Oct. 11, 1966 T. W. OLSEN 3,277,816

PRINTING MACHINE

Filed Aug. 24, 1964 4 Sheets-Sheet 1

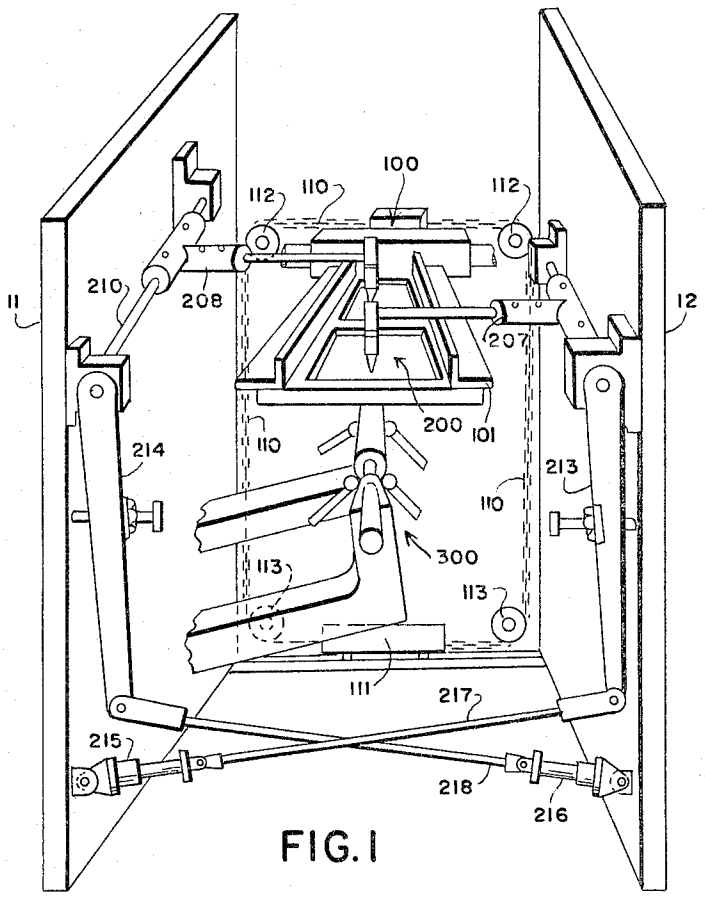


FIG. 1

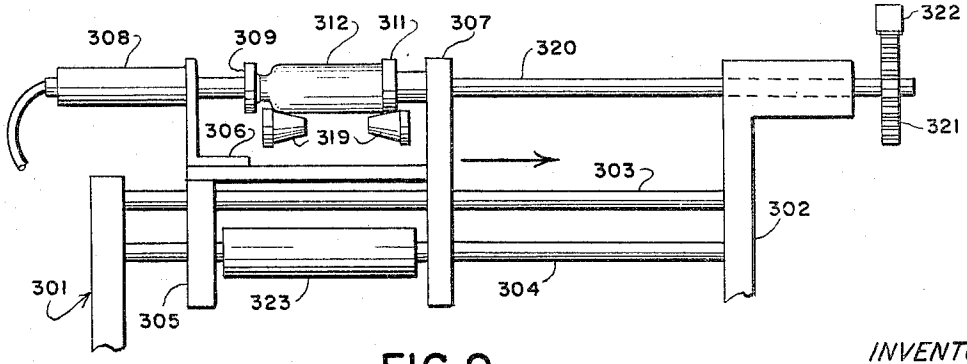


FIG. 9

INVENTOR.
Thomas W. Olsen

by Sparrow and Sparrow

ATTORNEYS.

