

Aug. 27, 1968

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3,398,680

DUPLEX ROTARY SCREEN PRINTING MACHINE

Filed March 23, 1967

5 Sheets-Sheet 1

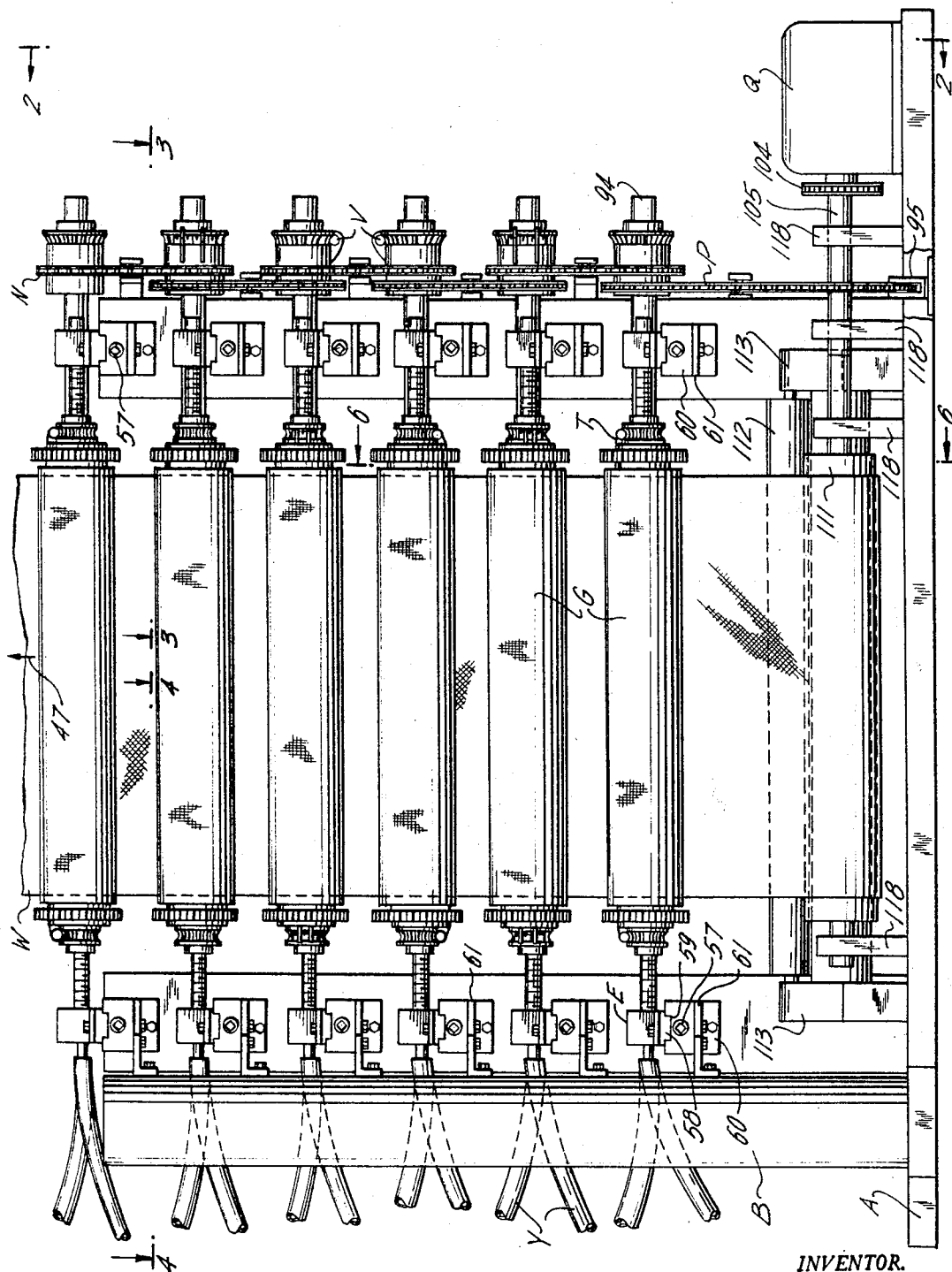


