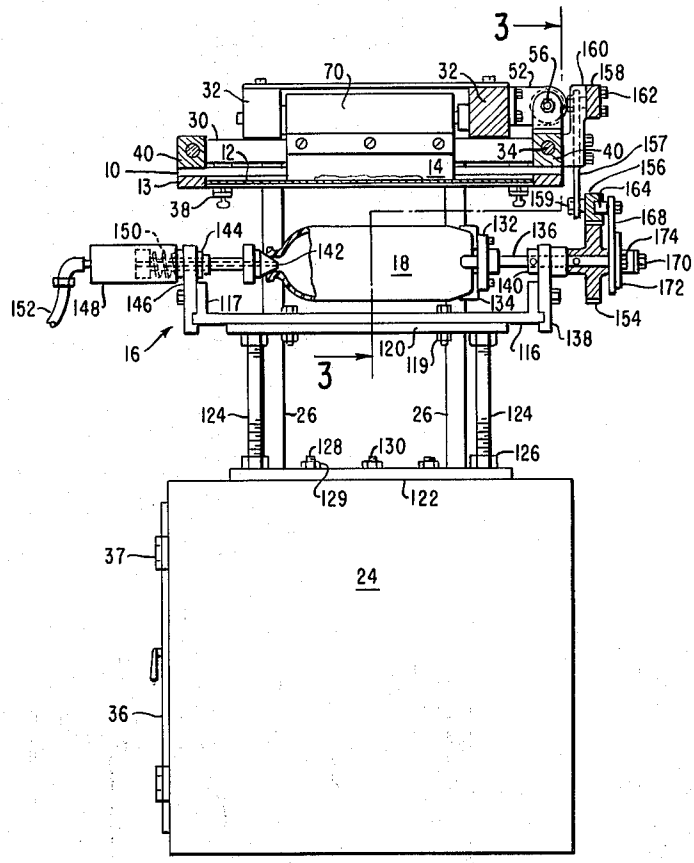
July 12, 1966 W. M. KARLYN 3,260,194

REGISTERING MECHANISM FOR STENCILLING APPARATUS

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FIG. 1



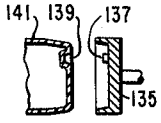


FIG. 5

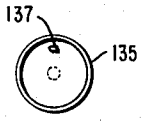


FIG. 4

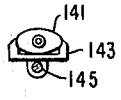


FIG. 7

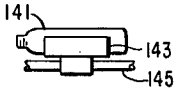


FIG. 6

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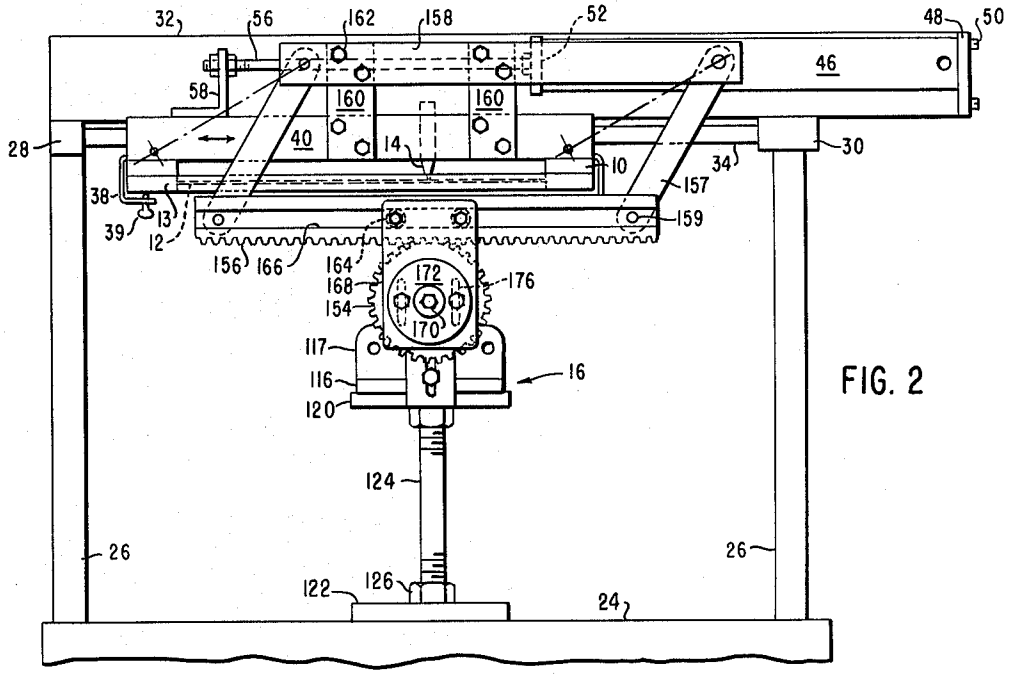