Oct. 11, 1966 T. W. OLSEN 3,277,816

PRINTING MACHINE

Filed Aug. 24, 1964 4 Sheets-Sheet 2

FIG. 2

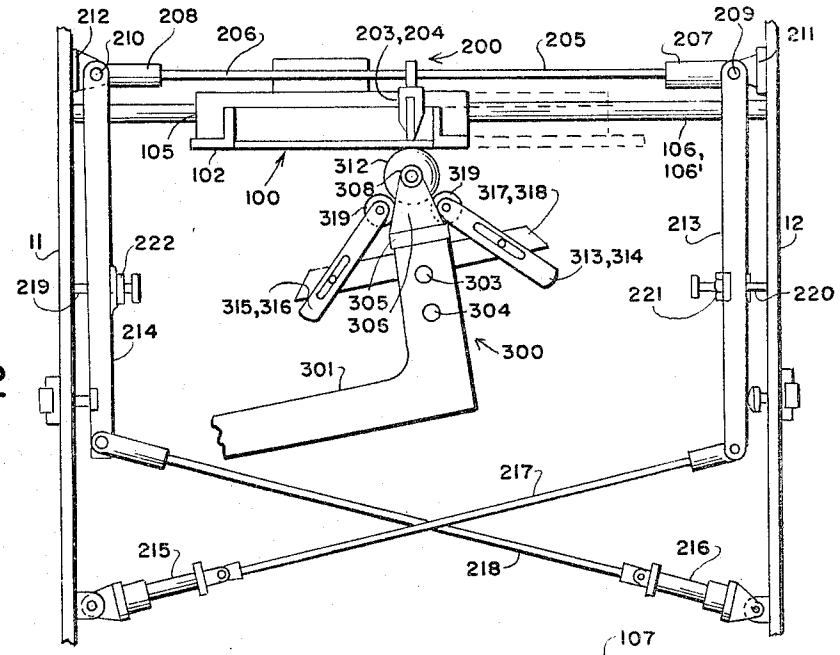
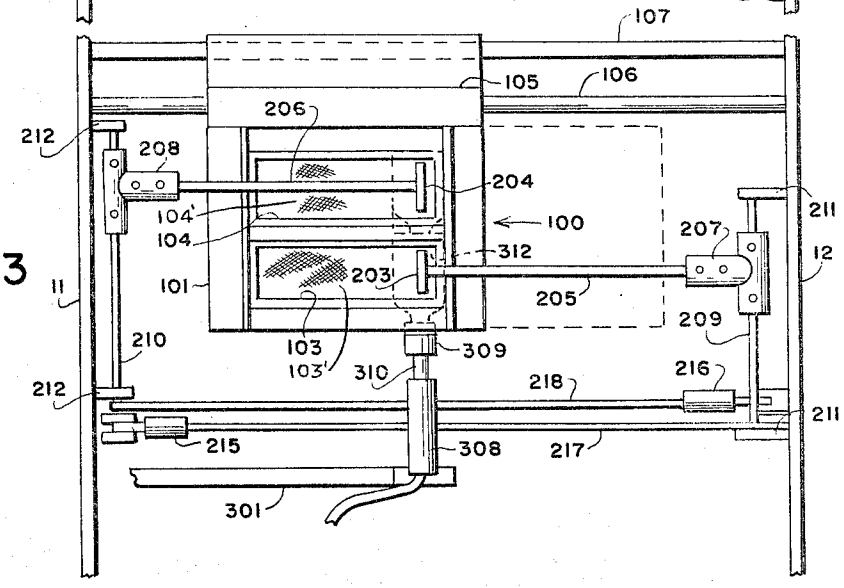


FIG. 3



INVENTOR.
Thomas W. Olsen

by
Sparrow and Sparrow

ATTORNEYS.