FIG. 1

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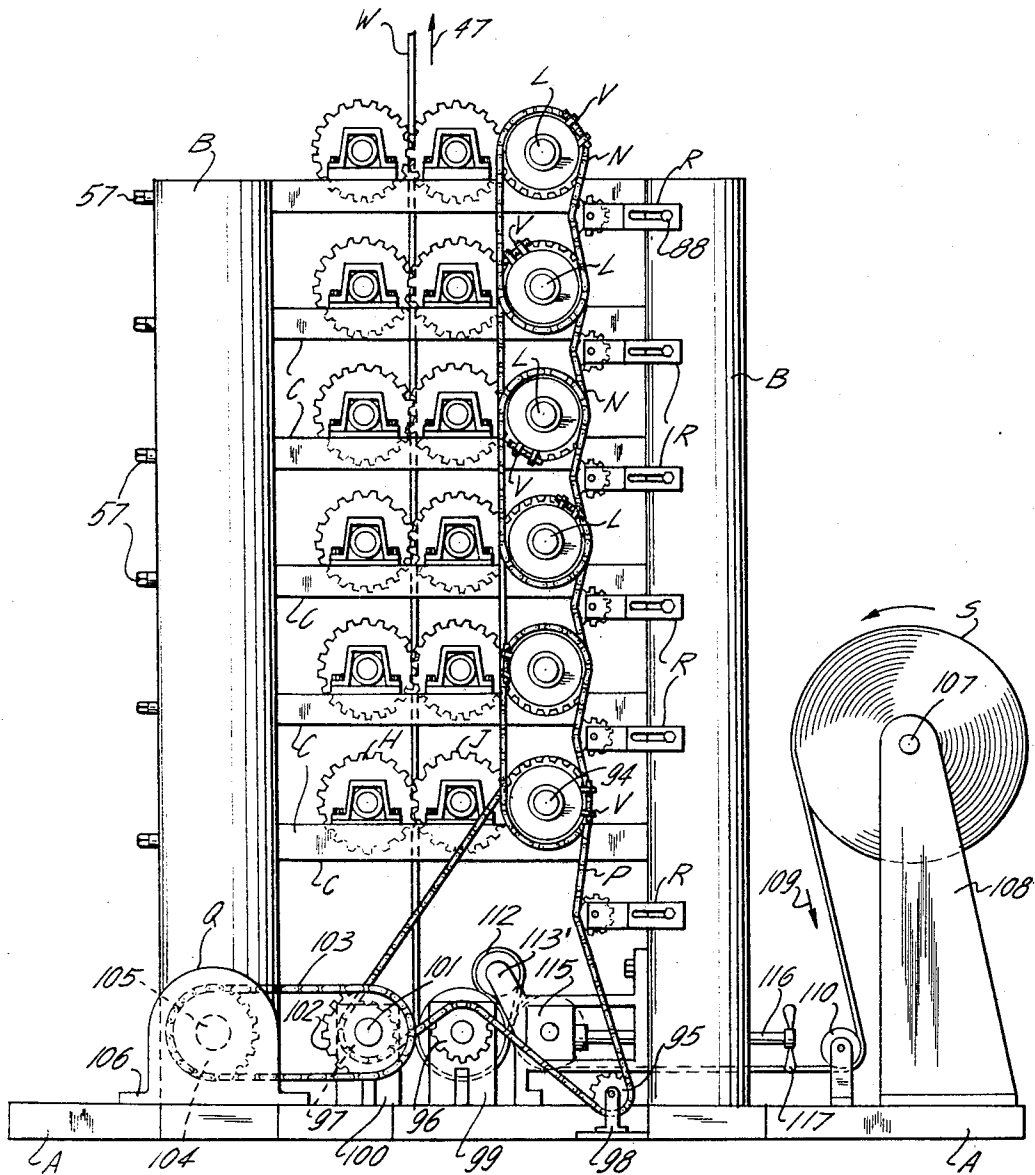
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DUPLEX ROTARY SCREEN PRINTING MACHINE

