United States Patent

Olsen

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[45] **May 2, 1972**

[54] SCREEN PRINTING MACHINE FOR ROUND AND FLAT ARTICLES

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[21] Appl. No.: **90,000**

Related U.S. Application Data

[63] Substitute for Ser. No. 700,856, Jan. 26, 1968, abandoned.

[52] **U.S. Cl.** .....**101/38 R**, 101/123, 101/124, 101/126

[51] **Int. Cl.**.....**B41f 17/18**, B41f 17/24, B41f 17/28

[58] **Field of Search**.....101/124, 123, 126, 38, 35

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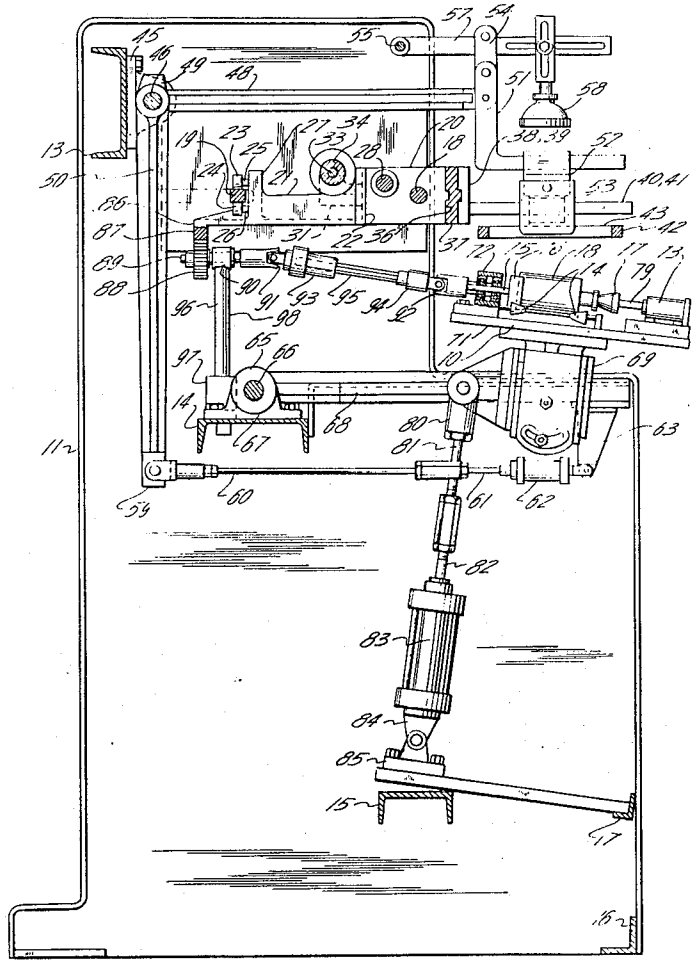
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[57] **ABSTRACT**

A screen printing machine for decorating bottles or like articles of various shapes which has interchangeable parts for component mechanisms such as screen, squeegee and article holder. It facilitates the decorating of articles of substantially round section by the use of a reciprocatingly moving screen and a stationary squeegee and the decorating of articles with at least one flat surface by the use of a stationary screen and a reciprocatingly moving squeegee.

