March 10, 1942. H. J. FOSTER 2,276,181

FABRIC PRINTING PROCEDURE

Filed June 30, 1939 2 Sheets-Sheet 1

Fig. 1.

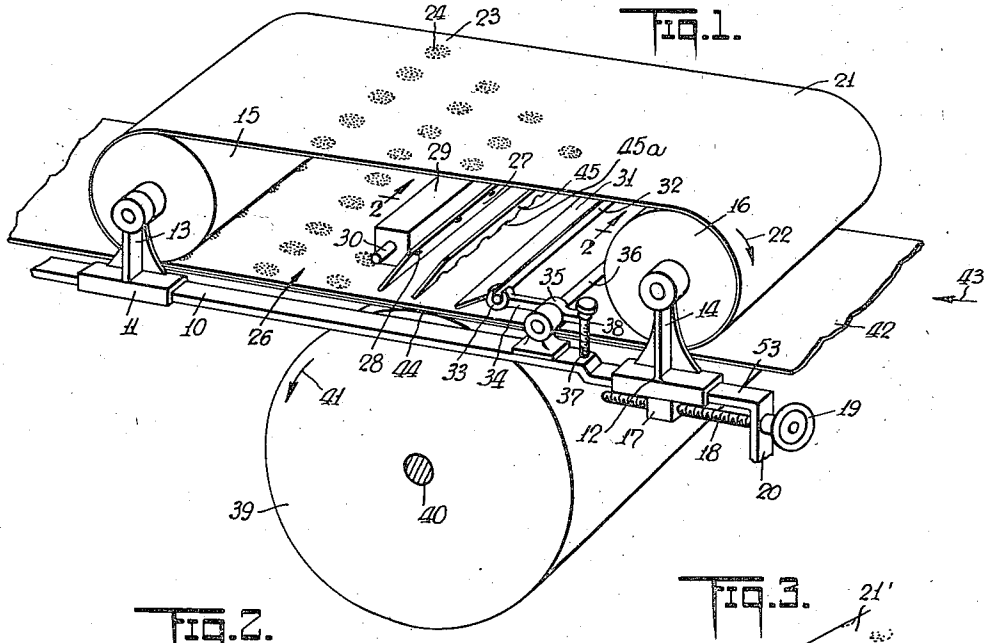


Fig. 2.

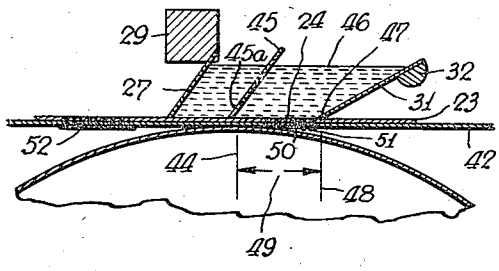


Fig. 3.

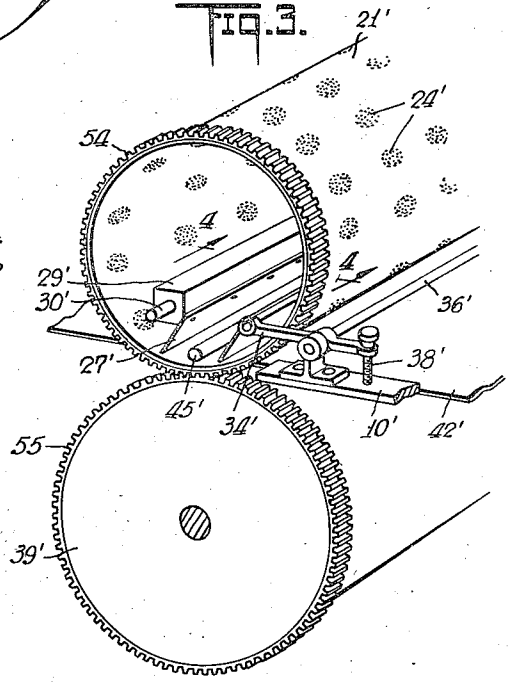
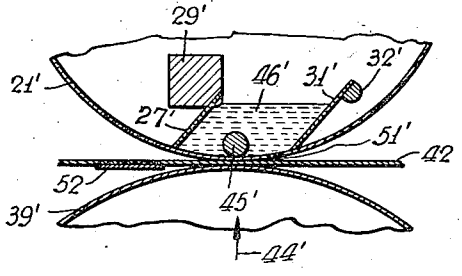


Fig. 4.