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FIG. 2



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5 Sheets-Sheet 3

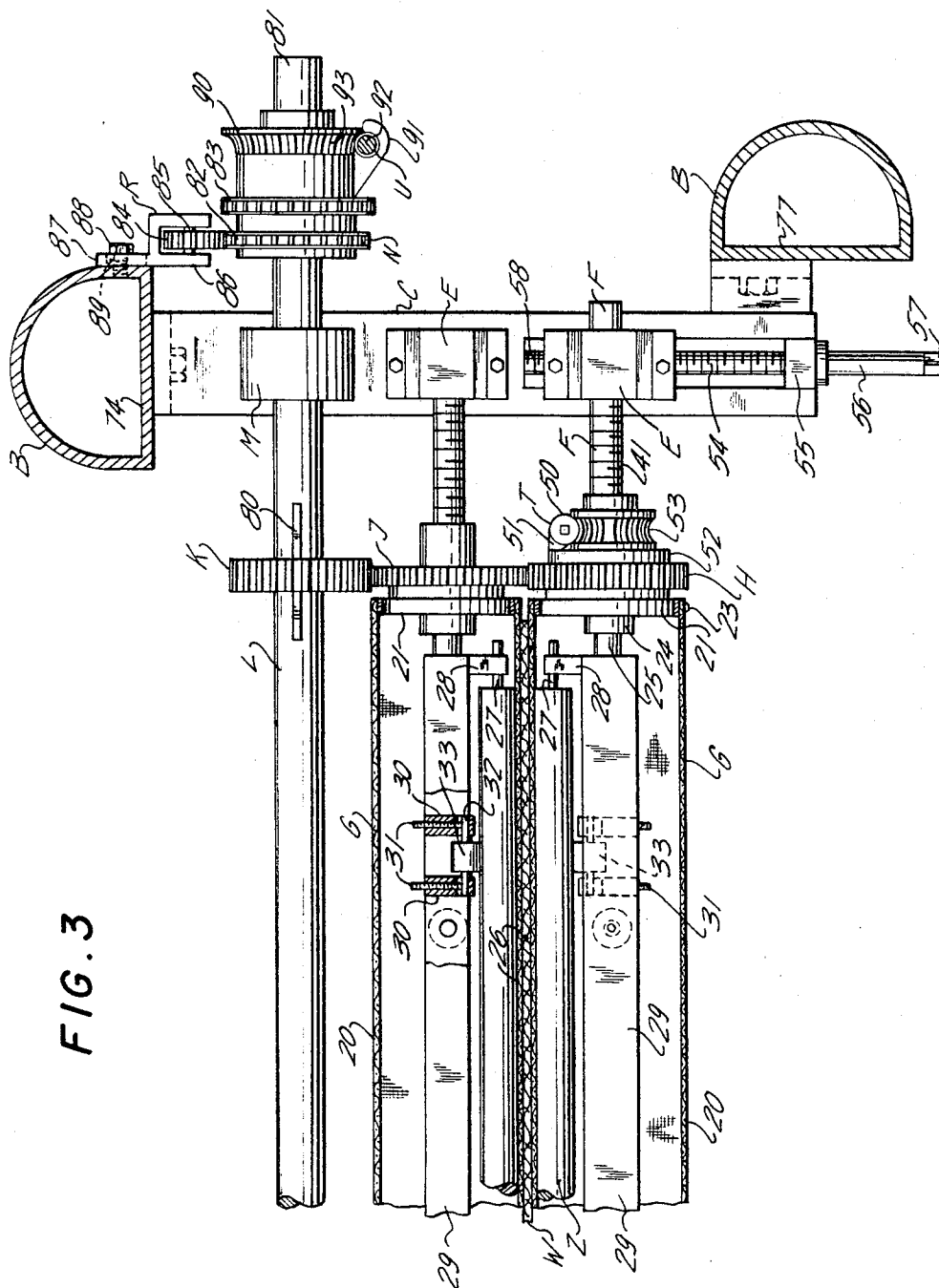


FIG. 3

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5 Sheets-Sheet 4

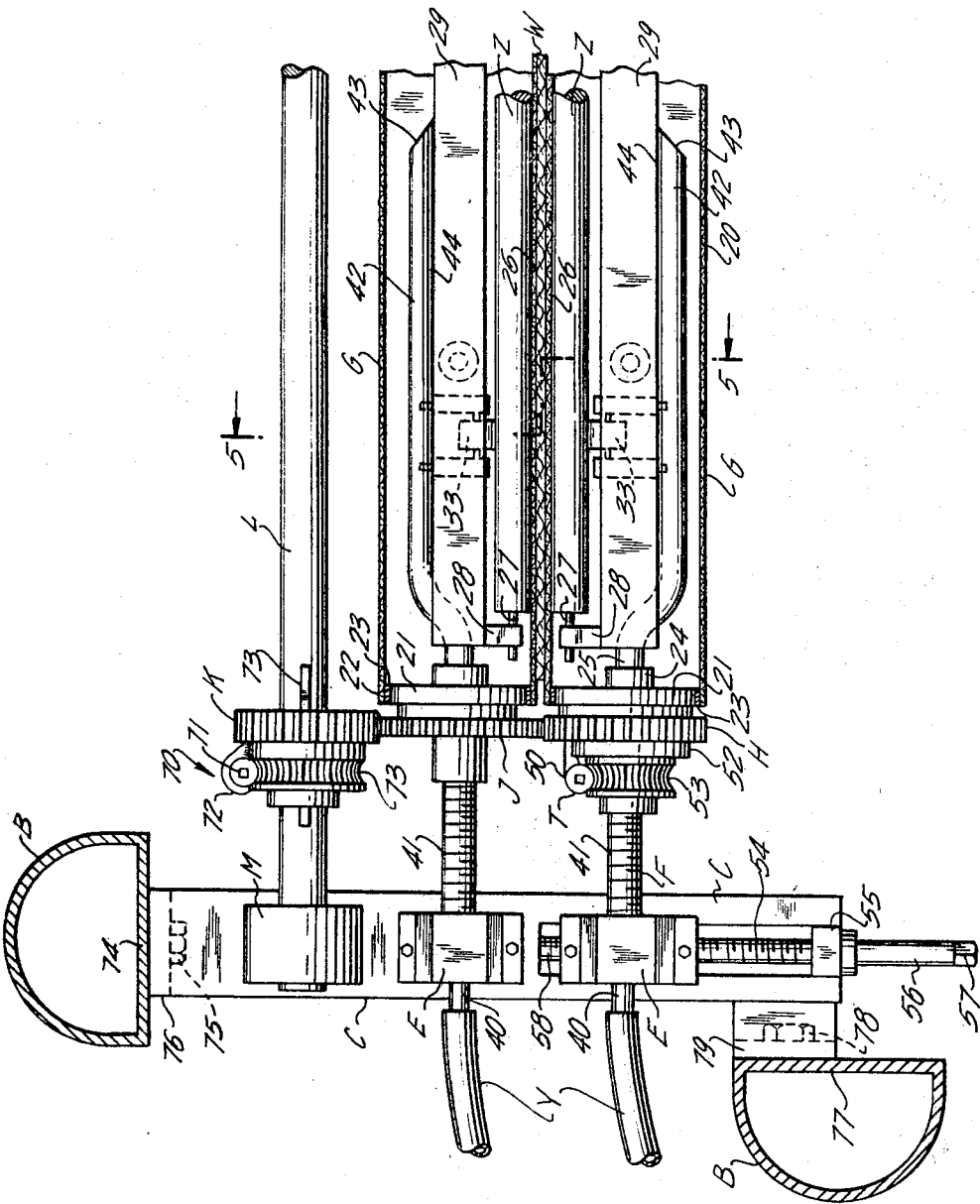


FIG. 4

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DUPLEX ROTARY SCREEN PRINTING MACHINE

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FIG. 5

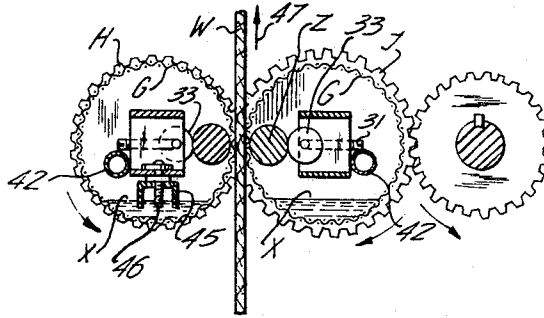


FIG. 6

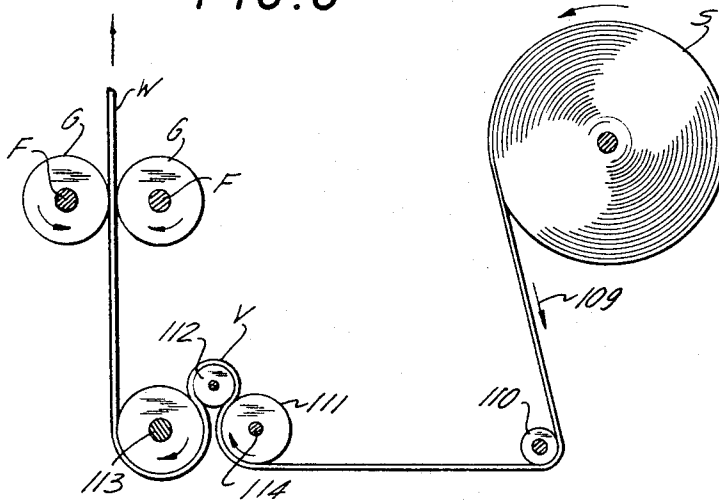


FIG. 7a

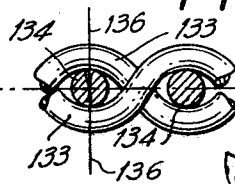


FIG. 7

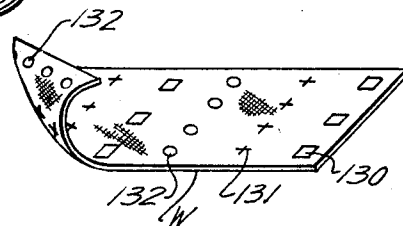
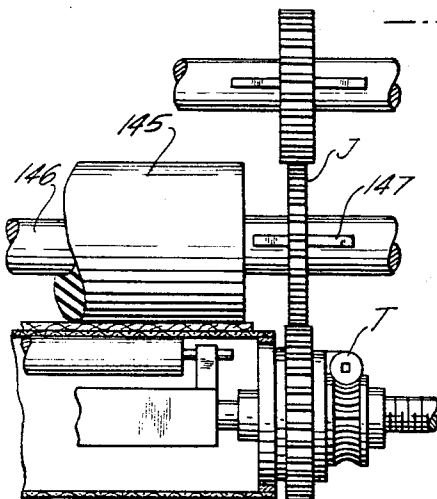


FIG. 8



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7 Claims. (Cl. 101-115)

ABSTRACT OF THE DISCLOSURE

The disclosure sets forth a duplex rotary screen printing machine designed to print heavy fabrics simultaneously on both sides thereof so that the same design will be applied to opposite sides and will penetrate to the median plane of the fabric. Drapery fabrics, towelling or other heavy fabrics so printed will have two finished imprinted sides which will be produced by one pass through the machine, with the design penetrating substantially through the entire fabric in registry from both sides.