Oct. 11, 1966 T. W. OLSEN 3,277,816

PRINTING MACHINE

Filed Aug. 24, 1964 4 Sheets-Sheet 3

FIG. 4

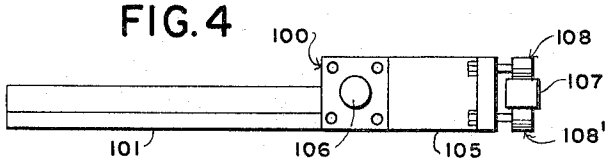
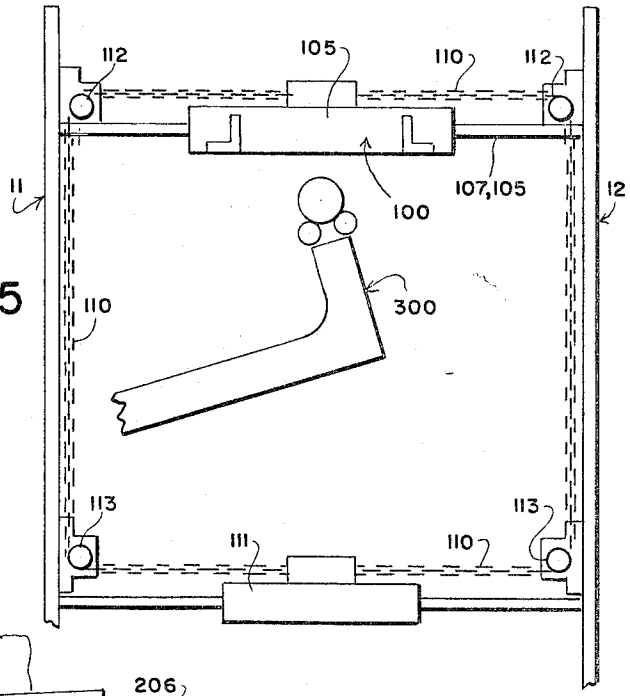


FIG. 5



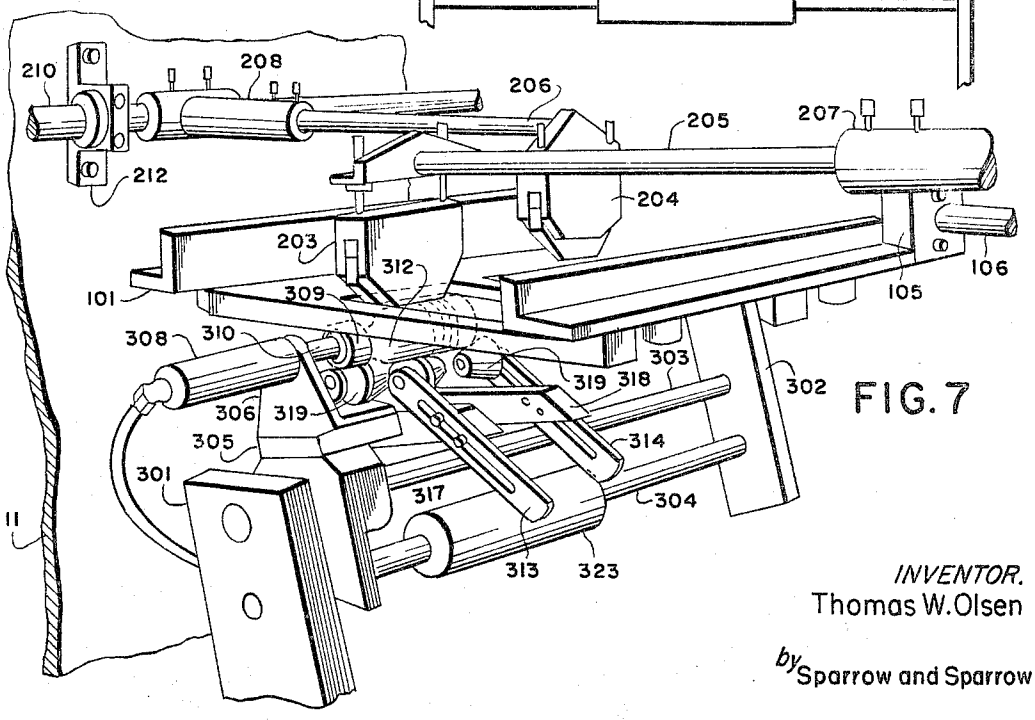


FIG. 7

INVENTOR.
Thomas W. Olsen

by Sparrow and Sparrow

ATTORNEYS.

