

Sept. 29, 1959

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2,906,201

CYLINDRICAL SCREEN PRINTING SYSTEM

Filed Sept. 13, 1951

2 Sheets-Sheet 1

FIG. 1.

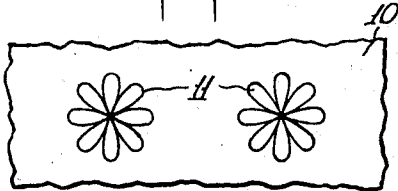


FIG. 2.

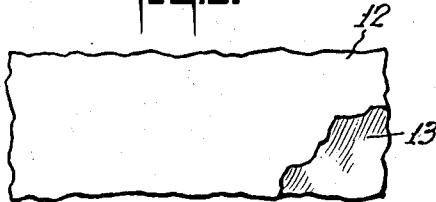


FIG. 3.

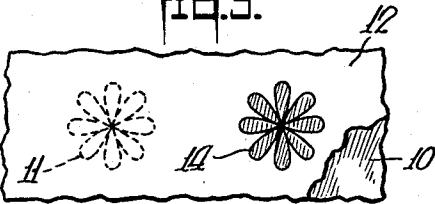


FIG. 4.

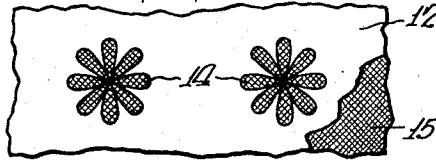


FIG. 5.

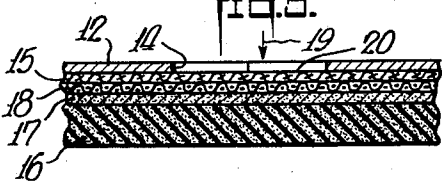


FIG. 6.

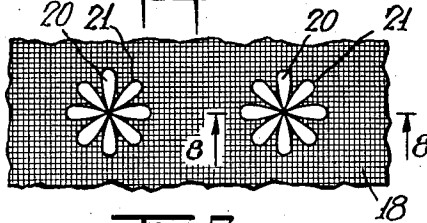


FIG. 8.

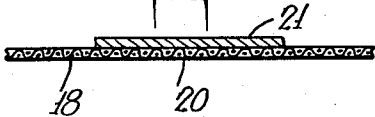


FIG. 7.

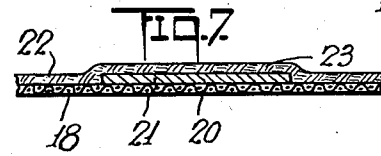
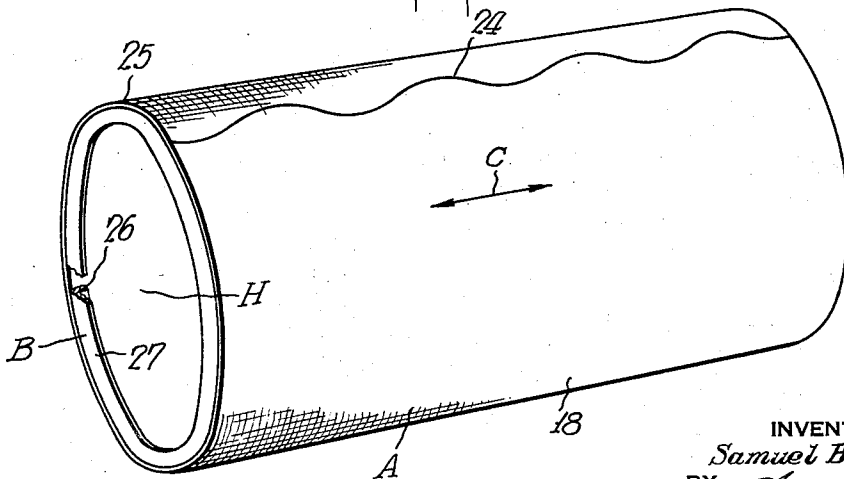


FIG. 9.