The application is achieved by using opposing screen rollers, interiorly of which is carried printing paste or liquid, with each of the opposing rollers being adjustable so as to achieve registry, and with the sets of rollers being adjustable so as to achieve registry.

Desirably the rollers are used in sets of 3, 4, 5 or 6 for applying the different colors in the front and back of the fabric in desired designs, and the rollers each have gearing arrangements at the ends thereof with a worm and wheel adjustment so that each pair of rollers will be in proper registry. At the same time each pair of rollers may be adjusted in respect to each other pair so as to achieve coordination with suitable adjustments for both the feed-in and feed-out rollers. Adjustment at each station or each pair of rollers will not affect the complete adjustment, and the complete adjustment will not affect the adjustment of any pair of rollers.

Desirably, the color applied is held in the bottom of the circular screen and is fed in from the ends of the screen rollers.

The fabric desirably printed should have a weight of about 4 to 8 ounces per yard of 45 yard goods, desirably of a relatively heavy weave with the fabrics used being preferably terrycloth, drapery fabrics, slipcovers, duck, blanket material and the like.

The printing speed may vary from 5 meters per minute to 20 to 50 meters per minute. Although the preferred application is to heavy fabrics, it is also possible to imprint light fabrics in the same manner. The machines may conveniently print 4 to 12 colors.

BACKGROUND OF THE INVENTION

(1) Field of the invention

The present invention relates to textile printing machinery and it particularly relates to textile printing machinery in which the fabric is color printed through a rotary screen. This process is generally applied to relatively heavy, thick fabrics such as blankets, draperies, terrycloth and the like, where it is desired to obtain a registry of a design on both sides of the fabric.

(2) Description of prior art

The prior art is generally directed to printing only one side of heavy fabrics with an engraved or intaglio roller or a screen roller. Generally where it is desired to apply the design to both sides, the fabric is passed through once and then a second time, and it is rare that the design is in registry on opposite sides of the fabric.

Furthermore, it is hard to duplicate the humidity, pressure and exact condition of the printing fluid, where the

printing takes place on opposite sides at different times and as a general rule, where it does take place at different times the print on one side of the fabric will be offset or out of registry with the print on the other side and have a different quality or character depending upon varying atmospheric conditions as well as difference in the condition of the cloth and printing fluid.

BRIEF SUMMARY AND GENERAL STATEMENT OF THE INVENTION

It is among the objects of the present invention to provide a duplex screen printing machine which will assure registry of the print on both sides of the fabric and which is particularly adaptable to relatively heavy fabrics such as terrycloth, draperies, duck, canvas, blankets.

Another object is to provide a duplex double side printing operation in which the fabric may be printed on both sides simultaneously in proper registry with penetration of the color to the median plane of the fabric, or to the center of the warp and weft strands of a woven fabric or to the center of the strands of a knitted fabric, with assurance there will be no fading or overrun and with perfect registry on opposite sides of the fabric.

Another object is to provide a multiple color printing machine which will be so adjustable as to secure registry of the same print on both sides of the fabric as well as printing at various stages of the fabric.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects, it has been found most satisfactory to provide a stack of pairs of rotary screen cylinders between which the fabric to be printed will desirably pass upwardly and be simultaneously imprinted on opposite sides with the same color design as it moves up from the stack. These screen cylinders are desirably held in parallel side frames by their end axles, each of which is adjustable in respect to the other roller or screen of a pair so as to adjust and control the registry.

The rollers at the same time are all driven by means of a chain or series of chains from a motor drive at the bottom of the frame. The desirable adjustment consists of a worm and wheel associated with each shaft, and to permit the pairs of rollers to be adjusted in respect to each other a suitable worm and wheel is provided.

In the preferred form of the invention, the fabric to be imprinted on both sides is fed in from below, up through and tangentially contacting the adjacent faces of the screen cylinders. Desirably, each roller printing shaft is mounted on an edge horizontal beam which is held in a fixed trapezoidal member.

Interiorly of each screen is a contact roller extending the full length of each screen and which is provided with a fixed series of adjustments to overcome any bowing, concavity or convexity, to be certain that the screens will be directly applied tangentially to the material as it moves upwardly.

Each screen roller is provided with a paint or liquid pigment supply which maintains a fixed level therein to assure that there will be uniform printing effect on opposite sides of the fabric. At the same time insufficient printing fluid is applied so that there will be no smearing or running over of the printing fluid beyond the predetermined design.

The printing fluid distributing machines may include level controls to be certain that there will not be an excess amount of printing fluid in any screen roller.