Oct. 11, 1966 T. W. OLSEN 3,277,816

PRINTING MACHINE

Filed Aug. 24, 1964 4 Sheets-Sheet 4

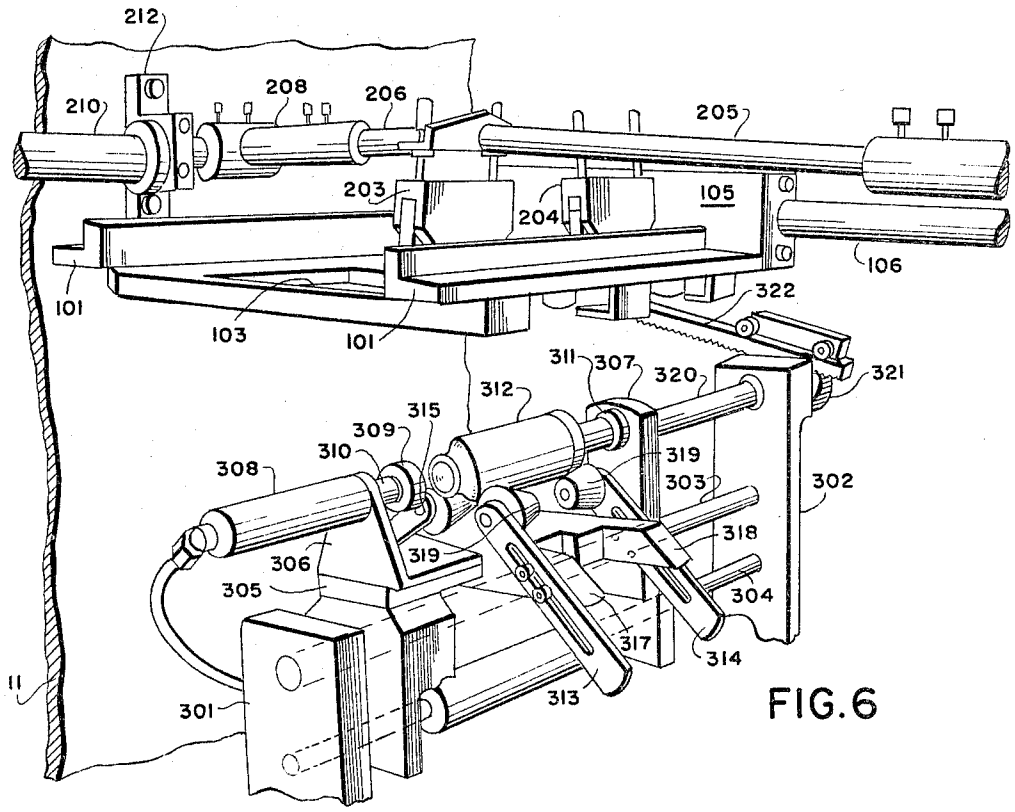


FIG.6

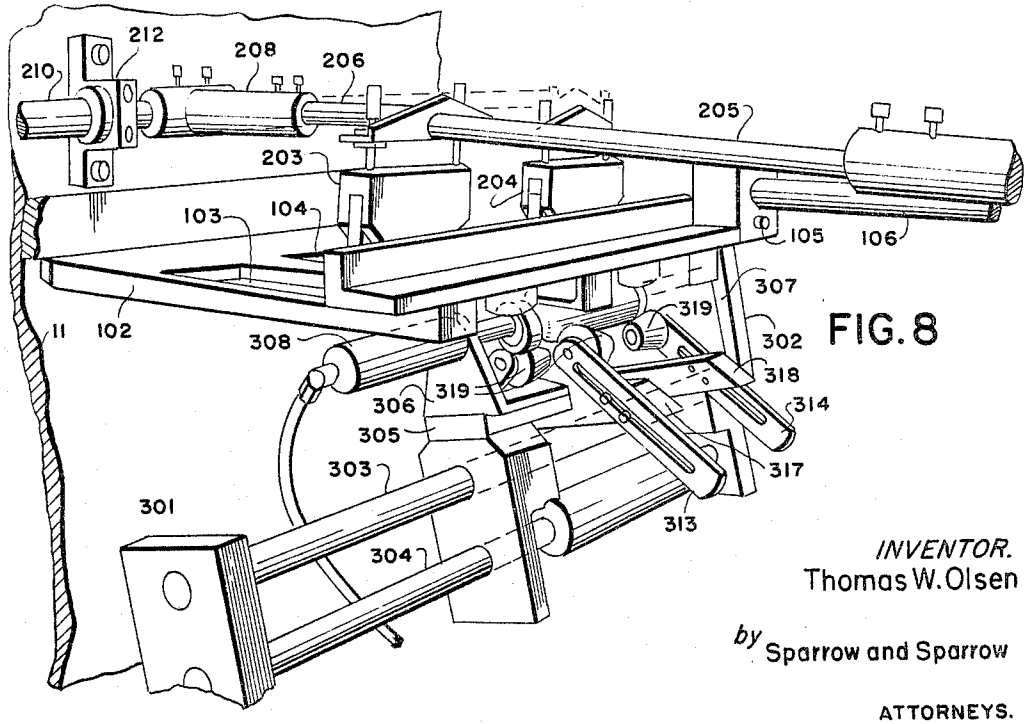


FIG.8

INVENTOR.
Thomas W. Olsen

by Sparrow and Sparrow

ATTORNEYS.

