece receiver 19 which engages the top of the bottle. The mouthpiece receiver is shown diagrammatically only, but it will be obvious to those skilled in the art that it must be mounted to move toward and away from the chuck, and that it should be cushioned by means such as a spring to resiliently hold the bottle in place against seat 18. Details of such a mouthpiece receiver are disclosed in U.S. Patent No. 2,721,516.

The drum 13 has a cable 20 tightly wound around it. The opposite ends of this cable are affixed to the opposite ends of the screen or extensions of the ends of the screen and it is taut. The circumference of the drum is the same size as the circumference of the bottle 16. Preferably chucks and drums are provided in sets for articles of different sizes. The drum is rigidly secured to the rear end of the registration shaft 21 which extends through the center of the registration apparatus assembly. In the instance shown, the rear end of the shaft has a flat 22 at one side against which a set screw 23, threaded through the hub of the drum, seats. It will be seen, therefore, that movement of the screen will drive registration shaft 21.

A hollow chuck shaft 24 surrounds the registration shaft 21 and the two shafts are journaled in bearings so that one may rotate freely with respect to the other. More specifically, the chuck shaft 21, between the clutch and the chuck, mounts a cylindrical inner race 25 of a needle bearing designated generally 26. Bearing 26 is seated within a race carrier 27 which is secured in an appropriate seat formed within the mount bracket 12 by means screws 28. The inner race 25 of the roller bearing is held in place on the hollow chuck shaft 24 against the race carrier which is at its forward end by a split ring 29 which is engaged in a groove in the chuck shaft 24 to the rear of the race.

The two shafts 21 and 24 are independently journaled within mount bracket 11. Two roller bearings 30 and 31 are seated in spaced relationship within the mount bracket, a spacer ring 32 being provided between them within the bracket. The inner race of the forward bearing 31 receives the rear end of the chuck shaft, a split ring 33 being provided to hold the chuck shaft in place relative to bearing 31. The registration shaft extends beyond the rear end of the chuck shaft and it mounts two bearing seats 34 which surround the shaft and which receive the inner race of bearing 30. In this case a split ring 35 is provided to hold the rear one of the two bearing seats 34 in place. The other bearing seat engages against a shoulder 36 provided by milling a step into the registration shaft 21. The bearings 30 and 31 are held in the mount bracket 11 by means of two circular race clamps 37 and 38 which are engaged respectively against the rear and forward faces of the bracket and which are secured by means of machine screws 39 which pass through race clamp 37, appropriate bores in the mount bracket and thread into the forward race clamp 38. In addition, the forward end of the chuck shaft 24

is counter-bored to provide a seat for the outer race of a needle bearing 40, the inner race of which surrounds and seats the registration shaft 21. Hence, the two shafts are mounted for rotation relative to one another upon a common central axis which is also common to the axis of a chucked bottle.

The forward end of chuck shaft 24 has an enlarged circular flange 41 made as an integral part of it. This flange is machined to provide a circular seat for chuck 17. The chuck also has a circular flange 42 upon it which engages against flange 41 of the chuck shaft. These two flanges are bolted together as shown by machine screws 43, which pass through flange 42 of the chuck and thread into the flange 41 of the chuck shaft. As an assembly expedient, the flange 41 radially inwardly of the machine screws may have one or more bores 44 in it to permit the machine 28 to be engaged through race carrier 27 and threaded into the mount bracket 12, the screws 28 being put into place before chuck 17 is seated.

The forward end of the registration shaft 21 also has a circular flange 45 upon it. This flange is smaller in diameter than the hollow interior of chuck sleeve 17 and it has a groove constituting a cross slide 46 machined diametrically across its outer face. Additionally, the forward end of the registration shaft 21 has a bore 47 which extends axially into the shaft. This bore seats a coil spring 48, the purpose of which will be explained. The cross slide 46 mounts a keeper indicated generally at 49. Referring to Figure 6, it will be seen that the inner face of the keeper has two riders 50 upon it which project into the cross slide or groove 46 engaging the opposite sides of the groove. Additionally, the keeper has two wings 51—51 which project from its opposite sides. These wings have elongated slots 52—52 in them through which large headed machine screws 53—53 are engaged, the screws threading into the flange 45 of the registration shaft. By loosening the two machine screws 53—53 the position of the keeper may be adjusted relative to the axis of shaft 21.

The inner face of the keeper has a square channel 54 in it. This channel receives and seats the registration finger which is designated 55. The finger is coextensive with the channel and one end is pivotally mounted within the keeper by means of a cross pin 56 which extends through the keeper from one side to the other, the pin being held in place by a pair of snap rings which engage the pin on the opposite sides of the keeper. The end of the finger 55 opposite the pivot pin 56 includes a right angular projection 57 which extends through a slot in the keeper beyond the keeper to a point on the plane of the outer face of chuck 17. The spring 48 is seated against the back of the finger and urges it into the extended position shown in Figure 8. The spring also permits the finger to be rocked back into the position shown in Figure 3.