BRIEF DESCRIPTION OF THE DRAWINGS

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

FIG. 1 is a side elevational view of the printing machine with a pile of 6 pairs of superimposed printing screens supported by the vertical side frames;

FIG. 2 is an end elevational view of the printing machine of FIG. 1, showing the mounting of the ends of the printing rollers;

FIG. 3 is a fragmentary, transverse, horizontal sectional view taken upon the line 3—3 of FIG. 1, looking downwardly, and upon an enlarged scale as compared to FIG. 1;

FIG. 4 is a transverse, fragmentary, horizontal sectional view taken upon the line 4—4 of FIG. 1, looking downwardly and upon an enlarged scale as compared to FIG. 1;

FIG. 5 is a transverse fragmentary vertical sectional view taken approximately along the line 5—5 of FIG. 4;

FIG. 6 is a diagrammatic side elevational view indicating the manner of feeding the fabric and the manner in which tension is controlled thereon;

FIG. 7 is a fragmentary perspective view indicating the register and coordination of the design on opposite sides of the fabric;

FIG. 7a is a diagrammatic cross-section upon an enlarged scale of the heavy fabric which is being imprinted by the printing screens;

FIG. 8 is a fragmentary horizontal perspective view similar to FIG. 3 showing an alternative arrangement in which the printing is effected from only one side by modification of the apparatus of FIGS. 1 to 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 to 4, there is shown a base stand A having the upright columns B which are hollow and desirably of D-shape or semi-cylindrical shape in section. These columns support the cross members C which carry bearings E for the shafts F of the screen rollers G.

The screen rollers G at each end are provided with the drive gears H and J, H being the drive gear on the outside cylinder G, and J being the drive gear on the inside cylinder G. These gears J and H, which drive the screen cylinders G, are in turn driven by the gears K on the shafts L.

The transverse shafts L have bearings M on the transverse members C. These shafts L are in turn driven from the sprocket chains N which encircle the shafts L in pairs.

The base sprocket drive P is driven from the motor Q. The various chain drives or chain connections N and P are provided with the adjustments R to assume proper tensioning.

The fabric roller S will feed the material which is to pass upwardly between the screen printers G. Each pair of rollers G may be adjusted in respect to one another for registry by means of the adjustment T (see FIGS. 3 and 4). The pairs of rollers G may be adjusted in respect to each other by means of the adjustment U (see FIG. 3).

The fabric as shown in FIG. 6 has its tension controlled by the adjustment V. The fabric W, which is produced as shown in FIG. 7 has exact registry on both front and back sides.

The printing liquid X, shown in FIG. 5, is fed independently into each roller G by the conduits Y. The pressure

rollers Z will hold the screening in contact against the cloth material so that a proper printing is achieved.

Referring specifically to FIGS. 3 and 4, the screen roller G is formed of a cylinder of screening 20 which is mounted at its ends and held in circular position by means of the end discs 21 which are either soldered or otherwise connected to the end edges 22 of the brass rings 23. These end circular or cylindrical plates 21 will have the nipples 24 which carry the shaft sections 25.

The cylinders will be spaced slightly apart to receive the material W to be imprinted and interiorly of each screen cylinder will be the pressure rollers Z, which press the tangential portions 26 of the screen cylinder 20 against the fabric W. These rollers Z are mounted at their end portions by means of the shaft 27 in the ears 28, which in turn are mounted upon the frame structures 29 positioned interiorly of each screen 20.

The pressure rollers Z have a tendency to bow over the length of the screen cylinders G, particularly where the length of the screen cylinders is in the upper range of 24 to 96" wide fabrics. The frame structure 29 has interior mounting members 30 which have adjustment screws 31 (see FIG. 3) acting upon the shafts 32 of the pressure rollers 33. The pressure rollers 33 are positioned at intervals along the length of the rollers Z, and they may be adjusted to press upon the opposite side of the pressure roller Z so that they will maintain their correct alignment and will neither bow nor take up any concavity or convexity which would prevent proper contact of the adjacent tangential portions 26 of the screen rollers G with the fabric W.

As indicated in FIGS. 3 and 4, the machine has a drive as indicated in FIG. 3 and a paint or liquid printing fluid supply which is indicated in FIG. 4. The liquid supply conduits Y may lead from suitable liquid supply drums not shown and they are connected to the tubes 40 which pass through the shaft portions 41 (see FIG. 4) and connect to the inlet nozzle portions 42 with the oblique ends 43 which may be mounted on the faces 44 of the structure 29.

The oblique outlet faces should preferably be in the middle 1/3 of the length of the screen cylinder G and desirably be about 35% to 50% of the way in from the end discs or plates 21. The feed through the tubes Y may be regulated by means of an electrical contact system shown in FIG. 5. The electrical contact system, which may control a valve upon the tubes Y, is provided with the cups 45 (see FIG. 5) having the central contact elements 46.