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CYLINDRICAL SCREEN PRINTING SYSTEM

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2 Sheets-Sheet 2

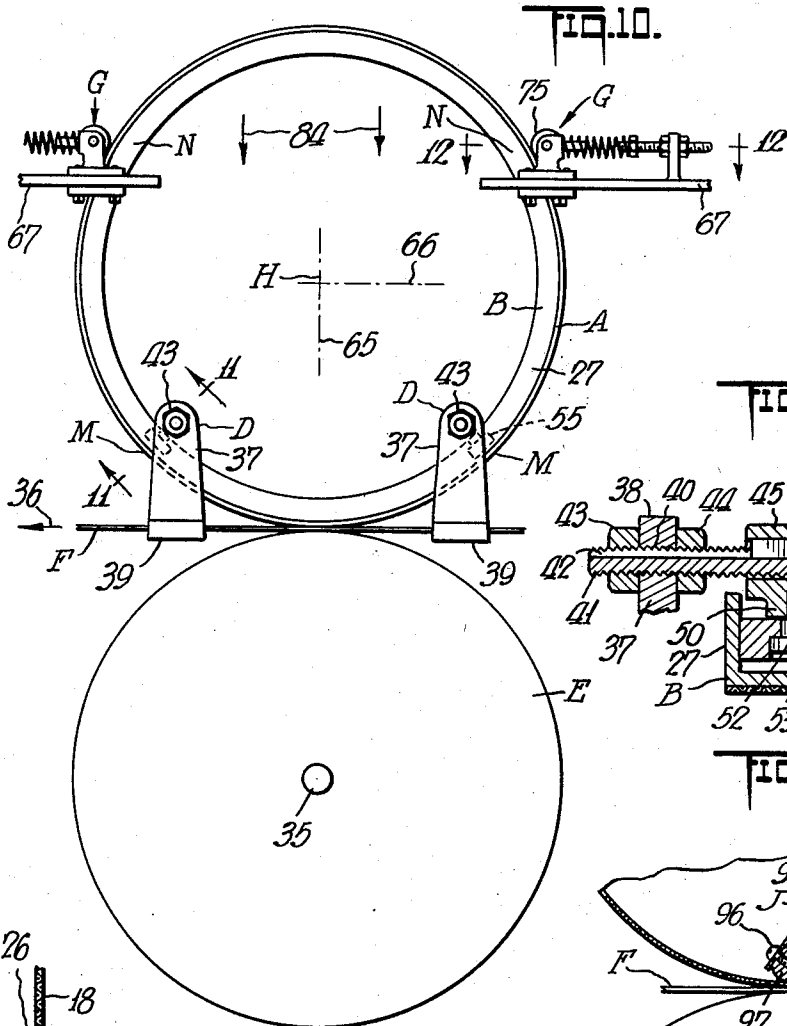


FIG. 10.

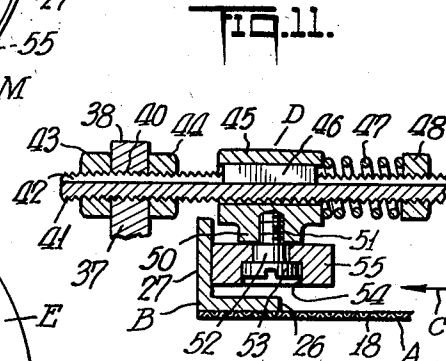


FIG. 11.

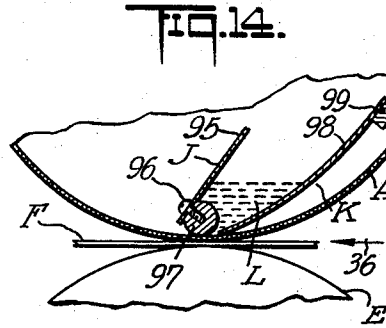


FIG. 14.