11 Claims, 7 Drawing Figures



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7 Sheets-Sheet 1

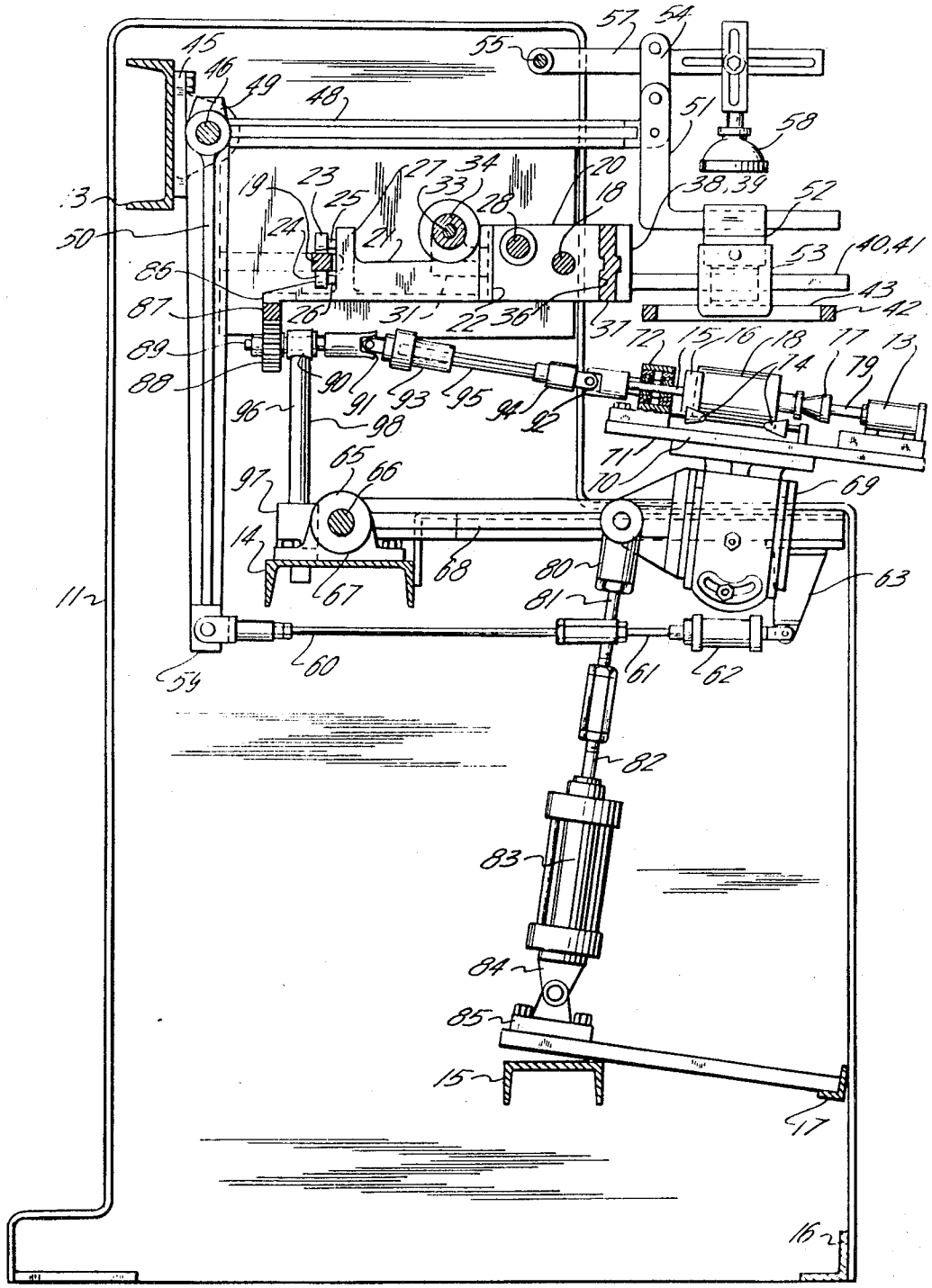


FIG. 1

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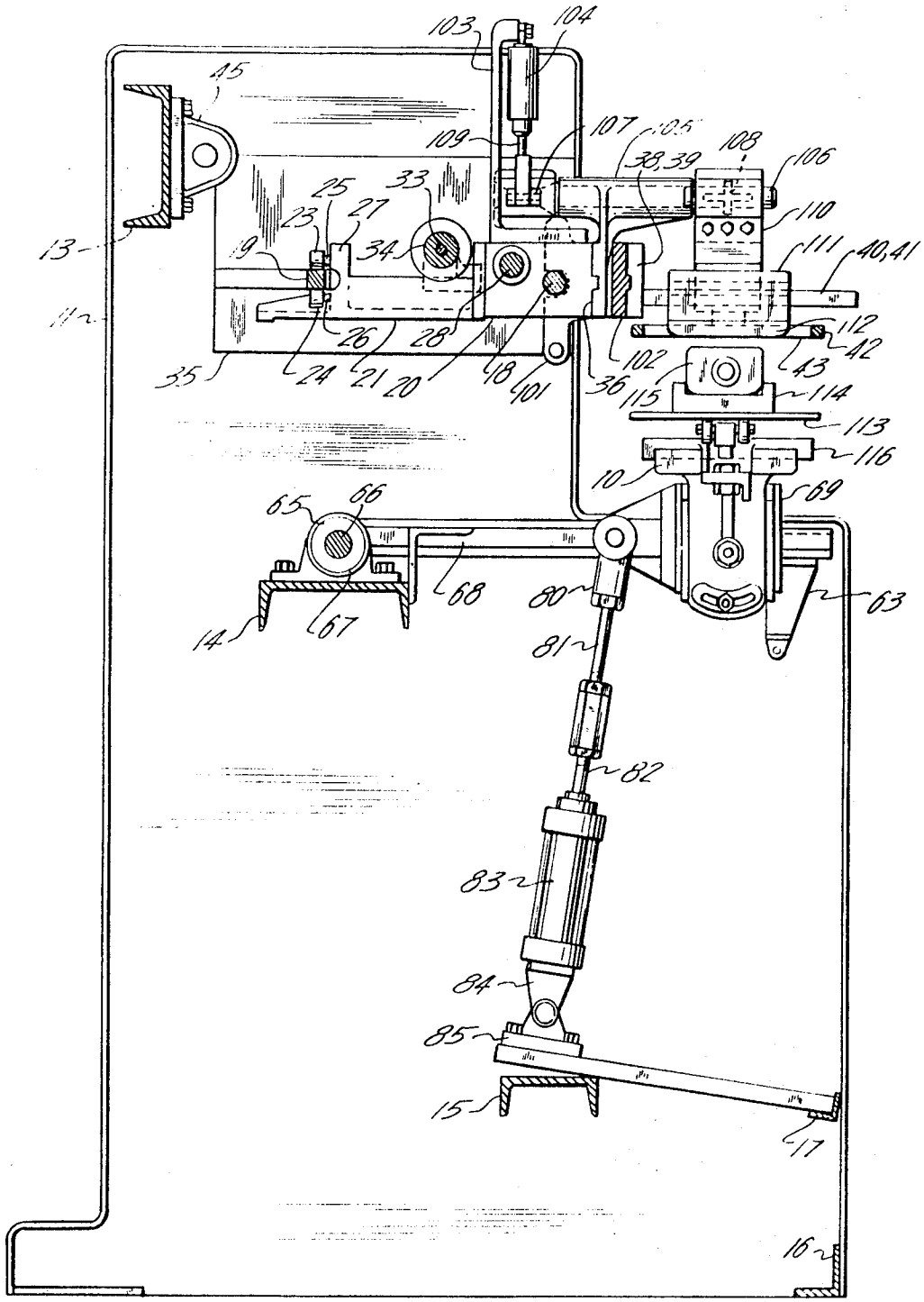