The bottle shown in Figures 2, 3, 7 and 8 has a notch 58 disposed radially of the bottle in the bottom adjacent to the outer edge. This notch may be V-shaped in cross section and the outer end of the registration finger projection 57 formed to fit the V shape. Other complementary shapes for the notch and finger may be employed if desired. In Figures 9 and 10 the bottom of the bottle is recessed to a greater extent than shown in Figures 2 and 3 and a lug 59 is provided which extends radially into the recess from the outer edge of the bottom of the bottle. Preferably the sides of the lug 59 taper toward the longitudinal axis of the bottle and are substantially flat. The sides of the outer end of the registration finger may be flat when used in conjunction with the lug.

As shown, the finger is in fixed position relative to the drum through shaft 21 so that it is in a set position with respect to the screen and the design upon the screen. The chuck 17, however, is rotatable independently of the

registration shaft 21 and for registration purposes it is designed to be driven from a power source within the machine through the clutch 14. In the instance shown in Figure 1, a drive shaft 60 is provided having a sprocket 61 affixed to it. A chain 62 is engaged around the sprocket 61 and around another sprocket 63 which is on the clutch. As shown in Figure 2, the teeth of the sprocket 63 on the clutch are formed upon a sleeve 64 which is in turn seated upon a flanged sleeve 65. The two sleeves are keyed together by means such as set screws 66 so that there can be no relative movement between them. The rear face of the inner sleeve 65 has a flange 67 extending radially out from it to constitute a clutch face. A ring of clutch material such as that shown at 68 preferably is secured to the clutch face by means such as rivets. The inner sleeve 65 is journaled on the chuck shaft 24 by means of a ball bearing 69, the inner race of the bearing being engaged at its forward end against a shoulder formed by a step in chuck shaft 24. The inner race is held in place by means of a split ring 70 at the side opposite the shoulder. The driven part of the clutch, being free to rotate relative to the chuck shaft, can be driven constantly if desired. The driven part of the clutch furthermore is engaged and disengaged with the chuck shaft 24 by means of a clutch slide 71. Following conventional practice the clutch slide has a deep groove extending around it in which is seated a ball bearing 72. The bearing is installed by removing a ring nut 73 which threads into place as shown to provide the forward wall delineating the groove. A split clamp ring 74 is engaged around the outer race of ball bearing 72, the clamp ring having two radial projections 75—75 which may be drawn together by means of a machine screw 76 to tighten the ring into place against the outer race of the ball bearing. A pair of pins 77—77 are threaded into the clamp ring at the respective opposite sides thereof and project radially outwardly through slots formed in the upper ends of arms 78—78 of a yoke 79. This yoke is mounted on a pivot underneath of the bed of the machine as shown in Figure 1 by means of a bracket 80. Preferably the yoke is actuated by means such as a cam in synchronization with the machine. The rear face of the clutch slide also has two pins 81—81 which project from it and into sliding engagement with bores 82—82 formed in a clamp 83. The latter clamp is split and it is fixed to chuck shaft 24 for rotation with it by tightening a machine screw 84 which traverses the split.

Hence, the chuck shaft is brought into driving engagement with the driven part of the clutch by shifting the yoke to engage the clutch slide with clutch face 68. The pins 81 in the clutch slide rotate the clamp 83. It is preferred that the cam or other means employed to shift the yoke be arranged so that the clutch is engaged to drive the chuck shaft through approximately only 400 degrees for registration purposes, this being more than enough to insure that the notch or lug on the bottom of a bottle is brought into contact with the finger, the rotation after such engagement is effected merely resulting in a slipping of the clutch.

As previously described, the clutch 14 may be de-commissioned during a screen operation so that the chuck 17 rotates freely serving to center the bottle with respect to the finger. In this type of operation the bottle is driven solely by means of the finger. However, if desired, the clutch can be used to drive the bottle to assist the finger during screening. The cam or other means employed to engage and disengage the clutch in synchronization with the operation of the machine under these circumstances is arranged so that it engages the clutch first to drive the chuck through a registration cycle of slightly over 360 degrees and then to be driven to rotate the bottle along with the finger during screening. Preferably, however, and in order to insure maintenance of precise rolling contact between the bottle and the

screen, the clutch may be arranged to engage the chuck in driving relation with the shaft 60 during pre-registration and then to engage it with the registration shaft during screening. In this way the clutch must turn precisely with the finger.

Having described my invention, I claim:

1. In a stencil decorating machine having a screen adapted to be moved across the surface of an article to be decorated, said article having an index device on the bottom thereof, means to orient initially said article with respect to the screen and to maintain rolling contact between the surface of the article and the screen during decorating movement of the screen, said means comprising a chuck annulus to receive the bottom of said article, said chuck annulus normally being free to rotate, means to drive said chuck annulus, means to selectively connect the means to drive the chuck annulus with the chuck annulus whereby an article in the chuck annulus is rotated, a registration finger mounted within the chuck annulus, means mechanically interconnecting the finger to the screen such that the finger is in fixed relationship to the screen but adapted upon movement of the screen to rotate at a rate to maintain rolling contact between the surface of an article in the chuck annulus and the surface of the screen, and said registration finger being positioned within the chuck annulus to engage the index device on the bottom of an article within the rotating chuck to stop the rotation of the article and thereby fix it in position initially relative to the screen and thereafter to rotate the article during screen movement.