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March 10, 1942. H. J. FOSTER 2,276,181

FABRIC PRINTING PROCEDURE

Filed June 30, 1939 2 Sheets-Sheet 2

Fig. 5.

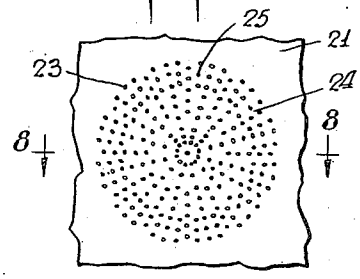


Fig. 6.

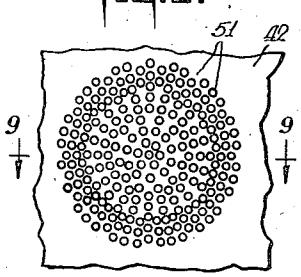


Fig. 7.

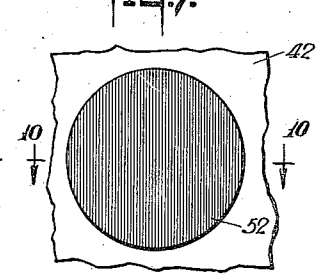


Fig. 8.

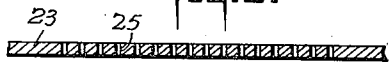


Fig. 10.

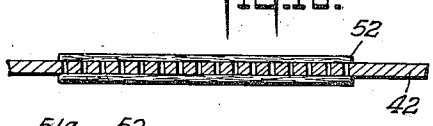


Fig. 10a.



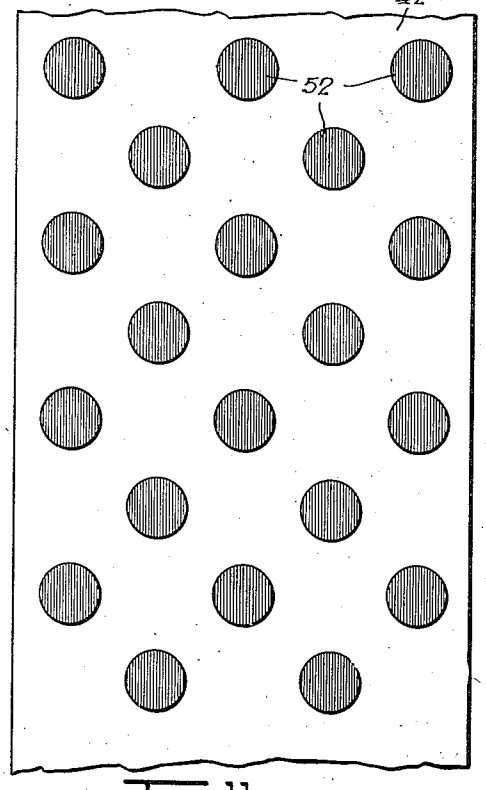


Fig. 11.

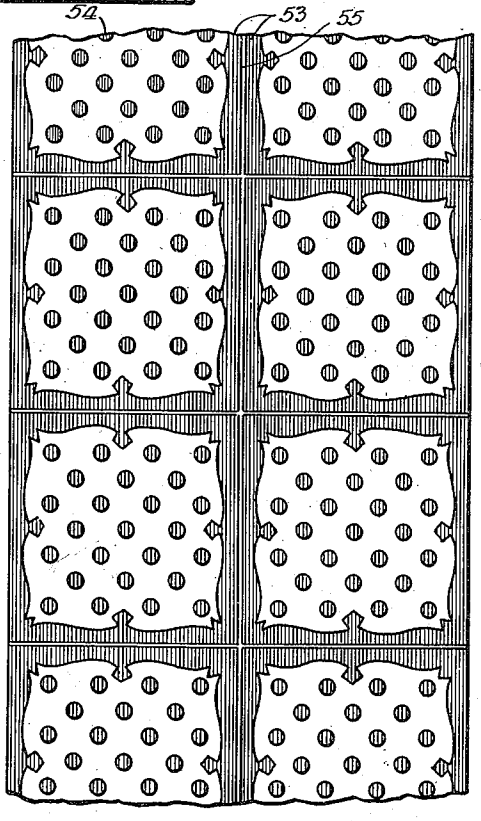


Fig. 12.