FIG. 2

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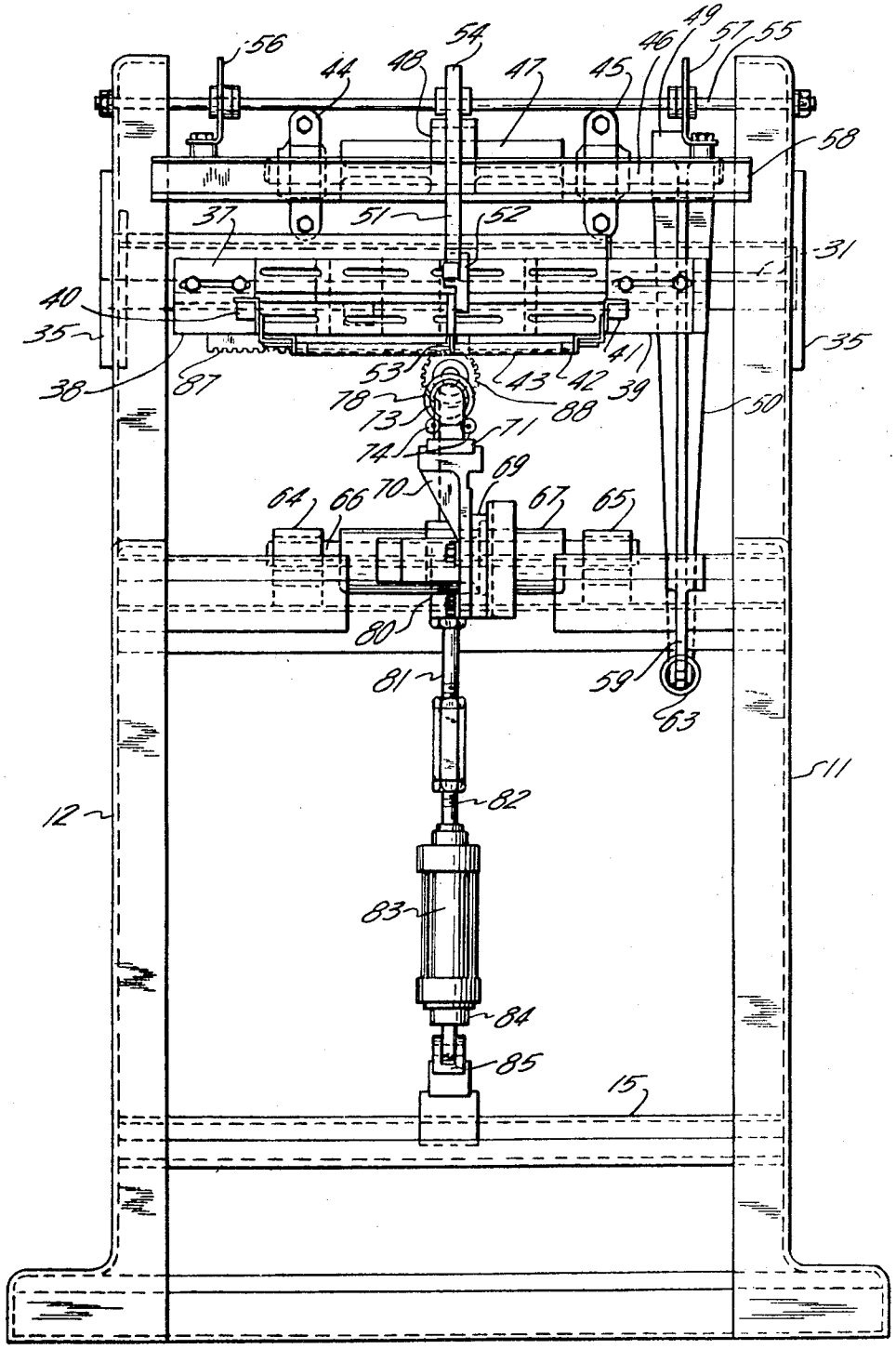