2. In a stencil decorating machine having a screen adapted to be moved across the surface of an article to be decorated, said article having an index device on the bottom thereof, means to orient initially said article with respect to the screen and to maintain rolling contact between the surface of the article and the screen during decorating movement of the screen, said means comprising a chuck to receive the bottom of said article, said chuck normally being free to rotate, means to drive said chuck, a clutch to connect selectively the means to drive the chuck with the chuck whereby an article in the chuck is rotated, a registration finger mounted within the chuck in position to engage the index device on the bottom of the article and thereby stop the rotation of the article, and means mechanically interconnecting the finger to the screen, whereby movement of the screen rotates the finger at a rate to drive an article engaged by the finger at a speed to maintain rolling contact between the surface of the article and the screen.

3. In a stencil decorating machine having a screen adapted to be moved across the surface of an article to be decorated, said article having an index device on the bottom thereof, the improvement comprising a chuck annulus to receive the bottom of said article, said chuck annulus normally being free to rotate, means to drive said chuck annulus, a slippable clutch to selectively connect the means to drive the chuck annulus with the chuck annulus whereby an article in the chuck annulus is rotated thereby, a registration finger mounted within the chuck annulus, means mechanically interconnecting the finger to the screen such that the finger is in fixed relation to the screen, and said registration finger being positioned within the chuck annulus to engage the index device on the bottom of an article within the rotating chuck to stop the rotation of the article with respect to the chuck annulus such that upon disengagement of the slippable clutch the article is in a predetermined fixed relation to the screen.

4. In a stencil decorating machine having a screen adapted to be moved across the surface of an article to be decorated, said article having an index device on the bottom thereof, the improvement comprising a chuck annulus to receive the bottom of said article, a registration finger mounted within the chuck annulus, spring means normally urging said finger outwardly whereby the bot-

tom of an article engaged in the chuck annulus is contacted by the finger, said finger being rotatably mounted, means interconnecting the finger to the screen such that the finger is rotated at a rate to maintain rolling contact between an article in the chuck and the surface of the screen during movement of the screen, said chuck normally being free to rotate to serve as a means to center an article being rotated by the finger, drive means, means to selectively connect the drive means with the chuck, whereby with the screen in fixed position the index device on the bottom of the article is intercepted by the finger upon rotation of the chuck to initially orient the article with respect to the screen.

5. In a stencil decorating machine having a screen adapted to move across the surface of an article to be decorated, said article having an index device on the bottom thereof, the improvement comprising a chuck to receive the bottom of said article, a registration finger mounted within the chuck in position to make driving contact with the index device on the bottom of the article, means to rotatably mount said finger within the chuck, means interconnecting the finger to the screen such that the finger is rotated at a rate to maintain rolling contact between the surface of an article in the chuck and the surface of the screen during decorating movement of the screen, said chuck normally being free to rotate to serve as a means to center the article being rotated by the finger during screen movement, drive means independent of the screen, means to selectively connect the drive means to the chuck when the screen is in fixed position to rotate the article in the chuck at least once and thereby initially bring the index device on the bottom of the article into driving engagement with the finger, and the means to selectively connect the drive means with the chuck being adapted to permit relative movement between the article and the drive means after the interception of the article has been made by the finger.

6. In a stencil decorating machine having a screen adapted to be moved across a cylindrical article to be decorated, said article having an index device on the bottom thereof, the improvement comprising a chuck to receive the bottom of said article, said chuck normally being free to rotate around the longitudinal axis of the cylindrical article received therein, drive means, a clutch to selectively connect said drive means to the chuck for rotating said article, a registration finger rotatably mounted within said chuck, and means connecting the registration finger to the screen so that upon the rotation of the chuck by said drive means the registration finger intercepts the index device and thereby fixes the position of the article with respect to the screen.

7. In a stencil decorating machine having a screen adapted to move across a bottle to be decorated, said bottle having a notch in the base thereof, the improvement comprising a hollow shaft, a chuck annulus at the forward end of said shaft adapted to receive the base of said bottle, a registration shaft extending through the center of said hollow shaft, a registration finger at the forward end of said registration shaft within the chuck annulus, means urging said finger outwardly to engage the bottom of a bottle received in the chuck annulus, means connecting said registration shaft to the screen whereby the registration finger is in fixed relation to the screen and is adapted to be rotated by the decorating movement of the screen, and means to selectively drive the chuck annulus to rotate a bottle received therein to bring the notch into position to be engaged by the registration finger and thereby fix the position of the bottle with respect to the screen.

8. The improvement as set forth in claim 7 in which means are provided to adjust the position of the registration finger radially with respect to the axis of the registration shaft.