FIG. 2

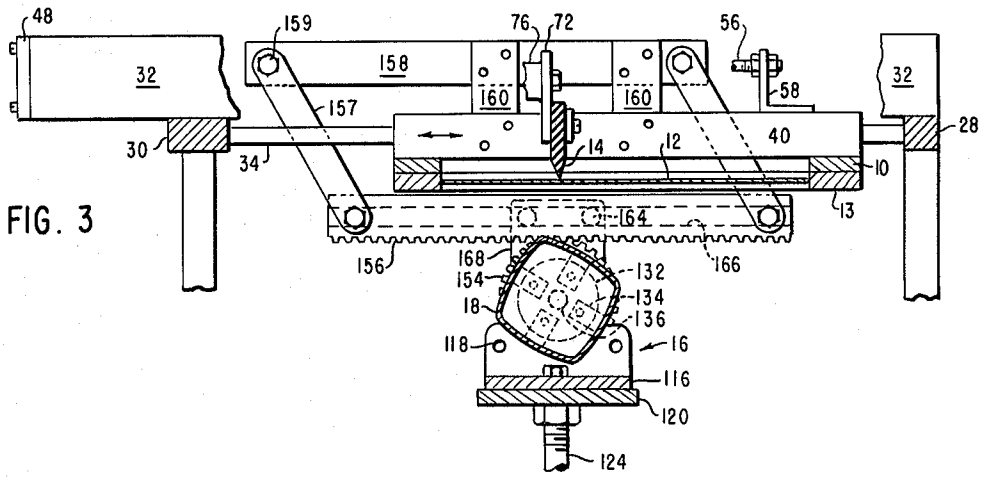


FIG. 3

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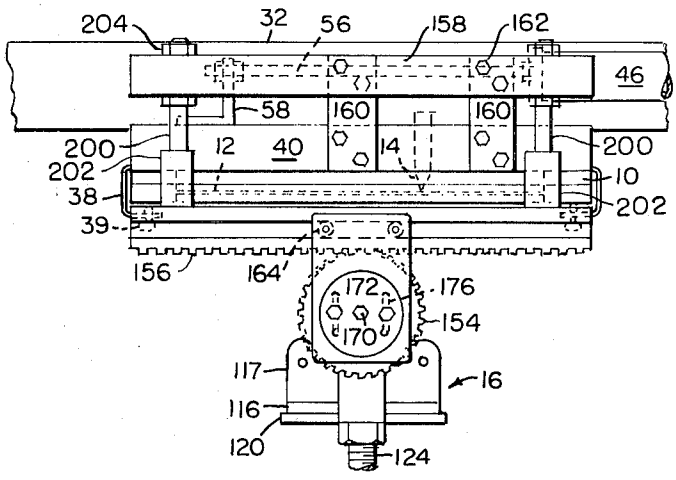
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FIG. 8



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United States Patent Office 3,260,194 Patented July 12, 1966

3,260,194

REGISTERING MECHANISM FOR STENCILLING APPARATUS

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Filed Sept. 20, 1965, Ser. No. 493,610
8 Claims. (Cl. 101—38)

This invention relates to an improved registering mechanism for stencilling apparatus. This application is a continuation-in-part of my copending application Serial No. 341,968, filed February 3, 1964. This invention relates particularly to an improvement in stencilling apparatus as disclosed and claimed in my U.S. Patent No. 3,109,365, issued November 5, 1963, entitled "Stencilling Apparatus." That patent pertains to an automatic stencilling apparatus by means of which a bottle or other article to be stencilled is supported rotatably against the surface of a silk screen having a prepared design, and the screen is translated in a plane tangential to the bottle surface, causing the bottle to rotate in registration with the design. As the screen translates, a pool of paint resting on its upper surface is forced through the screen by a squeegee, and thus imparts the design to the bottle.

In the case of circular cylindrical or even oval bottles, the frictional driving engagement between the bottle and the silk screen produces a satisfactory image. However, this means of maintaining registration between the bottle and the screen during the translation cannot be employed where it is desired to stencil a bottle having a substantially square or polygonal cross section, since any radius of curvature of a relatively flattened bottle surface is very much greater than a radius of rotation of the bottle about its own central axis. Therefore, for stencilling such bottles, it is necessary to provide some positive drive means for moving the bottle surface in synchronism with the translation of the screen.