FIG. 3

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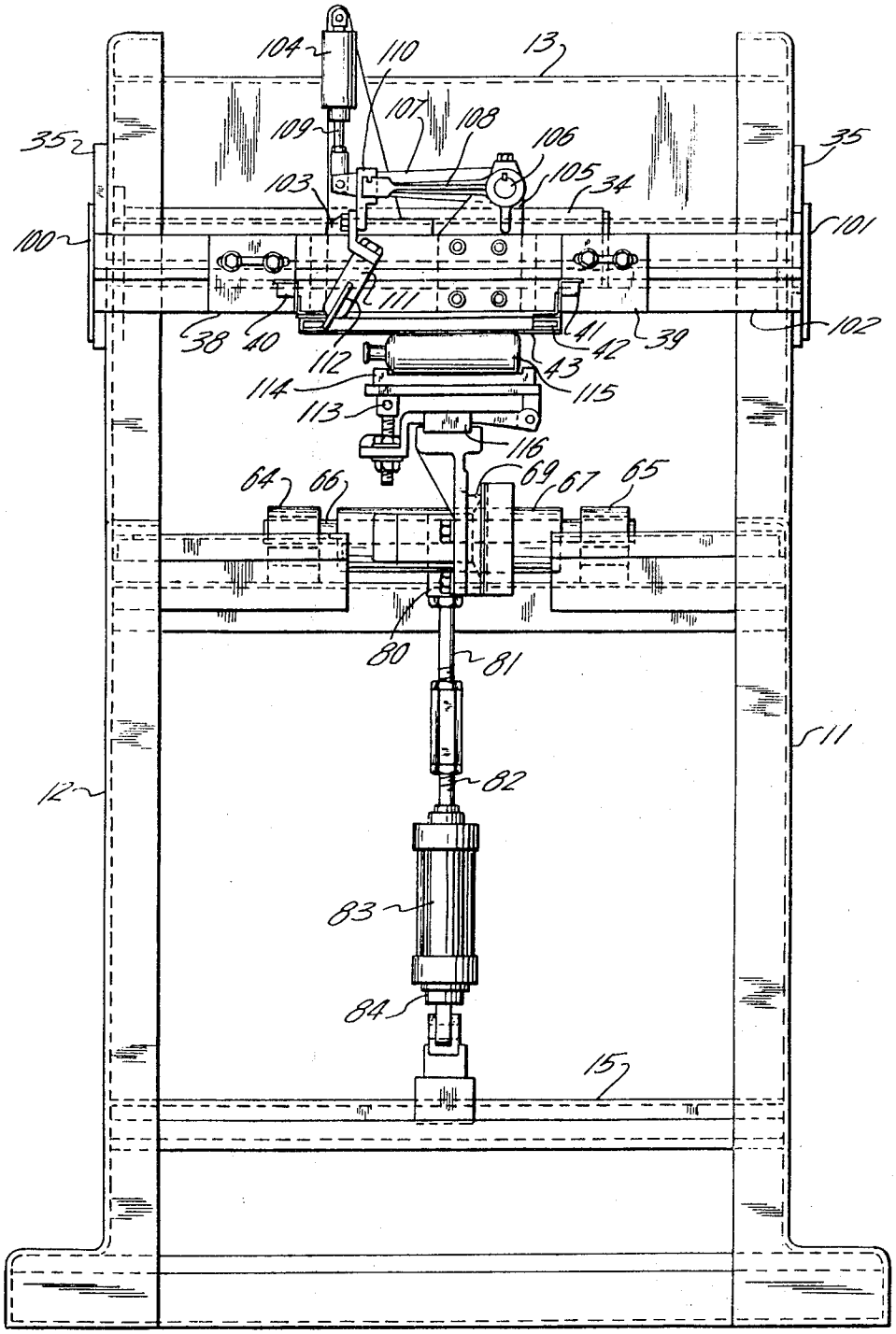