When the level of the fluid is as indicated in FIG. 5 there will be established a circuit from the exterior cup element 45 to the central element 46, the supply of printing liquid will be cut off, thus determining the amount of printing liquid held within the screen cylinder G. Desirably, the printing paint or fluid will be applied through the openings in the screen cylinders G at the point of tangency with the fabric W as it moves upwardly in the direction 47 as indicated in FIG. 5.

The drive for the screen cylinders G is best shown in FIG. 4. Each cylinder will have the drive gears J and H at each end inside of the bearings E on the cross members C. The position of the gears H in respect to their shafts F may be regulated by means of the adjustments T. The adjustments T consist of spiral gears or worms 50 which are mounted at 51 on the end structure 52 of the gears H.

The worms 50 will mesh with the gear 53 and will turn the outer cylinder G in respect to the inner cylinder G so as to adjust the registry without affecting the position or changing the position of the central cylinder G. This will take place when the fabric W is not in position.

The connection between the shaft section 41 and the cylinder G as shown in FIG. 4 is through the adjustment T and by changing this adjustment the position of the outer cylinder G is changed.

At the same time the spacing between the pairs of screen cylinders G may be regulated by means of the threaded adjustment 54 (see FIGS. 3 and 4). Each hor-

horizontal beam C carries a threaded adjustment 54 which is threaded into the end member 55 and rotated by means of the outwardly projecting shaft 56, which has a wrench insert 57.

The threaded shaft 54 extends through the bearing structure E as shown at 58, so that the outer bearing E may be adjusted in respect to the inner bearing E as indicated best in FIGS. 3 and 4. As shown in FIG. 1, the lower part of the outer bearing E has a dovetail lower projection 58 which fits in a recess 59 in the support member 60.

The cross member C will have a flange 61 which carries the base 60 (see FIG. 1).

As indicated in FIG. 4, each of the shafts L may also be adjusted in respect to the meshing drive gears H and J by means of the adjustment 70. The adjustment 70 has a worm 71 connected to the structure 72 which meshes with the gear 73. By turning this adjustment, the position of both screen cylinders G may be changed in respect to the shaft L to which the chain drives are applied.

The shaft L has the slide key 73 which enables movement of the gear K laterally if required. The bearing M for the shaft L in the set frame C does not have any adjustment. The positioning of the columns B as shown in FIG. 4 gives most adequate support to the frame. The flat side 74 on one of the columns B will be bolted at 75 to a flange 76 taking up any lateral thrust opposite the adjustment 56 of the outer shaft 41.

The lower column B in FIG. 4 will be turned at 90° to the upper column B so that the flat side 77 is presented across the axes of the cylinders G. The flat side 77 is provided with the bolt 78 and the mounting flange 79 will carry the cross structure C at the adjustable end to take up the long thrust of the shafts L and F.

At the drive end as shown in FIG. 3 the gear K also has a key adjustment 80 on the shaft L. The hollow columns B will be similarly positioned as at the other end when the flat side 74 parallel to the axes of the cylinders and the flat side 77 transverse to the axes of the cylinders G.

The right ends 81 of the shafts L carry the sprocket gears 82 and 83. The chain on the inside sprocket gear 82 meshes with an adjustment sprocket 84 mounted by the shaft 85 in the clevis 86. The clevis 86 has a slotted extension 87 which may be bolted in an adjusted position by means of the bolt 88 on the face 89 of the hollow column B.

This arrangement enables the gear 84 to take up any play or looseness in the sprocket chains N which extend around the adjacent ends 81 of the shafts L.

The sprocket elements 82 and 83 are mounted upon the cylinder member 90, which carries the structure 91 attached to the worm 92, forming part of the adjustment U. The worm 92 meshes with the gear 93 and enables adjustment in respect to the shaft 81 of the drive for the shaft 81 so that it may be retarded or advanced, to assure registry.

As shown in FIGS. 1 and 2, the drive is applied to the lowermost shaft 94 by means of the chain drive P which extends around the lower sprockets 95, 96 and 97. The sprocket 95 is carried on the stand 98 while the sprockets 96 and 97 are carried on the structures 99 and 100 on the base A.

The shaft 101 of the sprocket 97 is also the shaft of the larger sprocket wheel 102, which is driven by the chain 103 meshing with the sprocket 104. The sprocket 104 is driven by the shaft 105 of the motor Q, the base 106 of which is also mounted upon the base structure A.

It will be noted that each pair of shafts L are connected by chain drives N and each is adjustable by means of the adjustments U in respect to one another.

The fabric feed takes place from the roll supply S as shown in FIGS. 2 and 6, which roll S is held on the shaft 107, which shaft is held upon the uprights 108 ex-

tending upwardly from the base as indicated at 109 under the roller 110 and through the rollers 111, 112 and 113. The roller 112 is mounted on the structure 113' as shown in FIG. 2 and the roller 111 on the shaft 114 may be adjusted by movement of the block 115 and the shaft 116 with the handle 117 (see FIG. 2). The fabric W will pass upwardly between the screen rollers G during the printing operation after proper tensioning is given by adjustment of the shaft 116. The motor shaft 105 will be carried by the bearing 118 mounted on the base A (see FIG. 1).