In a stencilling machine as disclosed by the aforementioned patent, the bottle is rotatably mounted in a carriage which can be moved away from the screen for insertion and removal of successive bottles to be stencilled.

The present invention is concerned with the provision, in stencilling apparatus of this type, of a registering mechanism by means of which positive driving connection is made between the screen frame and a clamp rotatably supporting the bottle, such that translation of the screen rotates the bottle in synchronism, and thus prevents relative slippage between the surface being stencilled and the screen; at the same time, the improved registering mechanism maintains the registered relationship when the bottle, clamp, and supporting carriage are lowered from the screen, and automatically reregisters when the carriage is once again raised for stencilling operation. Thus, a succeeding bottle placed in the carriage is automatically registered. Further objects and advantages of the invention will appear as the following description of a preferred embodiment proceeds, reference being had to the accompanying drawings, in which:

FIG. 1 is an end view in elevation and partially in cross section of a stencilling apparatus incorporating the improved registering mechanism;

FIG. 2 is a fragmentary view in rear elevation;

FIG. 3 is a fragmentary sectional view taken along line 3—3 in FIG. 1, looking in the direction of the arrows;

FIG. 4 is a front view in elevation of a modified clamp for engaging the base of a circular bottle for automatic registration;

FIG. 5 is a side view in cross section of the clamp shown in FIG. 4, and the base portion of a mating bottle;

FIGS. 6 and 7 are side and front elevational views, respectively, of a cradle for rotatably supporting and registering an oval bottle; and

FIG. 8 is a fragmentary view in rear elevation of a modified apparatus.

In the drawings, the registering mechanism is shown incorporated in a stencilling apparatus substantially as disclosed and claimed in my aforementioned Patent No. 3,109,365. This apparatus includes a screen-supporting frame **10** which is arranged to support a planar silk screen **12** mounted in a base **13**; a rubber squeegee **14** arranged to abut an upper surface of the silk screen; and a carriage generally designated **16**, for rotatably supporting a selected article to be stencilled, such as a plastic bottle **18**, for elevation into engagement with a lower surface of the screen in vertical alignment with the squeegee. By translating the screen and its supporting frame in either direction of reciprocation in the plane of the screen, and by applying a pool of suitable paint to the upper surface of the screen, a stencil pattern may be applied to the surface of the article.

The apparatus is organized upon a base cabinet **24** on which are mounted a series of vertical standards **26**, and transverse braces **28** and **30**. Longitudinal bars **32** are provided to complete the supporting framework, and a pair of cylindrical guide rods **34** are secured at their opposite ends in the braces **28** and **30**, for slidably supporting the screen frame **10** for rectilinear recriprocation in the directions shown by the arrows. Equipment mounted in the base of the cabinet is accessible through a door **36** attached by means of hinges **37**.

Four clamps **38** are secured adjacent to the corners of the frame **10** and are provided with threaded screws **39** for securing the base **13** to the lower surface of the frame. The frame **10** has a pair of bars **40** secured in longitudinally extending relation along its lateral edges, each of which contains a pair of linear ball bushings for slideable engagement with the guide rods **34**. Terminal positions of the frame are pre-selected according to the length of the stencil, and are established by means of adjustable stops (not shown) mounted on the guide rods **34**.

A reciprocable double-acting pneumatic motor **46** is arranged for reciprocating the screen and frame, and is mounted between a bracket **48** secured to an end of the bar **32** by screws **50**, and an L-shaped bracket **52** secured to the same bar. An actuating rod **56** of the motor **46** is drivingly connected to the bar **40** of the frame, by means of an L-shaped bracket **58**.

The squeegee **14** is of a conventional type, and is carried by a bracket **72** and an arm **76**, which is mounted by means not shown for reciprocation of the squeegee into or out of engagement with the upper surface of the screen.

The article-supporting carriage **16** includes a base plate **116** having upstanding flanges **117** at its ends. The base plate **116** is detachably secured by threaded fasteners **119** upon an upper plate **120** of the carriage, so that various fixtures may be readily interchanged for use with various forms and sizes of articles. The plate **120** is spaced from a lower plate **122** by means of threaded studs **124**, secured in adjustable relationship to the lower plate by means of lock nuts **126**.