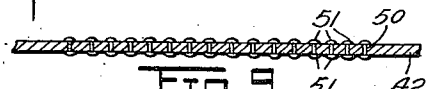


Fig. 9

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FABRIC PRINTING PROCEDURE

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Application June 30, 1939, Serial No. 282,229

6 Claims. (Cl. 101—116)

The present invention relates to a fabric printing procedure and it particularly relates to a procedure which may be utilized for flock printing or for printing with adhesive, liquid or plastic materials having substantial body which will form a deposition or surfacing of desired thickness and deposition upon the fabric.

In flock printing procedures and in similar printing procedures with adhesive materials, a dotted or discrete effect is obtained, resulting from applying to the fabric through a perforated plate or cylinder of an adhesive or plastic or fluid printing material having substantial body. This dotted or discrete effect is usually not most satisfactory and it is not readily possible to secure solid designs which will extend over substantial areas upon the fabric.

Moreover it has been found quite difficult to apply designs which would extend over a considerable area upon the fabric without undue stiffness and loss of flexibility.

It is, therefore, among the objects of the present invention to provide an improved printing procedure of the character above described which will enable the production of greater variety in designs and more solid designs which may be extended over substantial areas and in any configurations desired, and which at the same time will not unduly increase the stiffness of the fabric, nor decrease its drapability or flexibility and which will render it possible to produce designs by flock printing or by the application of adhesive materials of substantial body without the necessity of giving a discrete, dotted or separated effect.

In printing fabrics it is often desirable to print them in such a way that there may be formed thereon a design applicable for example to doilies, curtains, scarfs, various elements of wearing apparel, such as the front, back and sleeves of blouses and so forth.

Where designs of this character are printed upon a run of woven or knitted fabric, although the design may be readily cut out by the purchaser of the fabric, nevertheless considerable difficulty is experienced inasmuch as it is necessary to trim the edges or to seam the edges and additional material must be provided for this purpose and frequently it is difficult to obtain articles from such continuously printed design without considerable labor on the part of the purchaser of the printed fabric.

It is, therefore, among the further objects of the present invention to provide a procedure which will enable substantially continuous printing of cut-out designs, whether they be for doilies, curtains, scarfs, neckties, elements of wearing apparel and so forth, in such a way that the design may be readily cut out of the fabric along the printed lines without the necessity of trimming the edges or finishing the edges as by seaming or hemming, with assurance that the cut edges will not unravel and will present a desirable finished appearance.

Still further objects and advantages will appear from the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the invention.

In accomplishing the above objects it has been found most satisfactory according to one embodiment of the present invention to print the adhesive material or fluid or liquid plastic material, whether or not a flock is to be subsequently applied, in such a way that the material will be caused to dispose itself in substantially solid designs upon the fabric and in such a manner that the fabric weft and warp ends at the point of application of the design will be substantially locked in slip-proof condition with danger of ravelling being substantially eliminated, if the fabric be cut across or along the edges of the applied designs.

In applying the design it has been found most satisfactory first to provide a suitable perforated carrier for the adhesive which will move with the fabric. This perforated carrier may consist of a thin sheet metal or copper or brass cylinder or a belt or band and upon this cylinder or belt or band there may be applied a series of closely spaced perforations forming the outline of the design.

It has been found most desirable to regulate the spacing and size of these perforations to a range from 100 to about 400 perforations per square inch, having a size varying from 50 to 68 wire gauge, although a spacing of perforations and sizing of perforations may be made outside of this range under certain circumstances.