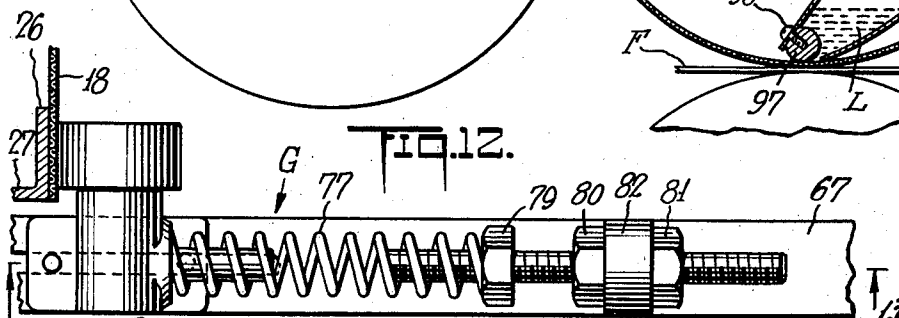


FIG. 12.

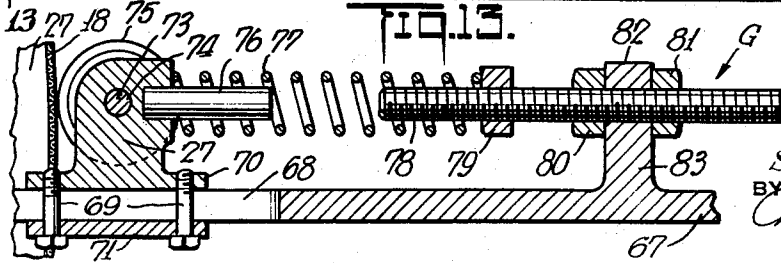


FIG. 13.

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1

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CYLINDRICAL SCREEN PRINTING SYSTEM

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Application September 13, 1951, Serial No. 246,383

9 Claims. (Cl. 101-116)

The present invention relates to a cylindrical screen printing system, and it particularly relates to a procedure and apparatus for applying paint, adhesive and other viscous or liquid materials to sheet materials such as textile fabrics, paper, plastic film, or the like.

It is among the objects of the present invention to provide a novel printing procedure, and particularly a screen printing procedure in which a relatively thick viscous paint, adhesive, or other liquid may be applied to woven or knitted textile fabrics, plastic film, paper or other sheet materials in desirable designs.

Another object is to provide a novel screen printing system to be used in connection with flock printing which will enable the desired application of adhesive material in a predetermined design to a sheet material such as a woven or knitted fabric, paper or plastic material followed by applying a flock to the imprinted sheet material.

Another object is to provide a screen printing procedure which will enable application of a paint or adhesive to sheet materials continuously with a minimum of hand labor and with relatively high speed of production and economy of machinery, labor and materials.

A further object is to provide a novel cylindrical screen arrangement in which the screen desirably carries in its open mesh portions a pre-determined design and in which assurance is had that said design will be accurately reproduced upon the sheet material without smearing or spreading in the pre-determined areas.

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 prepare the design in the following manner:

The design is first laid out on a sheet of paper. Then the design is transferred from the sheet of paper upon which it is originally made to a transparent thin film having a transparent paper backing, by a cutting procedure so that the thin plastic transparent film carried by the backing paper will be cut out at places corresponding to the original drawing of the design. This thin plastic film is then separated from the paper backing after cutting out and applying to a flat woven screen mesh, with the result that the uncut portions of the plastic film will block off the background of mesh whereas the cut-out portions will expose the portions of the mesh through which the design is to be applied to the fabric. At this stage the mesh and film applied thereto are in flat condition.

Then the woven wire mesh is laid on a flat sponge rubber pad to the surface of which has been applied a thick layer of finely divided chalk.

The resist or soap solution is then applied to the screen carrying the cut-out plastic film with the result that this

2

resist will pass through the soak itself upon and fill up the interstices of the screen where the plastic film has been cut out, with the balance of the resist or soap solution sinking into and being taken up by the absorbent chalk. Then the metal screen is lifted from the chalk and sponge rubber base and the cut-out protective film is removed and the screen is then thoroughly lacquered with a water resistant lacquer.