United States Patent Office 3,277,816 Patented Oct. 11, 1966

3,277,816

PRINTING MACHINE

Thomas W. Olsen, Wayne, N.J., assignor to Modern Decorating Company, a corporation of New Jersey

Filed Aug. 24, 1964, Ser. No. 391,624
5 Claims. (Cl. 101—38)

This invention relates to printing machines, and particularly to machines for printing indicia, such as, for example, symbols, legends, advertising matter, names and addresses, directions for use, etc., on articles of cylindrical or tubular shape, such as bottles or the like articles, using the screen printing process.

Machines for performing printing operations on articles of a cylindrical or tubular shape are known, but most of these machines are adapted for printing on the outer surface of collapsible tubular articles, such as tubes for the cosmetic industry and the like light items which must be supported by mandrels. Furthermore, articles of this kind usually have a uniform diameter extending its length and are open on one end so that they can be stripped over the supporting mandrel.

By a machine, according to the present invention, printing of indicia, particularly in at least two colors, is performed on such articles of cylindrical or tubular shape which are self-supporting and which do not require any internal support. The invention consists in such novel features, construction arrangements, combinations of parts and improvements as may be shown and described in connection with the apparatus herein disclosed by way of example only and as illustrative of a preferred embodiment. Objects and advantages of the invention will be set forth in part hereafter, and in part will be obvious herefrom or may be learned by practicing the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

It is an object of the present invention to provide a machine for printing indicia in at least two different colors on articles having a cylindrical or tubular shape.

A further object of the present invention is to provide an instrumentality for printing indicia on bottles or the like articles by the screen printing process.

A still further object of the present invention is to provide a printing machine for printing at least two colors in perfect color register on articles of cylindrical or tubular shape.

Another object of the present invention is to provide a printing machine for printing indicia on hollow articles of cylindrical shape without necessitating internal support means for such hollow articles.

Yet another object of the present invention is to provide a printing machine for printing indicia on articles of a cylindrical or tubular shape, which is easy and convenient to operate.

Various further and more specific purposes, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawings which form part of this specification and illustrate merely by way of example one embodiment of the device of the invention. In the following description and in the claims, parts will be identified by specific names for convenience, but such names are intended to be as generic in their application to similar parts as the art will permit. Like reference characters denote like parts in the several figures of the drawing, in which:

FIG. 1 is a schematic, perspective illustration of the principle of the machine;

FIG. 2 is a side view of the machine showing the main operating parts thereof in a simplified form;

FIG. 3 is a plan view of the machine as shown in FIG. 2;

FIG. 4 is a detail view of the printing frame support;

FIG. 5 is a schematic view of the chain drive of the printing frame;

FIG. 6 is a detail view, taken in perspective, of the operating mechanism of the machine in the loading position;

FIG. 7 is a detail view, taken in perspective, of the operating mechanism shown in FIG. 6, during the first phase of the printing operation;

FIG. 8 is a detail view, taken in perspective, of the operating mechanism shown in FIG. 6, during the second phase of the printing operation; and

FIG. 9 shows a side view of the drive of the chucking device for the article to be printed.

Referring now in more detail to the drawings illustrating a preferred embodiment by which the invention may be realized, there is illustrated in FIG. 1 the principal mechanism of the machine of the invention, showing side supports or side frames **11** and **12** of the machine. A screen printer designated by the general numeral **100**, a squeegee or like mechanism generally designated by the numeral **200**, and mechanism holding the article to be printed, generally indicated by the numeral **300**.

The screen printer **100** comprises a printing frame **101** having a bottom plate **102** in which two openings **103** and **104** are arranged. The two openings **103** and **104** are each covered by a silk, nylon or other suitable screen **103'**, **104'** in conventionally-known manner in screen printing process. Printing frame **101** of screen printer **100** has a rear bar **105** which is glidingly supported by two shafts **106** and **107** which are firmly attached to side supports **11** and **12**. Rollers **108** and **108'**, which are mounted on rear bar **105**, are arranged for rolling on shaft **107**. Thus, the printing frame **101** is adequately supported and can be moved without undue friction.