In applying the design, the fabric is usually passed between the perforated carrier and a pressure cylinder and the adhesive is carried on the opposite side or inside of the cylinder or perforated carrier between suitable holders or blades, which may be termed respectively doctor and color blades. The adhesive or plastic imprinting material should have a substantial opportunity to pass through and form small projections or par-

tial droplets through the perforation before or during the time such perforations come into contact with and before they are pressed against the fabric.

When the perforations carrying these slightly formed partial droplets or protuberances of the plastic or imprinting fluid strike against the fabric, there will be a maximum density of imprinting fluid at the center of the perforation and there will then be a thinner spread usually from the periphery of the perforation toward the adjacent perforation and this effect will be enhanced under the pressure of the opposite roller. The resultant surfacing of the adhesive will be at minimum thickness at the space between the various perforations.

As a result, when this adhesive dries by itself or with the application of a finely divided rayon or cotton flock, the thin coated portions, although they will take up the flock, will nevertheless permit flexibility substantially identical with that originally obtained with the substantially widely spaced or discrete dots and at the same time produce a substantially solid effect.

Moreover the pressure which is applied, together with the excess imprinting fluid, will assure that the fluid will penetrate through the woven fabric being imprinted, with the result that a uniform imprinting will be obtained on both sides, permitting the ready application of a flock and a uniform effect on both sides of the fabric.

As a result, not only will the designs be more artistically presented upon the fabric, but, in addition, there will be assurance that the weft and warp of the fabric will be locked together at the point of application of the fabric, both against slipping and against ravelling where such design is used as a cutting edge.

In accomplishing the above objects it has not only been found satisfactory to cause the adhesive or imprinting fluid to flow through the perforations substantially before the point of contact, but it has also been found important to apply an extra element between the two blades, between which the fluid is held, which will have the effect of pressing the adhesive or imprinting fluid through the perforations and/or preventing return thereof at and adjacent to the point of pressure by the pressure roller. This intermediate element also has the effect of assuring more even flow of solution and color through the stencil perforations onto the fabric.

Referring to the drawings which illustrate several of the various possible embodiments of the present invention, but to which the present invention is by no means restricted, since the drawings are merely by way of illustration and not by way of limitation,

Fig. 1 is a perspective view of an imprinting device for imprinting a flock printing adhesive or other bodied printing fluid, in which the perforated fluid-carrying device takes the form of a belt,

Fig. 2 is a transverse sectional view upon the line 2—2 of Fig. 1, upon a somewhat enlarged scale as compared to Fig. 1,

Fig. 3 is a fragmentary end perspective view of another imprinting arrangement utilizing a cylinder instead of a belt,

Fig. 4 is a fragmentary transverse sectional view upon the line 4—4 of Fig. 3, upon a somewhat enlarged scale as compared to Fig. 3,

Figs. 5, 6 and 7 are respectively enlarged plan views respectively illustrating the stencil, the initially imprinted cloth and the imprinted cloth after pressure has been applied,

Figs. 8 to 10 respectively are transverse sectional views upon the lines 8—8, 9—9 and 10—10 of Figs. 5, 6 and 7 respectively,

Fig. 10*a* is a diagrammatic cross section of a fabric with the adhesive solution applied thereto, illustrating how such solution may thin out between areas which have been directly imprinted upon a greatly increased scale as compared to Fig. 10.

Figs. 11 and 12 respectively are plan views of an imprinted fabric, Fig. 11 showing how a design may be applied to a fabric according to the present invention, which fabric may be utilized for dresses or garments, and Fig. 12 illustrates how a cut-out design may be impressed upon a fabric for cutting up into doilies or some other suitable article.

Referring to Fig. 1, the machine is provided with a frame 10, upon which are carried the slider members 11 and 12 having the uprights 13 and 14, which carry the cylinders 15 and 16.

The slider 11 may be fixed in position, while the slider 12 may be made adjustable by the eye 17 through which fits the adjusting screw 18 having the turn knob 19 extending through the flange 20. By turning the handle member 19, the position of the cylinder 16 may be varied and the tension on the belt or band stencil 21 may be regulated. The band stencil extends around and is driven by one or both of the cylinders 15 and 16 in the direction indicated at 22 by a mechanism not shown.