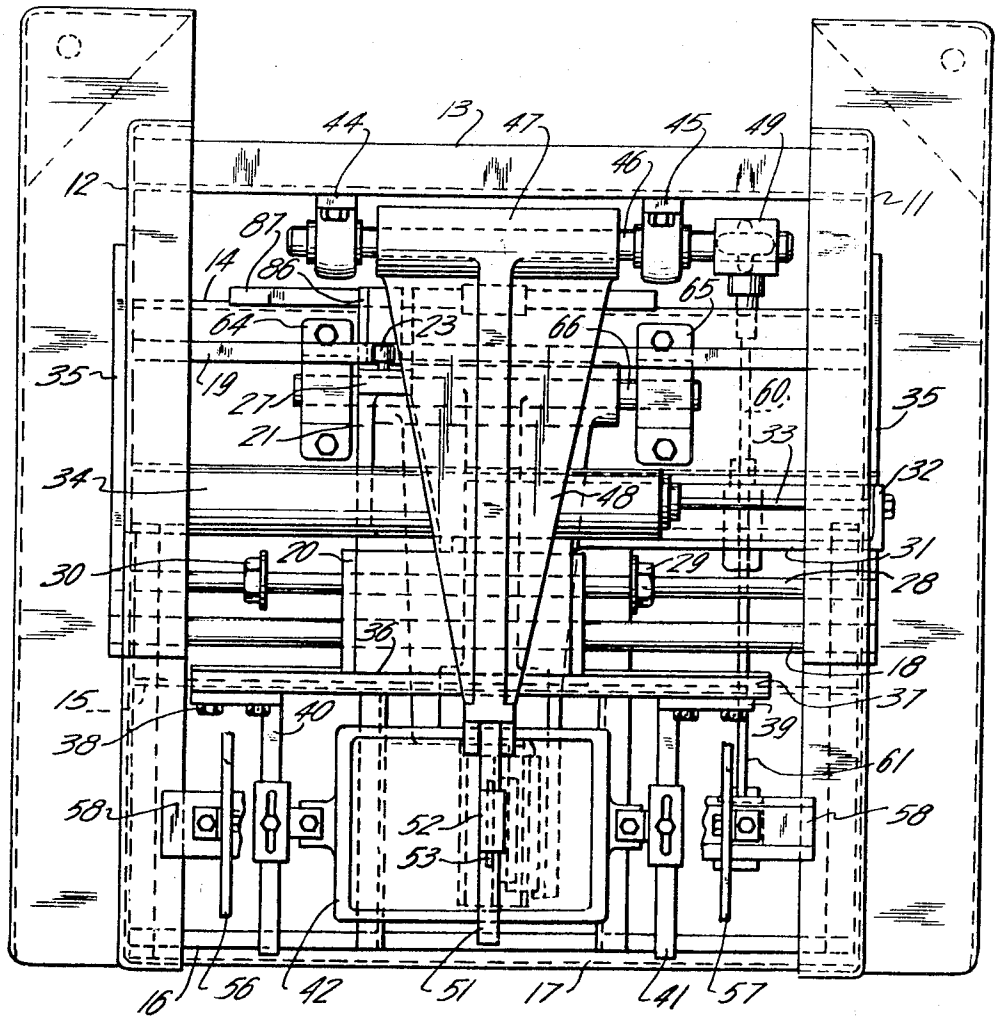
FIG. 4

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FIG. 5



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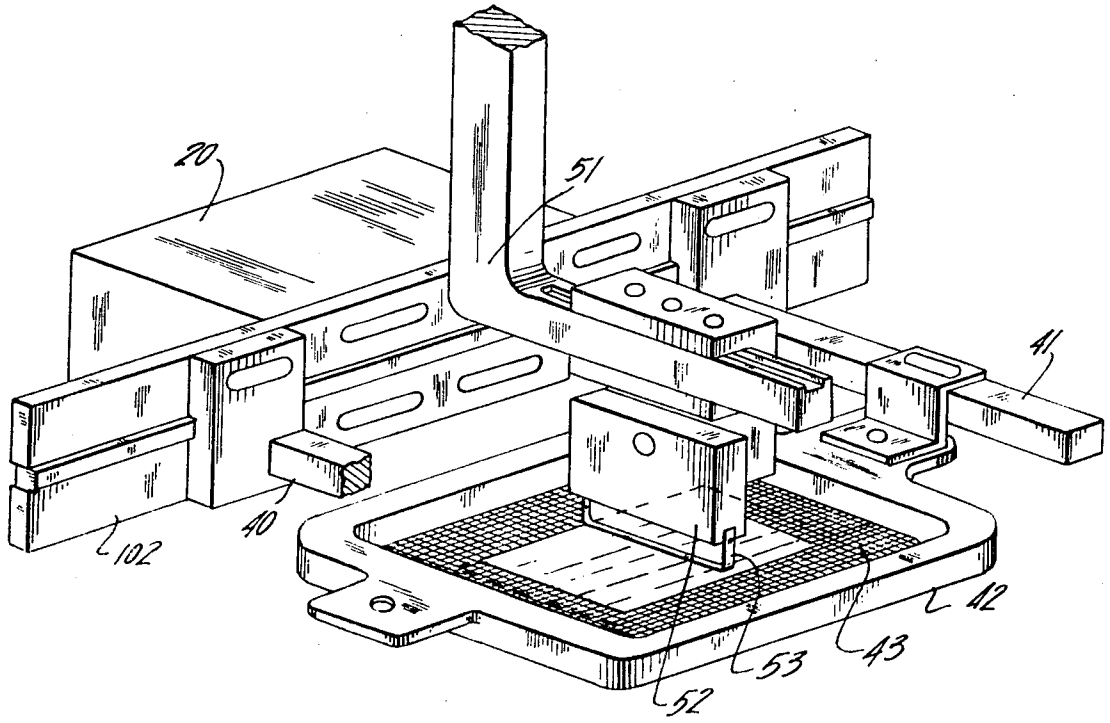
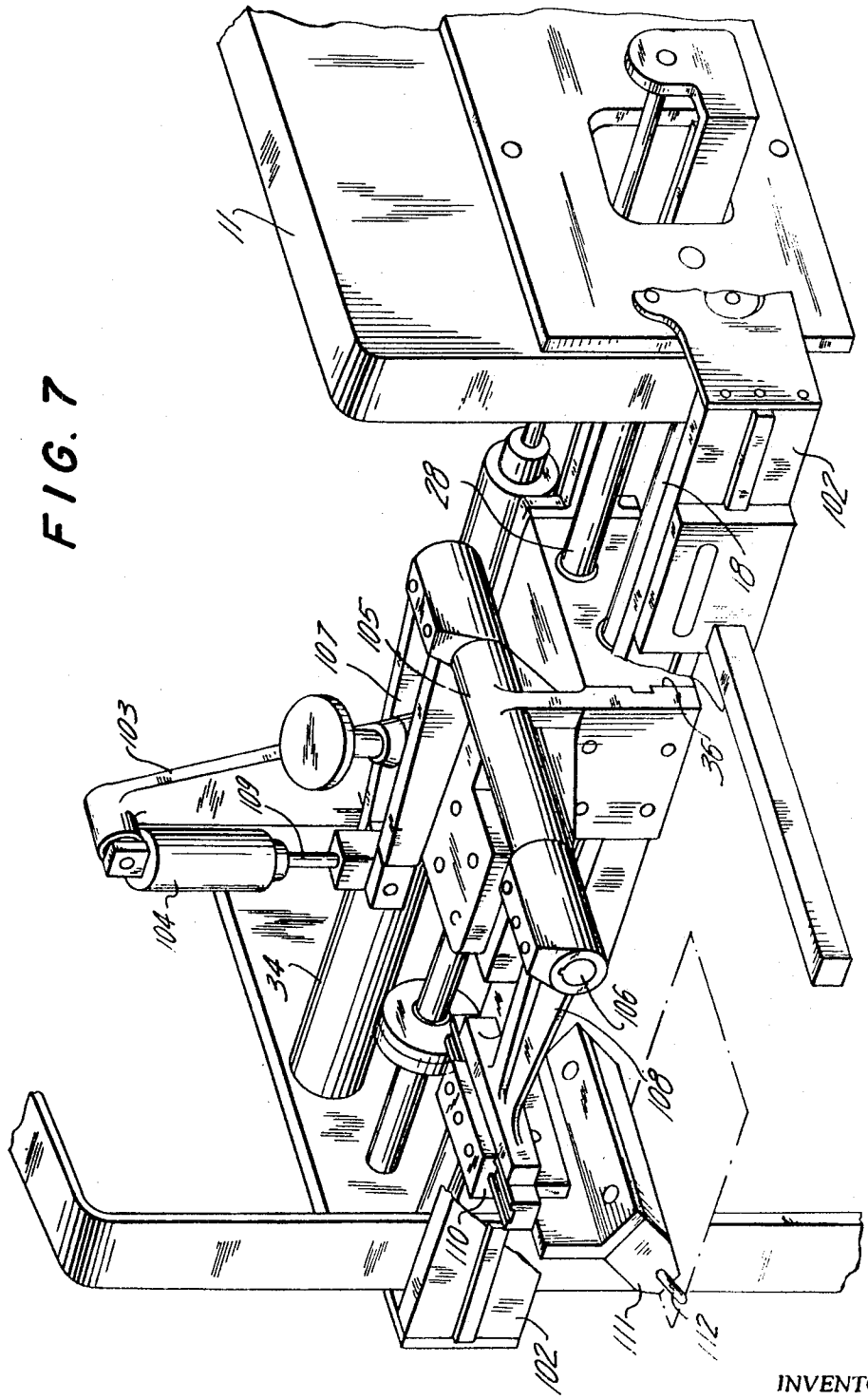