Screen printer **100** is moved sideways between the side supports **11** and **12** by a chain **110** which is operated by a double-acting air cylinder **111**. Chain **110** is attached to rear bar **105** and to air cylinder **111** and is guided over sprockets **112**, **113**, thus forming a closed drive loop.

Within openings **103**, **104** of bottom plate **102** of printing frame **101** are contacting or pressure means, such as, squeegee heads **203**, **204** in such manner located that they may be alternately brought into and out of contact with the screens in openings **103**, **104**. Heads **203**, **204** are mounted on arms **205**, **206** which are mounted in brackets **207**, **208** which in turn are fastened to shafts **209**, **210**, respectively. Shafts **209**, **210** are rotatably held in bearings **211**, **212** attached to frames **11**, **12**. Lever arms **213**, **214** are fastened to shafts **209**, **210** respectively, which are operatively connected with fluid power cylinders **215**, **216** by means of connecting rods **217**, **218** respectively. Squeegee heads **203**, **204** thus are brought alternately in contact with the screens in openings **103**, **104** by means of the fluid power cylinders **215**, **216** respectively. Setscrews **219**, **220**, with securing nuts **221**, **222**, are arranged on levers **213**, **214** for limiting the movement of same so that the proper amount of pressure of heads **203**, **204** on the screens in openings **103**, **104** may be adjusted.

Below printing frame **101** and in proper relationship to openings **103**, **104** there in is a workpiece-holding device bearing the general numeral **300**. There is a support frame structure having two arms **301**, **302**, which is pivotally mounted (not visible in the drawings) and which can be swung upwardly and downwardly. Two shafts **303**, **304** are arranged for joining the upper parts of the arms **301**, **302** and for supporting a bracket plate **305** which can be glidingly moved sideways on shafts **303**, **304** by a fluid power motor (not shown in the drawings). Mounted on the opposite ends of bracket plate **305** are supports **306**, **307**. On support **306** is mounted a fluid power cylinder **308**, having a rotatable head **309** on its

shaft **310**. Supports **306**, **307**, cylinder **308** and head **309** form a chucking or locking device for the cylindrical or tubular articles to be printed. On the other support **307** is a rotatable end holder **311**. Between the head of power cylinder **308** and rotatable end holder **311** a cylindrical or tubular article, such as, for example, a bottle **312**, can be clamped so that this article may rotate about its own longitudinal axis. End holder **311** is fixed to a splined shaft **320**, which in turn has a gear **321** (of the same diameter as the bottle) fitted to splined shaft **320**. Gear **321** is then meshed with gear rack **322** which is pivotally mounted on frame **101** and moves with it, driving the bottle at the same circumferential speed as screen printing frame **101**, thus providing registration of the color printing. Side supports **313**, **314**, **315**, **316** (partly visible in the drawing) are adjustably located on cross braces **317**, **318**. Rollers **319** are mounted on the upper ends of side supports **313**, **314**, **315**, **316** for supporting the bottle **312** and for setting it in the correct position with respect to the chucking device composed of the fluid power cylinder **308** and the rotatable head **309**. Another fluid power cylinder **323** is provided on shaft **304** for moving the workpiece **312** with its clamping device sideways so that workpiece **312** may engage successively printing openings **103**, **104**.