The stencil 21 carries a design indicated diagrammatically at 23 formed by a large number of perforations 24 spaced about 100 minimum to about 400 maximum per square inch and these perforations may have a diameter ranging from 50 to 68 wire gauge.

These perforations which are employed in the stencils of both embodiments of Figs. 1 and 2 and Figs. 3 and 4 are shown upon a somewhat larger scale in plane upon Fig. 5 and in cross section and in Fig. 8 and it will be noted, as shown, that the single perforations 25 are preferably arranged in staggered relationship to each other over the entire area of the design 24, the particular perforations shown in Fig. 5 being arranged in staggered concentric and radial rows.

In the space 26 between the rollers 15 and 16 and the upper and lower sections of the belt 23 is positioned the doctor blade 27 attached at 28 to a suitable carrier 29, which may be mounted at 30 and also a color blade 31 mounted upon the rod 32. The rod 32 may be carried in the recessed elements 33 carried on the arms 34 and having an eye 35 bearing upon the rod 36 extending across the space 26.

The position of the recessed member 33 may be regulated by the set screws 37 extending through the eye 38 extending rearwardly from the eye 35, the lower portion of said set screw being threaded into the rail 10.

As shown, the doctor blade 27 may be caused to press down upon the interior lower face of the belt 21, while the color blade 31 may be caused to contact the interior face a substantial distance from the blade 28 by its own weight, the position of contact being regulated by adjustment of the set screw 37. Between the doctor blade 27 and the color blade 31, the belt 23 meets the pressure roller 39 carried upon the shaft 40, which pressure roller turns in the direction indicated at 41.

The adhesive solution or the colored imprinting solution 46 (see Fig. 2) is held between the blades 27 and 31 in sufficient amount to assure penetration thereof through the perforations and the ends of the space between the blades 27 and 31 are closed by suitable dams.

The fabric 42 enters in the direction indicated by the arrow 43 and normally the pressure roller will press up the fabric 42 and the belt 21 at the point of contact 44 into the space between the blades 27 and 31, and these blades 27 and 31 at the same time will tend to draw the fabric 42 and the belt 21 down against the face of the pressure roller, which pressure roller may be provided with a rubber or other elastic facing (not shown).

In the form shown in Fig. 1 there is provided between the main doctor blade 27 and the color blade 31, a supplemental doctor blade 45 which will tend not only to press the adhesive solution through the perforated areas 24, but will also prevent the solution being forced back by the pressure of the roller 39.

It will be noted by reference to Fig. 2 that the lower edge of the color blade 31 is positioned substantially forward of the point of contact 44, as indicated at the point 48, with the result that during movement through the space 49 the plastic solution 46 will have the opportunity to ooze through the perforated areas 24 and form partial droplets 50, which start to seep through the fabric as shown at 51 in Fig. 2 even before the point of contact 44.

This will give an effect upon the cloth as indicated in plan in Fig. 6 and in cross section in Fig. 9, and it will be noted that the adhesive solution will be in excess as indicated at 51, both upon the upper and lower faces of the fabric and will have partly or wholly penetrated through the fabric.

At the pressure point 44 then the imprinting fluid, still moist, will be compressed and caused to spread sidewardly while passing under the lower edge of the blade 45 as indicated diagrammatically at 52 in Figs. 2, 7 and 10 to cover the entire area and form a base for application of a substantially solid design.

Although as diagrammatically shown at 52 in Figs. 2, 7 and 10, and particularly Fig. 10*a*, the droplets 51 of the adhesive or imprinting fluid appears to have spread or been flushed uniformly over the area 52, it will be found, upon close examination, that usually the maximum concentration is adjacent the center of point of application at 51*a* of the droplets 51 (see Fig. 10*a*) through the perforation 25 and the solution or imprinting fluid will decrease the thickness at 52*a* in the space which corresponds to that portion of the belt stencil 21 between the perforations 25. This effect is best indicated diagrammatically in Fig. 10*a*.