The carriage is mounted for vertical reciprocation to raised or lowered positions on guide rods **128**, secured in the plate **122** by nuts **129**. The guide rods are slidably received in bearing bushings (not shown) mounted in the base cabinet **24**, and the carriage is drivingly connected with a pneumatic motor (not shown) mounted in the cabinet, all as more fully described by the aforementioned patent. Suitable control means are also provided for coordinating the actuation of the screen frame **10** with the movements of the carriage. However, these means form no part of the present invention, and further detailed description thereof is believed unnecessary.

The present invention is particularly concerned with a registering drive mechanism which forms a positive driving connection between the screen frame **10** and a bottle **18**, which is illustrated with a generally rectangular cross section and therefore must be maintained by such means in register with the screen **12**. At the same time, these means permit the carriage **16** to be raised and lowered, and automatically bring the bottle into proper registration with a design in the screen. The mechanism includes a clamp **132**, which in this case is provided with four slidable jaws **134** in cruciform arrangement, for gripping the base of the bottle **18**.

Alternative means for registering bottles of other forms in predetermined relation may be used, such as a protrusion receivable in a mating recess in the bottle. For example, the clamp **132** may be replaced with a clamp **135**, as illustrated in FIGS. 4 and 5, which includes a protrusion **137** offset from the center of the cap and received in a mating recess **139** in the base of the bottle **141**, for positively registering the bottle with the clamp and providing a driving connection.

In a modification shown in FIGS. 6 and 7, an oval bottle **141** is supported in a cradle **143**, which is shaped to hold the bottle in registered relation. The cradle is mounted on a rod **145** for oscillation about the rod axis as the screen passes over the bottle surface; the rod being rotatably mounted by bearing means (not shown) on the carriage **16**.

Referring again to FIG. 1, the clamp **132** is rotatably supported on the carriage by means of a spindle **136**, mounted on the carriage by means of a standard **138** having a bearing unit **140**. The bottle is rotatably supported at its opposite end by means of an inflation nozzle **142**, which is rotatably supported by a bearing unit **144** mounted in a standard **146** on the carriage, and reciprocable along the axis of the bottle by means of a single-acting pneumatic motor **148** having a return spring **150**. The arrangement is such that as compressed air is applied to the motor **148** through the conduit **152**, a bypass (not shown) also supplies air to the nozzle **142** for inflating the bottle **18**, which may be of soft plastic and therefore too flexible for proper stencilling without such inflation.

For rotatably driving the clamp and bottle in synchronism with the screen as the latter translates, a drive pinion **154** is pinned to the spindle **136**, and meshed with a rack **156**. The rack forms one member of a four-bar parallelogram linkage, including a pair of links **157** and a drive bar **158**, pinned by screws **159**. The drive bar is affixed to the bar **40** by means of brackets **160** secured by threaded fasteners **162**. It will be understood that in an alternative form, the bar **158** may be omitted and the links **157** secured directly to the bar **40** of the frame **10**, which then forms one member of the linkage.

In any elevational position of the carriage and bottle, translation of the screen with the bars **40** produces a corresponding translation of the rack and synchronized rotation of the pinion **154** and the bottle. The carriage may at the same time be raised or lowered freely in and out of engagement with the screen, rotating to some extent while translating vertically, but resuming registered relation with the screen as it is brought back into engagement therewith.

The weight of the rack **156** will ordinarily be sufficient to hold it in mesh with the pinion **154**, but to insure maintenance of this engagement, the preferred embodiment is provided with a pair of rollers **164** slidably received in a groove or recess **166** formed in the side surface of the rack. The rollers are mounted in a bracket **168**, adjustably secured with respect to the spindle **136** by means of a screw **170** mounting the spindle in a bearing unit **172**, which is in turn mounted by bolts **174** received in elongated slots **176** formed in the bracket. By adjusting the mounting of the bearing and spindle with respect to the bracket, drive pinions of various diameters may be accommodated, to adjust the apparatus to different sizes of bottles or other articles.

In a modification of the registering linkage shown in FIG. 8, the links **157** of the construction shown in FIGS. 1–3 are replaced by extensible rod means comprising guide rods **200**, which are free to slide vertically in ball bushings **202** or the like. The ball bushings are affixed to the rack **156**, while the rods **200** are secured by nuts **204** threaded thereon, to the bar **158**. Thus, horizontal reciprocation of the bar **158** by the motor **46** is transmitted to the rack **156** and to the pinion **154**, while the rack is free to reciprocate vertically with the pinion and the carriage **16**, and the registered relationship is maintained at all times.