Referring to FIG. 5, the effect of the double nip or double tangential printing will be to give the fabric a printed design as indicated at 130, 131 and 132 on opposite sides of the fabric, which will match and be in registry. Both sides of the fabric will be simultaneously printed with the same fluidity of ink, under the same conditions of fabric tension and under the same climatic conditions, resulting in a registered printing on both sides of heavy fabrics such as drapery fabrics, terrycloth and the like; as shown in the detailed view of FIG. 7a, the ink may be applied sufficiently so that it will penetrate through the loop portion 133 to the center of the central strands 134, meeting at the median plane 135 of the woven fabric. The ink penetration is indicated at 136 from both sides due to the action of the screen rollers G.

With a thinner fabric it is possible to print all the way through the fabric by the modified arrangement shown in FIG. 8. In FIG. 8 the same structure is used as in FIG. 3, except that there is substituted for the inside roller G a solid roller of rubber or steel on the shaft 146 driven by the same gear J and having a key adjustment 147. With the modified arrangement of FIG. 8, although the rubber back roller 145 may be adjusted, it is not necessary to do so, since registry is obtained through the screen roller.

It is thus apparent that the present applicant has provided a duplex system of printing on both sides of the fabric simultaneously from prepared screen cylinders, each carrying all printing ink or paint which is desirably applied to both sides of the fabric at the same time.

The ink should be so adjusted as to penetrate the distance of 40 to 50% of the depth of the fabric so that the printing application at each side will meet at the median plane of the fabric without over supply, which tends to cause overrun and spread of the ink beyond the picture desired. The ink should be so well absorbed by the fabric that it will not interfere with the subsequent applications of higher pairs of rollers in the pile as indicated in FIG. 2.

The most desirable fabrics to be printed which will accommodate themselves to printing on both sides with the print design meeting centrally of the fabrics will have a weight of six ounces to 16 ounces per yard of 45 inch width goods. To express this in yards per pound, there should be between one and three yards per pound of 45 inch width. Smaller or wider widths may be adjusted proportionally.

As many changes could be made in the above duplex rotary screen printing machine, and many widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. A vertical duplex multicolor screen printing machine for printing relatively heavy textile fabrics of the nature of drapery cloth, blanket material, terrycloth and canvas with liquid printing inks in registry on both sides simultaneously with absorption toward the central zone of the fabric and moving vertically upwardly through successive printing stages, each stage consisting of tangentially con-

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tacting cylindrical screens with the fabric moving upwardly therebetween and being imprinted in a different color in each said passage upwardly therebetween, the machine comprising a plurality of superimposed parallel pairs of tangentially contacting cylindrical printing screens positioned in a vertical arrangement, one above the other, pressure rollers inside of said printing screens to press said screens together and against the fabric, a tensioning fabric feed below the lowermost pair of printing screens, a pair of intermeshing gears at the ends of each cylindrical screen of each pair of printing screens to rotate said screens of each pair, a drive gear meshing with and positioned along one side of each pair of intermeshing gears at the ends of each pair of cylindrical screens, driving chains encircling and connected to and driving each superimposed pair of drive gears, an adjustment to adjust the position and registry of each pair of printing screens associated with one of each said pair of intermeshing gears, a fabric feed below the cylindrical screens and independent liquid ink supply to each cylindrical screen.

2. The machine of claim 1, there being from 3 to 12 parallel pairs of cylindrical screens and means to adjust the tension of the driving chains between each pair of superimposed drive gears.

3. The machine of claim 1, means to feed said liquid ink from said screens to each side of said vertical fabric in sufficient quantity to assure penetration without gravity effect substantially to the median plane of the fabric and to a depth of about 50% of the thickness of the fabric.

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4. The machine of claim 1, said driving chains being positioned so as to drive the gears of each upper superimposed cylinder from the gear of the next lower cylinder and means to adjustably tension said chains.

5. The machine of claim 1, each said independent liquid supply being provided with control means and an inverted cup control arrangement positioned in the liquid ink in each cylindrical screen to control the flow of ink into said cylindrical screen.

6. The machine of claim 1, said drive gears being provided with adjustments including worm and gear arrangements.

7. The machine of claim 1, the adjustment to adjust the position and registry consisting of a worm and gear arrangement.

References Cited

UNITED STATES PATENTS

2,549,605	4/1951	Huck	101—181
2,665,634	1/1954	Schwartz et al.	101—115 XR
2,928,340	3/1960	Stein et al.	101—120
3,160,094	12/1964	Bean	101—181
3,232,224	2/1966	Kramer	101—120
3,115,433	12/1963	Eolkin et al.	118—7 XR

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