Frequently it is found most satisfactory to cause the spread to be such that the spread portions will not substantially meet and coalesce and/or so that there will be coalescence along certain lines or circles without coalescence over the entire design or there may be coalescence over the entire area, but the effect of separating the areas of application, either by areas carrying a diminished amount of the imprinting fluid or carrying no imprinting fluid, gives a substantial and high desirable flexibility, which cannot be attained when the imprinting fluid is impressed in substantially solid areas over the and upon the fabric to be imprinted.

By regulating the spacing 49 to give an increased length of travel for oozing of the fluid 46 through the perforated areas 24 and through the fabric 42, it is possible to get a more coalesced spread and by diminishing the space it is possible to get a less coalesced spread.

This effect may be controlled by increasing or decreasing the fluidity or viscosity of the imprinting fluid which has been found to be most desirably formed of flexible, synthetic resinous materials with or without combination with cellulose derivatives.

Among the most satisfactory adhesive materials for this purpose are various combinations including vinylite and/or acrylic acid or even halogenated rubber resins, preferably carried in a relatively slow drying organic solvent base, which may include various low or intermediate molecular weight aliphatic alcohols ranging from methanol to hexanol, or dihydric alcohols such as methylene, ethylene, propylene and butylene glycols, ethers of these various materials containing groups ranging from the methoxy to the butoxy, esters of these various alcohols ranging from methyl esters to hexyl esters and also various phenyl, tolyl or xylyl substituted products.

There may also less preferably be employed resins as of the nature of phenol formaldehyde resins, urea formaldehyde resins, glycerol-organic acid (dibasic acid) resins and so forth.

Replacing part or all of these resins, there may be utilized cellulose derivatives, such as cellulose nitrate, cellulose acetate, ethyl cellulose or benzyl cellulose.

These various solvent mixtures, which may contain from 10 to 50% of the resin or cellulose derivative and the balance solvent, may also contain various wax or fatty materials such as the high molecular weight glycerides of fatty acids, the high molecular weight fatty acid esters of the high molecular weight fatty alcohols, and their sulphonated, sulphated, borated and/or phosphated derivatives.

Preferably these fatty acids or fatty alcohols may have from 12 to 32 carbon atoms and may be used in percentages varying from 0 to 10 or 15%.

It is also possible to include plasticizer materials such as for example ethyl lactate, butyl lactate, various alkyl phthalates, triphenyl or tri-cresyl phosphates and so forth.

If desired, drying oils may be included such as the various boiled or blown drying oils, such as linseed, rapeseed or China-wood oil and there may also be included suitable amounts of pigments, such as finely divided bronze, aluminum, vermilion, ultra-marine blue, cadmium red, carbon black and so forth.

Although it is preferable that the viscous solution 46 be of such a nature that it will remain damp sufficiently after the passage of the roller 49 to receive and hold a finely divided flock and then to be baked, if desired, where no flock is to be presented, the solution may be made more quick drying so as to dry substantially immediately after leaving the pressure roller 39.

At the same time, if desired, the viscous solution may be made of a quick drying variety and may even be made of such a nature as to be liquid or adhesive only when heated so that subsequently the solution may be heated to cause a further spread or coalescence of the imprinted portions and at the same time with such heating to cause partial or total liquefaction a flock may be applied to the fabric.

Less preferably the printing solutions may be made with an aqueous base or with an aqueous-alcohol base, in which case water soluble methyl cellulose, dextrin, gum tragacanth, gum arabic, gum shiraz, Locust bean gum, carob bean gum, agar-agar, Irish moss, pectin, gelatin and albumen may be employed, preferably with the addition of small amounts of antiseptics or preservatives.

These imprinting compositions will be subjected to a strong agitating action by the movement of the belt 23 between the blades 27 and 31 and this agitating action will be increased by the intermediate blade 45, with the result that the solution or adhesive liquid will more quickly pass through the perforated areas 24 to form the droplets indicated at 51 in Fig. 9, which droplets then may be readily flushed or spread by the pressure roller 39.

As indicated in Fig. 1 the right side 53 of the rail 10 is somewhat depressed so that the roller 16 will be somewhat lower than the roller 15, causing the fabric 42 and the belt 21 to move upwardly in the direction 43 over the pressure roller 49.