This lacquer should also be resistant to the paint, adhesive or other material which is to be applied to the fabric or sheet material through the screen.

This varnish or lacquer will fill up all the interstices of the screen except those which have already been filled up or covered by the resist or soap solution. The screen in this condition is then rolled into a cylinder and its meeting edges are permanently connected together while the ends of the cylinder are welded or soldered on to cylindrical rings desirably angular in cross section. This cylindrical screen is then mounted in a printing mechanism and it rolls freely upon a lower driven roller with the fabric passing between the upper screen roller and the lower driven roller.

The cylindrical screen is desirably longitudinally tensioned or extended by spring pressed roller members which act against the end rings and hold the cylinder out in the direction of its central axis. These rollers are desirably positioned adjacent the point of contact of the cylindrical screen with the fabric and with the lower driving roller.

At the same time the two pressure rollers are applied to the cylinder at the sides which are substantially above the center so as to press the screen cylinder down against the lower roller.

The viscous paint or adhesive is then placed interiorly of the cylinder and there is provided a doctor blade with a lower cold rolled steel rod forming the contact against the interior of the cylinder screen and forming one side of the paint or adhesive receptacle. The other side is formed by a curved throw knife.

It has been found that the tensioned screen roller in spite of its flexibility when interiorly and longitudinally tensioned will accurately reproduce upon the fabric the pre-determined designs without smearing, running or distortion, and that a very large number of reproductions may be obtained at a relatively high rate of production.

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 diagrammatic fragmentary view of a typical flower design as applied to a paper original.

Fig. 2 is a similar fragmentary view of a portion of a transparent paper backing carrying a facing of a thin plastic film.

Fig. 3 is a diagrammatic fragmentary view showing the double transparent sheet of Fig. 2 applied to the sheet of Fig. 1 with one of the flower designs cut out upon the transparent plastic film facing of Fig. 2.

Fig. 4 is a fragmentary plan view similar to Fig. 3 but showing the plastic film which has now been cut out with the design of Fig. 1 applied to a key screen of woven silk.

Fig. 5 is a fragmentary transverse sectional view of a sponge rubber base covered with chalk carrying a metal screen upon which has been superimposed the key screen consisting of a woven silk mesh with a cut out plastic film.

Fig. 6 shows the metal screen with the resist applied thereto.

Fig. 7 is a transverse vertical sectional view upon the line 7—7 of Fig. 6 showing the superimposed resist solution as applied to the flat metal screen.

Fig. 8 is a fragmentary transverse sectional view similar to Fig. 7 showing the lacquer applied to the screen and over the resist or soap solution.

Fig. 9 is a front perspective view showing the screen after it has been welded and soldered and formed into cylindrical shape and attached to the end rings.

Fig. 10 is a side elevational view showing the cylindrical screen in end elevation mounted in a printing machine.

Fig. 11 is a transverse oblique sectional view upon the line 11—11 of Fig. 10 upon an enlarged scale as compared to Fig. 10.

Fig. 12 is a transverse sectional view upon the line 12—12 of Fig. 10 upon an enlarged scale as compared to Fig. 10.

Fig. 13 is a vertical sectional view upon the line 13—13 of Fig. 12.

Fig. 14 is a diagrammatic vertical transverse sectional view showing the doctor blade and the throw blade holding the viscous paint or adhesive in position within the hollow cylindrical screen.

Referring to Figs. 1 to 7 the drawing is first made upon a sheet of paper 10. As indicated in Fig. 1, the design may consist of the flowers 11, or any other typical scrolling or flowers or large dimensional design.

In Fig. 2 there is shown a thin plastic film 12 which is transparent having a transparent supporting backing 13, which may be of a thin sheet of treated paper. The double sheet of Fig. 2 is then applied to the sheet of Fig. 1 to give the structure of Fig. 3.