FIG. 6

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FIG. 7



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SCREEN PRINTING MACHINE FOR ROUND AND FLAT ARTICLES

This patent is a substitute for U.S. Pat. Ser. No. 700,856, filed Jan. 26, 1968 and now abandoned.

BACKGROUND OF THE INVENTION

The invention relates generally to printing machines, more particularly to screen printing machines for decorating articles of various shapes, such as bottles or the like, and to interchangeable mechanisms in the machines for accommodating articles of substantially round section and of articles which have at least one flat surface.

Screen printing machines for applying indicia on substantially round articles, either cylindrical or conical, are known in the art, also machines for printing indicia by the same printing process on a flat surface of an article which does not have a round section. However, heretofore each type of articles required a special machine which chould only be used for printing on the surface of the article with the particular shape, and the one special machine could not be used for the other type and shape. The problem of having a more universal and versatile machine has been solved by this invention.

SUMMARY

The invention consist in such novel features, construction arrangements, combination 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. The basic advantage of the invention is to provide one construction of a screen printing machine with interchangeable mechanisms for accommodating two different types of articles to be decorated. Further 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 the object of this invention to provide contrivances for printing indicia and the like decorations on the outer surface of articles of cylindrical, conical or rectangular shape, such as bottles or the like.

Another object of the invention is to provide a printing machine for the screen printing process for applying indicia on substantially three-dimensional articles.

A further object of the invention is to provide interchangeable mechanisms for a screen printing machine for printing indicia or the like on either round or flat surfaces of articles such as bottles or the like.

Furthermore it is an object of this invention to provide interchangeable mechanisms for a screen printing machine of the type described above for either moving the screen reciprocatingly and holding the squeegee in stationary position or for holding the screen stationary and moving the squeegee reciprocatingly while in both cases the squeegee is lifted upwardly of the screen at the end of the printing stroke.

Various further and more specific purposes, features and advantages will clearly appear from the detailed description given below taken in connection with the accompanying drawing which forms part of this specification and illustrates merely by way of example one embodiment of the device of the invention.

BRIEF DESCRIPTION OF THE DRAWING

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 section of the machine showing the mechanism for printing indicia on a round bottle;

Fig. 2 is the same section of the machine showing the mechanism changed for printing indicia on the flat side of a rectangular bottle;

FIG. 3 shows the front view of the machine with the mechanism for printing indicia on a round bottle, as shown in FIG. 1;

FIG. 4 shows the front view of the machine with the mechanism for printing indicia on the flat side of a rectangular bottle, corresponding to FIG. 2;

FIG. 5 shows a plan view of the machine, corresponding to FIGS. 1 and 3;

FIG. 6 shows the machine for round ware articles, such as shown in FIG. 1, 3 and 5, in isometric proportions;

FIG. 7 shows the attachment for rectangular and flat ware articles such as shown in FIG. 2 and 4, in isometric proportions.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in more detail to the drawing illustrating a preferred embodiment by which the invention may be realized, there is in FIG. 1 a vertical section of the printing machine, in FIG. 3 the front view of this machine and in FIG. 5 the top or plan view of the machine, with the mechanisms in place for printing indicia on round cylindrical or conical articles. The machine has two side walls **11**, **12** which are connected with one another by rigid cross-braces **13**, **14**, **15**, **16** and **17**. A substantially round shaft **18** is mounted horizontally extending between side walls **11** and **12** and a substantially square bar **19** is extending at the same level as shaft **18** but at a distance spaced apart therefrom, parallel to shaft **18**. Shaft **18** supports a carriage body **20** which is arranged to slide on shaft **18**. A bracket **21** is attached to the rear wall **22** of carriage body **20**, extending toward square bar **19** where there are rollers **23** and **24** on studs **25**, **26** on a vertical wall **27** of bracket **21**. Rollers **23** and **24** rollingly engage bar **19** for supporting of carriage body **20** by bracket **21**. A second shaft **28** extends between side walls **11** and **12** and goes freely through carriage body **20**, shaft **28** bears movable stops **29** and **30** for limiting the reciprocating travel of carriage body **20**. Another bracket **31** is attached to rear wall **22** of carriage body **20** extending longitudinally parallel to shafts **18** and **28**. Bracket **31** has an upright end wall **32** to which the piston rod **33** of an air cylinder **34** is connected. Air cylinder **34** is fastened with its rear end to a mounting plate **35** on wall **12** which supports also shafts **18**, **28** and bar **19**. Thus, air cylinder **34** is capable of moving carriage body **20** reciprocatingly between adjustable stops **29** and **30**. On the front wall **36** of carriage body **20** is an elongated plate **37** fastened in such manner that it may be conveniently set in any longitudinal position. Two brackets **38** and **39** each having an arm **40**, **41** (respectively) extending at right angles from plate **37** are fastened thereto. These arms **40**, **41** support a horizontal frame **42** into which the printing screen **43** is fastened.