It should be noted that it is feasible to omit one of the pair of links **157** in the construction of FIGS. 1–3, or one set of the guide rods **200** and bushings **202** in the apparatus of FIG. 8. Also, other linkage means may be employed for suspending the rack **156** from the frame **40**, **158** for freedom of reciprocation, and for maintaining the registered relationship between the pinion **154** and the frame by maintaining the rack in mesh.

It will be understood from the foregoing description that the improved registering mechanism, in combination with stencilling apparatus as described, provides positive registration between the bottle and the stencil screen and insures accurate reproduction by preventing relative slippage, and at the same time permits the supporting carriage to be lowered for loading successive bottles, while maintaining registered relationship with the screen. If it is desired to stencil a design in two or more colors, design registration as maintained as the article is stencilled by successive screens, one for each color; in this respect, the improved mechanism is of particular value with respect to round or oval-section articles as well as polygonal ones.

While I have illustrated and described preferred embodiments of my invention by way of illustration, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the true spirit and scope of the invention, which I therefore intend to define in the appended claims without limitation to specific details of the foregoing embodiment.

What I claim is:

1. Apparatus for stenciling the surface of an article, comprising, in combination:

a frame adapted to support a silk screen;

a carriage including rotatable means for holding and rotatably supporting an article to be stenciled;

means for reciprocating said carriage transversely to said screen between a position engaging the supported article with the surface of said screen, and a position spacing the article from said screen;

a linkage including a portion of said frame, a rack, and means suspending said rack from said frame portion for freedom of movement transverse to said screen and for guiding said rack in parallel relation to said screen throughout transverse movement of said rack;

and a pinion rotatably supported by said carriage for transverse movement therewith and drivingly engaged with said holding means for rotation thereof;

said suspending means being constructed and arranged for guiding said rack freely through a transverse movement of a length equal to the reciprocating movement of said carriage, whereby said rack remains intermeshed with said pinion throughout said reciprocating movement, for rotationally driving said article in continuous positively-registered relation to said frame.

2. Apparatus as recited in claim **1**, in which said suspending means comprise at least one link pivotally connecting said frame portion with said rack.

3. Apparatus as recited in claim **1**, in which said suspending means comprise at least one extensible rod means connecting said frame portion with said rack.

4. Apparatus for stencilling a surface of an article as

recited in claim 1, in which said holding means comprises a clamp having jaws adjustable to grip an article to be stencilled for rotation of the article with said holding means.

5. Apparatus for stencilling a surface of an article as set forth in claim 1, in which said holding means comprises a clamp shaped to receive a base portion of the article, said clamp including a protrusion offset from the center of rotation thereof for mating with a recess in the article to maintain registration of the clamp with the article.

6. Apparatus for stencilling a surface of an article as set forth in claim 1, in which said holding means comprises a cradle formed to receive the article in nested relation therein, and said cradle is offset from the center of rotation of said holding means.

7. Apparatus for stencilling a surface of an article, comprising, in combination: a frame adapted to support a plane silk screen; a carriage including rotatable means for holding and rotatably supporting an article to be stencilled; means for reciprocating said carriage between a raised position engaging the supported article with the lower surface of said screen and a lowered position spacing the article from said screen; a four-bar pivotally-connected parallelogram linkage of which the first bar comprises a portion of said frame for translation therewith, a second bar comprises a rack, and third and fourth bars pivotally suspend said rack from said first bar for freedom of vertical movement in parallel relation thereto; and a pinion rotatably supported by said carriage for movement therewith and drivingly engaged with said holding means for rotation thereof; said rack resting on and being intermeshed with said pinion for rotationally driving said article in registered relation to said frame upon reciprocation of said carriage.

8. Apparatus for stencilling a surface of an article, comprising, in combination: a frame adapted to support a plane silk screen; means mounting said frame for reciprocation in the plane of the supported screen to first and second terminal positions; a carriage including rotatable means for holding and rotatably supporting an article to be stencilled; means for reciprocating said carriage between a raised position engaging the supported article with the lower surface of said screen and a lowered position spacing the article from said screen; a four-bar pivotally-connected parallelogram linkage of which the first bar comprises a portion of said frame for translation therewith, a second bar comprises a rack, and third and fourth bars pivotally suspend said rack from said first bar for freedom of vertical movement in parallel relation thereto; and a pinion rotatably supported by said carriage for movement therewith and drivingly engaged with said holding means for rotation thereof; said rack resting on and being intermeshed with said pinion for rotationally driving said article in synchronized relation to translation of said frame, and for maintaining registered relation of said holding means with said frame by continued intermeshing of said rack and pinion upon reciprocation of said carriage and said holding means.

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