In Fig. 3 the thin plastic film 12 which is to be cut out is on top and above the sheet of paper 10 carrying the design. The designs 11 will be visible through the transparent film 12 and the paper 13, and they may be directly cut out with a knife as is indicated for example at 14. This thin plastic film 12 which has been now cut out at 14 is then applied to a finely woven silk screen which may be woven of a cellulose acetate rayon, which acetate rayon may be subsequently subject to dissolution in an organic solvent solution. The mesh of the acetate silk screen 15 may vary from 60 to 100 mesh although coarser meshes of 40 to 60 may also be employed. The plastic film 12 is suitably anchored to the woven acetate screen after removal from the paper backing 13.

Then there is prepared a sponge rubber bed 16, as shown in Fig. 5, which is covered with a layer of chalk, 17.

Upon the layer of chalk 17 there is positioned a woven metal screen 18 which may be of Monel material or other resistant metallic material. Although the screen may widely vary in dimension and size, it has been found most satisfactory to use a 60 mesh screen, but the mesh can conveniently vary from 30 to 100 mesh.

Upon this metal screen 18, which has been laid in flat condition upon the chalk covered sponge rubber base 16—17, is positioned the key screen as shown in Fig. 4, consisting of the silk mesh 15 with the plastic facing 12, having the cut out designs 14.

Then a resist solution or concentrated soap solution is applied, as indicated by the arrow 19, which will pass through the openings 14 and cover, impregnate and coat the exposed portions of the screen at 20 to form a layer of water soluble resist material as indicated at 21 in Figs. 6 and 7. The open portion 20 of the screen will be thorough impregnated with the resist or soap solution 21 and its interstices will be completely filled therewith.

The key screen 12—15 is shown removed in Fig. 7.

Then a water insoluble lacquer, which may be of the phenol formaldehyde type or the vinyl lacquer type, may be applied to form a coating film as indicated in Fig. 8,

with the lacquer at 22 coating and filling the interstices of the screen 18 and also extending over and covering over the resist application 21.

The screen 18 is then formed into a cylinder as indicated at A and its meeting edges are connected together as indicated at 24, and its ends 25 are soldered to the cylindrical flange 26 of the end ring B.

The end ring B has the vertical flange 27 forming the end of the cylinder A. This cylinder then may be sprayed with water after the lacquer 22—23 has been hardened or baked if necessary. This spraying with water will break up and remove the resist 21 with the covering lacquer 23, which will leave an open space in the area 20.

The rest of the screen will be completely impregnated and covered by the residual water-proof phenol formaldehyde or vinyl lacquer.

If the key screen backing of cellulose acetate rayon is still in position it may also be removed by an organic solvent solution which will not attack or remove the lacquer 22.

In this condition the cylindrical screen will only permit passage of the paint or adhesive to be applied to the fabric at the open areas 20 corresponding to the cut out portions 14 which in turn correspond to the flowers 11. The chalk facing 17 on the sponge rubber backing 16 will prevent spreading, smearing or interruption of the design and will give a sharp outline to the portions of the screen where the resist 21 has been removed.

The fineness of the key screen 15 and of the metal screen 18 will control the fineness of the design, but too fine a design will prevent passage of the thick viscous paint or adhesive on the fabric, whereas too coarse a mesh 15 or 18 will give a roughened edge effect.

Referring to Fig. 10 there is shown the cylindrical screen cylinder A with the end rings B. These end rings are held apart and the cylinder A is stretched longitudinally as indicated by the double arrow C in Fig. 9 by the extender or tension roller system D. At the same time the screen cylinder A is pressed down against the lower pressure cylinder E and against the fabric F by the contact spring pressed rollers G, which are positioned above the center line or axis H of the cylinder A.

The doctor blade J and the throw knife K will keep the paint L in position to be applied through the openings 20 in the screen. The screen cylinder A will only be supported upon the fabric F and the lower cylinder E. The lower cylinder E is mounted by the shafts 35 upon the machine. The fabric F in being imprinted and passing to the flocking and drying chambers will move in the direction as indicated by the arrow 36.