On cross-brace **13** which is located in the upper rear area of side walls **11**, **12**, two bearings **44**, **45** are mounted which support a rotatable shaft **46**. A hub **47** of a horizontally extending arm **48** is fastened on shaft **46**, and another hub **49** of a vertically downwardly extending arm **50** is also fastened on shaft **46**. Arm **48** supports on its forward end an angular arm **51** on which the squeegee bracket **52** is adjustably fastened. A flexible squeegee blade **53** is attached to squeegee bracket **52**. Linked on the upper part **54** of angular arm **51** and substantially supported by a shaft **55** are two arms **56**, **57** which support a heating device **58**, so that heating device **58** may be swung upwardly out of the way when it is not needed. On the lower end **59** of vertical arm **50** a rod **60** is articulatedly attached which is directly connected with the piston rod **61** of an air cylinder **62** which is fastened on an angle bar **63** attached to side wall **11**.

On cross-brace **14**, two bearings **64**, **65** supporting a rotatable shaft **66** are fastened. On shaft **66** the hub **67** of a forwardly extending ware holder arm **68** is mounted. Arm **68** supports at its forward end a vertical plate **69** on which a swiveling ware holder bracket **70** is attached. Ware holder bracket **70** carries a plate **71** on which a bearing bracket **72** and a

small air cylinder 73 is fastened and also substantially cone-shaped ware support rollers 74. A short shaft 75 is rotatably held in bearing bracket 72, which has a ware receiving face plate 76. A rotatable chuck 77 for holding the ware 78 to be decorated by the printing operation is fastened to the piston rod 79 of air cylinder 73. The upper end 80 of a connecting rod 81 is articulatedly linked on ware holder arm 68. Rod 81 is adjustably fastened to the piston rod 82 of an air cylinder 83 which is swingably mounted by a pivoting link 84 and a yoke bracket 85 on cross-brace 15.

The rear end 86 of bracket body 21 carries a rack bar 87 which meshes with a gear 88. A short shaft 89 is rotatably held in a bearing support 90. Gear 88 is mounted on one end of shaft 89 and a universal joint 91 is mounted on the other end. Short shaft 75 which extends beyond bearing bracket 72, has also a universal joint 92 mounted thereon. Between the inner ends 93 and 94 of universal joints 91 and 92, respectively, is a connecting spline shaft 95 which is fixedly set in one of universal joints 91, 92 and which can axially slide in the other joint. Bearing support 90 is on the top of a vertical post 96 which is slidably held in a socket 97 but is prevented from turning by at least one key 98. Socket 97 is mounted on top of cross-brace 14. Since vertical post 96 can be adjusted vertically, it is possible to put gears 88 of various diameters on shaft 89 for meshing with rack bar 87, and universal joints 91, 92 can transmit the rotation of gear 88 correctly to shaft 75 and thus to ware articles 78.

The operation of the machine is as follows:

Screen 43 bears the insignia to be printed, in the form of a suitable stencil. Proper printing ink is poured on the screen and is kept there within frame 42. Carriage 20 which has frame 42 mounted thereon, is reciprocatingly moved by air cylinder 34. The ware article, for example a round or a conically shaped bottle 78 is rotatably supported and clamped on ware holder bracket 70 and is rotated by rack 87, gear 88, connecting shaft 95 and universal joints 91, 92 in such manner that the peripheral speed of the bottle and the linear speed of the screen is the same. When now arm 68 is lifted by air cylinder 83 so that the bottle contacts the screen from below, and when simultaneously squeegee blade 53 is lowered by air cylinder 62 to contact the screen from above, the insignia contained in the screen are correctly rolled onto the outside of the bottle without smearing. At the end of the stroke of carriage 20, properly limited by one of the stops 30, ware holder arm 68 is dropped and squeegee blade 53 is lifted so that the return stroke of carriage 20 can be performed while the finished bottle is taken off by releasing the air cylinder clamp 73 and by placing a new bottle on the ware holder plate and clamping it there.

This is a known procedure for decorating cylindrical articles; however by virtue of the adjustable vertical post which permits the use of a large diameter gear and by the universal joints in the drive of the bottle, even articles having an elliptical shape now can be decorated by printing, because it will only be necessary to select a gear 88 of such radius that the radius of the curvature of the ellipse of the shape of the article is the same. Since printing invariably is applied to one or both broad sides of the bottle, this new structure operates quite correctly.