The printing machine operates as follows. Screens **103'** and **106'** preferably made of nylon, silk or other suitable material, and bearing the indicia or other matter to the printed on bottle **312**, are positioned in openings **103**, **104** of printing frame **101**, and are inked with appropriately colored heated printing inks in suitable manner. Workpiece-holding device **300** is lowered by suitable mechanical means (not shown), and the cylindrical or tubular article, such as bottle **312**, is clamped between the rotatable heads **309** and **311** by fluid power cylinder **308**. Printing frame **101** is moved by chain **110** actuated by hydraulic cylinder **111** into the left position (as shown in FIGS. 2 and 3), arms **301**, **302** are swung upwardly by suitable mechanical means (not shown) so that bottle **312** is positioned under the screen in opening **103**. Squeegee head **203** is lowered by fluid power cylinder **215** so that is presses the inked screen firmly against the surface of bottle **312**. The printing process then is performed by moving printing frame **101** to the right side (FIGS. 2 and 3) by chain **110** whereby the inked screen **103'** is run over bottle **312** under the pressure of squeegee head **203**. Bottle **312** is, at the same time, rotated in precise register with printing frame **101** by rack **322** and gear **323**. At the end of the stroke of printing frame **101**, squeegee head **203** is lifted off the screen by hydraulic cylinder **215**, workpiece-holding device **300** is lowered and bracket plate **305** with the clamped bottle **312** thereon is shifted on shafts **303**, **304** so that bottle **312** precisely is registered in place beneath the screen **104'** of opening **104**. During this operation, the heated ink has sufficient time to dry and harden. Arms **301**, **302** are now lifted again, squeegee head **204** is lowered by its fluid power cylinder **216** and frame **101** is moved back to the starting position on the left side (FIGS. 2 and 3), thus performing the second printing operation. Thereafter, squeegee head **204** is lifted, arms **301**, **302** of workpiece-holding device **300** are lowered, bracket plate **305** returned, the chucking device (**306**, **307**, **308**, **309**) operated by fluid power motor **308** is released and the printed bottle **312** is withdrawn. With reloading of the chucking device, a new operating cycle can be started.

It is obvious that a perfect color printing register on bottle **312** thus can be obtained because of the accurate, mechanically determined positioning of the interrelated elements for achieving the desired result.

By providing more than two printing screens in corresponding openings in frame **101**, and by modifying the shifting stroke of the aforementioned chucking device, more than two colors may be printed on the bottle or other cylindrical or tubular article in predetermined registration.

While the invention has been described and illustrated with respect to a certain preferred example which gives satisfactory results, it will be understood by those skilled in the art after understanding the principle of the invention, that various other changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

I claim:

1. A machine for printing indicia on an article having a body portion of substantially cylindrical or tubular shape, said article having a longitudinal axis, comprising: screen printing means having at least two adjacently arranged printing screens, first and second, respectively, means for applying ink to each one of said screens, means disposed below said screens for locking said article in position along said axis and for rotatably holding said article against said screens, respectively, means for reciprocatingly shifting said screens in unison in a direction transverse to said axis, power driven means for shifting said means for locking said article and said article in the direction of said axis from a first position below said first screen to a second position below said second screen.

2. A machine for printing indicia on an article having a body portion of substantially cylindrical or tubular shape, said body having a longitudinal axis, comprising spaced supports, a screen printing frame having at least two printing screen sections, first and second, respectively, means for releasably locking said article in a horizontal position along said axis below said frame, means for moving said frame between said supports in a direction transverse to said axis, squeegee means disposed over said screen sections, means for moving said squeegee means into and out of enagagement with said screen sections, means for rotating said locking means, means for raising and lowering said locking means whereby said article when engaged by said locking means may be brought alternately towards and away from said screen sections, respectively, and means for shifting said locking means and said article axially in a direction substantially transverse to the movement of said frame for positioning said body portion of said article below said screen sections in successive order for the printing operation.

3. A machine according to claim **2**, and said locking means having roller means for supporting said article, said roller means having adjustable arms for accommodating similar articles having various diameters.

4. A machine according to claim **2**, and said means for rotating said locking means comprising gear means connected to said locking means, and a rack pivotally mounted on said frame, said rack being in engagement with said gear on said locking means.

5. A machine according to claim **2**, and said means for rotating said locking means comprising a gear connected to said locking means, said gear being substantially of the same diameter as said body portion of said article, and a rock pivotally mounted on said frame, said rack being in engagement with said gear on said locking means.

References Cited by the Examiner

UNITED STATES PATENTS

2,132,818	10/1938	Cone	101——115
2,153,435	4/1939	Schneider et al.	101—115
2,866,403	12/1958	Zimmermann et al.	101—38 X
3,109,365	11/1963	Karlyn	101—124
3,190,463	6/1965	Cohan	101—38 X

ROBERT E. PULFREY, *Primary Examiner.*

WILLIAM F. McCARTHY, *Assistant Examiner.*