The extender or tension roller system D is supported by the brackets 37 which at 39 are connected or supported upon the frame only of the machine.

The upper ends 38 of the brackets 37 are threaded as indicated at 40 and they receive a threaded rod 41.

This threaded rod is provided with a key slot 42 and with the adjustment nuts 43 and 44. Sliding loosely upon the threaded rod 41 is the collar 45 having the key 46. The key 46 extends into and slides in the keyway 42.

The collar is pressed by a coil spring ring 47 which encircles the threaded rod 41. The threaded rod 41 also carries the adjustable nut 48 which enables adjustment of the tension upon the spring 47.

The collar 45 has a projection 50 which carries the threaded stud 51. The stud has the bearing portion 52 and an enlarged head 53 to fit into a recess 54 in the roller 55. The roller 55 rests against the inside face of the flange 27 of the end ring B and pulls the screen 18, as indicated by the arrow C.

These rollers 55, as indicated in Fig. 10, may be applied at positions M which are about 45° from both the horizontal and vertical.

This position may vary from 30 to 60° between the vertical line 65 and the horizontal line 66, but 45° has been found to be preferred.

5

In the pressure roller systems G, as shown in small scale in Fig. 10 and in large scale in Figs. 12 and 13, a horizontal bracket 67 is mounted upon the machine. This bracket 67 is slotted, as indicated at 38, to receive the bolts 69.

The bolts 69 extend through the base plate 70 and the bottom plate 71 of the bearing structure 72.

The bearing structure 72 carries the openings 73 which receive the shaft 74 of the rollers 75.

The rollers 75 press against the screen 18 at its place of attachment or soldering to the longitudinal flange 26 of the end rings B. The bolts 69 assure alignment of the pressure rollers 75 in pressing against the end rings B.

The pressure rollers 75, as shown in Fig. 10, are ap-shaft 76 which is encircled by the spiral spring 77. This spring extends to the right, as shown in Figs. 12 and 13, to encircle the threaded rod 78. The threaded rod 78 receives a nut 79 for adjusting the tension upon the spring 77. The rod 78 also receives the two nuts 80 and 81 which adjust the position of the threaded rod in respect to the upright frame member 82. The frame member 82 is mounted at 83 upon the bracket 67.

The pressure rollers 75, as shown in Fig. 10, are applied at positions N about 35 to 45° above the horizontal and they tend to press the cylinder A downwardly as indicated by the arrows 84.

Interiorly within the screen cylinder A are the doctor blade J and the throw knife K. The doctor blade has a stiff plate of steel 95 extending longitudinally the full length thereof which is screwed at 96 to the steel rod 97. The steel rod 97 contacts the interior base of the cylinder A.

The throw knife K consists of a curved blade of steel 98 extending the full length of the cylinder A with a mounting block 99. The mounting block 99 enables the support of the throw knife K beyond the end of the cylinder A.

The above system permits a reliable high speed method of screen printing viscous paints and liquids in designs of much greater width and length than otherwise possible with ordinary flock printing procedures in which a perforated cylinder is utilized limiting the design to a plurality of holes arranged in patterns.

The entire system, as shown in Figs. 1 to 14, is very flexible and permits a high speed of production.

As many changes could be made in the above cylindrical screen printing system, 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 cylindrical screen printing machine having a screen roller consisting of a tensioned woven wire mesh cylinder with the major part thereof covered to leave an open design portion with end rings attached thereto, and a doctor blade and throw blade positioned in the interior thereof to maintain a pool of paint to be printed upon a fabric passing under said roller, said end rings being of right angle cross section with one flange at each end extending circularly around the end of the cylinder and lying in a plane transverse to the axis of the cylinder and tensioning rollers riding on and against the inside face of said flange on each side of and adjacent to said pool and on each end of said cylinder to stretch the lower side of said cylinder longitudinally in the direction of its axis.