However, it would be impossible to decorate a flat side of a ware article, such as a bottle having a rectangular section. In order to achieve this kind of production, the invention comprises a new mechanism which, when put into operation, permits printing decorative indicia on flat sides of articles with the same machine. This new mechanism is shown in FIG. 2 and FIG. 4 of the drawing. The machine is basically the same as before. Carriage 20 is reciprocatingly moved by air cylinder 34, and ware holder arm 68 with vertical plate 69 is lifted and lowered by air cylinder 83 as before. But carriage 20 no longer holds screen frame 42 and screen 43 which becomes stationary. To that extent auxiliary brackets 100 and 101 are attached to mounting plates 35 and a new elongated plate 102 is bolted to brackets 100 and 101 in such manner that carriage front wall 36 can freely pass behind elongated plate 102. Brackets 38, 39 with arms 40, 41, respectively are fastened on plate 102 and support screen frame 42, as before. Thus, screen 43 now is immobilized. On the top face of carriage 20 is now mounted a bracket 103 which supports a vertically mounted air cylinder 104. Furthermore, a bracket 105 is attached on front wall 36 of carriage 20, carrying rotatably a horizontal shaft 106 which has two arms 107 and 108 fixedly keyed thereon, extending from shaft 106 in the same direction. The free end of arm 107 is attached to the piston rod 109 of air cylinder 104, whereas the free end of arm 108 carries an adjustable squeegee bracket 110, which has a squeegee holder 111 attached thereto. A squeegee blade 112 is inserted in squeegee holder 111 at an angle.

Thus, the squeegee is now reciprocatingly moved over the immobilized screen, and it is lifted and lowered at the ends of the stroke by its own air cylinder 104.

Obviously the rotatable ware holder plate 71 now is replaced by a new ware article holder consisting substantially of a base plate 116 and an adjustable top plate on which a cradle 114 for the flat article 115 is mounted.

The previously used parts, shaft 46 with horizontal arm 48 and vertical arm 50, rod 60 and air cylinder 62 are temporarily taken out, so are rack bar 86, gear 88, and the universal joints 91, 92 with shaft 95. Another kind of heater (not shown in the drawing) may or may not replace heater 58.

The operation for decorating the flat side of a rectangular bottle is the opposite from the operation for a round article in that both the screen and the article to be decorated are not moving, except for the lifting and lowering of the article for bringing it into contact with the screen and for moving it down for being taken off and replaced with a new one. Instead, the squeegee is moved back and forth and the squeegee blade is lifted and lowered by its own air cylinder from and to the screen at the corresponding ends of the stroke, whereby the air cylinder travels all the time with the squeegee.

By using the exchangeable parts on the basic operating machine elements, the machine becomes versatile and of an almost universal use for decorating ware articles of widely differing shapes.

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.

I claim:

1. A screen printing machine for applying indicia on an article such as a bottle or the like having round, conical, elliptic or rectangular shape, said machine comprising in combination, a frame structure, a first shaft longitudinally extending in said structure, a carriage body slidingly arranged on said first shaft, said carriage having a bore parallel to said first shaft, a second shaft extending parallel to said first shaft, said second shaft passing freely through said bore in said carriage, movable stops on said second shaft for limiting the travel of said carriage, means for reciprocatingly moving said carriage, a printing screen located in front of said carriage, a squeegee above said screen, first means for lowering and lifting said squeegee into and out of contact, respectively, with the upper side of said screen, an article holder arranged below said screen, and second means for lifting and lowering said holder for bringing said article into and out of contact, respectively, with the underside of said screen, a bar having a substantially square section, said bar extending parallel to both said first and said second shaft, a rearwardly extending bracket on said carriage, at least two freely movable rollers on said bracket, said rollers engaging said bar on top and bottom, respectively, thereof, interchangeable means for moving reciprocatingly said screen and for rendering said squeegee stationary, and interchangeable alternate means for immobilizing said screen and for moving reciprocatingly said squeegee.

2. A screen printing machine according to claim 1, and further comprising a rack bar, said rack bar fixedly attached to said rearwardly extending bracket, a gear engaging said rack bar, a cross shaft carrying said gear, universal joints on said cross shaft, said cross shaft having a face plate for holding said article, and rotatable clamping means on said article holder for elastically pressing said article against said face plate.

3. A screen printing machine for applying indicia on said articles according to claim 2, and a bearing support for said cross shaft, said bearing support being vertically adjustable independent of said article holder for permitting said gear on said cross shaft to have various diameters.

4. A screen printing machine according to claim 1, further comprising a rack bar at the rear end portion of said bracket, a gear engaging said rack bar, a cross shaft carrying said gear, universal joints on said cross shaft, said cross shaft having a face plate for holding said article, and rotatable clamping means on said article holder for elastically pressing said article against said face plate.

5. A screen printing machine according to claim 4 and a bearing support for said cross shaft, said bearing support being vertically adjustable independent of said article holder, for permitting said gears on said cross shaft to have various diameters.

6. A screen printing machine according to claim 1, and said interchangeable means comprising brackets adapted to be mounted on said carriage, one of said brackets having rotatable means for lowering and lifting said squeegee respectively into and out of contact with said upper side of said screen, and a fluid operated motor on the other of said brackets for operating said rotatable means.

7. A screen printing machine according to claim 1, said first and said second shafts being substantially round in section.

8. A screen printing machine according to claim 7, said frame structure having spaced side frames, upper and lower cross bars connecting said frames, said structure having an open front, said first and said second shafts extending parallelly between said side frames.

9. A screen printing machine according to claim 8, said means for reciprocatingly moving said carriage comprising a fluid power motor.

10. A screen printing machine according to claim 1, said frame structure having spaced side frames, upper and lower cross bars connecting said frames, said structure having an open front, said first and said second shafts extending parallel to each other between said side frames.

11. A screen printing machine according to claim 1, said means for reciprocatingly moving said carriage comprising a fluid power motor.

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