2. A cylindrical screen printing machine having a screen roller consisting of a tensioned woven wire mesh cylinder with the major part thereof covered to leave an open design portion with end rings attached thereto having transverse end flanges, and a doctor blade and throw blade positioned in the interior thereof to maintain a pool of paint to be printed upon a fabric passing under said roller,

6

said screen roller having means to ride on the inside face of the transverse end flanges of said end rings adjacent the bottom of said cylinder and on each side and each end of said cylinder to maintain it in longitudinal tension.

3. A cylindrical screen printing machine having a screen roller consisting of a tensioned woven wire mesh cylinder with the major part thereof covered to leave an open design portion with end rings attached thereto having transverse end flanges, and a doctor blade and throw blade positioned in the interior thereof to maintain a pool of paint to be printed upon a fabric passing under said roller, said screen roller being provided with end extension means to ride on the inside face of the transverse end flanges of said end rings adjacent the bottom of said cylinder and on each side and each end of said cylinder to stretch said cylinder out longitudinally.

4. A cylindrical screen printing machine having a screen roller consisting of a tensioned woven wire mesh cylinder with the major part thereof covered to leave an open design portion with end rings attached thereto having transverse end flanges and a doctor blade and throw blade positioned in the interior thereof to maintain a pool of paint to be printed upon a fabric passing under said roller, said end rings being of angular cross-section and being provided with tension rollers to ride on the inside face of the transverse end flanges of said end rings adjacent the bottom of said cylinder and on each side and each end of said cylinder to cause extension of the ends of said cylinder outwardly.

5. A cylindrical screen printing machine having a screen roller consisting of a tensioned woven wire mesh cylinder with the major part thereof covered to leave an open design portion with end rings attached thereto and a doctor blade and throw blade positioned in the interior thereof to maintain a pool of paint to be printed upon a fabric passing under said roller, said doctor blade consisting of a hard metal rod pressing against the interior of the cylinder formed by the metal screening, said end rings being of right angle cross section with one flange at each end extending circularly around the end of the cylinder and lying in a plane transverse to the axis of the cylinder and tensioning rollers riding on and against the inside face of said flange on each side of and adjacent to said pool and on each end of said cylinder to stretch the lower side of said cylinder longitudinally in the direction of its axis.

6. A cylindrical screen printing machine having a screen roller consisting of a tensioned woven wire mesh cylinder with the major part thereof covered to leave an open design portion with end rings attached thereto, and a doctor blade and throw blade positioned in the interior thereof to maintain a pool of paint to be printed upon a fabric passing under said roller, and a lower roller contacting the bottom of said screen roller and driving said screen roller and means to press said screen roller downwardly upon said lower roller, said end rings being of right angle cross section with one flange at each end extending circularly around the end of the cylinder and lying in a plane transverse to the axis of the cylinder and tensioning rollers riding on and against the inside face of said flange on each side of and adjacent to said pool and on each end of said cylinder to stretch the lower side of said cylinder longitudinally in the direction of its axis.

7. In a textile flock printing machine, an open hollow woven wire mesh screen cylinder carrying the printing fluid and having areas not to be printed blocked off and having the mesh open and unobstructed in the areas where printing is to take place to permit passage of printing fluid through said mesh, said cylinder having end circular rings of L-shaped cross section with the inward flanges of the L directed perpendicularly inwardly toward the axis of the cylinder and the other second flanges being permanently mounted on the inside of terminal peripheral portions of the cylinders, pairs of small rollers riding on

7

the outside of the other second flanges at each end of the cylinder and at opposite sides of the cylinder above the axis of the cylinder, the axes of said rollers being parallel to the axis of the cylinder and second pairs of small rollers riding on the insides of the first-mentioned inward flanges at opposite sides of the cylinder and at both ends of the cylinder and below the axis of the cylinder.

8. The machine of claim 7, each of said rollers having an adjustable coil spring and a screw adjustment therefor.

9. The machine of claim 7, said upper rollers being provided with means to bias said rollers downwardly and thereby bias said cylinder downwardly and said lower rollers being provided with means to tension said cylinder longitudinally in the direction of its axis.

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8

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