In the embodiment of Figs. 3 and 4, similarly functioning parts being indicated by the same numerals primed, the perforated roller or cylindrical stencil 21' takes the place of the perforated band 21 of Fig. 1.

The roller or rod 45' takes the place of the intermediate doctor blade 45 and the roller 21' and the pressure roller 39' are geared to each other by the gearing 54 and 55.

If desired, either in the embodiments of Fig. 1 or Fig. 2, the fabric might be carried upon a carrier belt positioned between the fabric 42 and the pressure roller 39 or 39'.

In Figs. 11 and 12 is shown the effect which is produced, the dotted design in Fig. 11 showing the areas 52 substantially completely and fully covered by flock without there being any appearance of discrete dots and the doilies in Fig. 12 having border designs 53 and intermediate circular designs 54 substantially devoid of discrete dots with the cutting lines 55 enabling cutting up of the fabric to form individual doilies without the need of trimming or finishing the edges.

It is thus apparent that the applicant has devised a simple method for obtaining an improved printed effect or flocked effect upon fabrics, and particularly woven fabrics, which is widely applicable and which not only gives a design of improved quality but also permits the use of the imprinting process for forming patterns which may be readily cut out without the necessity of finishing the cut edges.

The present process may be readily applied without substantially modifying the construction of the apparatus and it is possible to so adjust the settings of the apparatus with corresponding changes in the character of the design which is employed.

The intermediate blade 45 or the rod 45' respectively shown in Figs. 1 and 2 and Figs. 3 and 4, should permit the uniform circulation of the adhesive solution 46, the blade 45 being provided with perforations 45a for this purpose. The intermediate doctor blade 45 and the rod 45' tend to force the adhesive or color through the stencil perforations 24 and keep it even and also add more pressure to the printing surface of the stencil belt and the cylinder at the printing area.

It is particularly important to have such intermediate doctor blade 45 or rod 45' where the main blade 27 and the color blade or plate or knife 31 are spaced as far apart as in the present apparatus, since this intermediate element will assure a more even flow of color through the stencil perforations onto the fabric. By having the intermediate blade 45 perforated near the belt stencil 21 as shown, there will be no danger that more color will be held in front of the blade 45 than in rear of the blade 45.

It is, of course, apparent from the above description that the blade 45 of Figs. 1 and 2 might be used in lieu of the roller rod 45' of Figs. 3 and 4.

As many changes could be made in the particular features of fabric printing procedure, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A process of flock printing, which comprises causing an adhesive imprinting solution to penetrate through a perforated stencil before said stencil contacts with a fabric to be imprinted, said stencil having a large number of fine openings arranged to form a design, and then pressing the fabric while in contact with the stencil after substantial penetration has taken place to cause said imprinting fluid to flush from said openings toward the adjacent openings and simultaneously pressing against said openings on the inside of the stencil to prevent return flow of said solution while said stencil is in contact with the fabric, said openings consisting of small circles having dimensions varying from about 50 to 68 wire gauge and about 100 to 400 of said openings being employed per square inch.

2. A printing apparatus comprising a pressure roller, a rotating perforated cylindrical stencil having a plurality of fine perforations thereon to form imprinting areas, means including a well to hold an imprinting fluid inside of said stencil on the side opposite said pressure roller, and means to prevent return of said fluid at the point of application of said pressure roller, said holding means consisting of two inclined blades extending longitudinally of the cylindrical stencil spaced substantially away from the point of application of said stencil with said pressure roller and said preventing means being positioned substantially at said point of application and consisting of a freely rotating roller.

3. A flock printing apparatus comprising a lower pressure roller, an upper contacting rotating perforated cylindrical stencil, separated inclined blades extending longitudinally within the interior of said stencil parallel to the axis of said stencil and positioned a substantial distance on both sides of the point of contact with the pressure roller so as to form a well in which an imprinting fluid is received, and a contact means positioned substantially between said inclined blades at the point of contact arranged so that the imprinting fluid may flow freely thereby during rotation of said stencil, the flowing of the imprinting fluid being obstructed by said inclined blade so that it will not flow beyond said inclined blades into the other part of the cylindrical stencil.

4. A method of producing an imprinted fabric carrying a substantially continuous flushed de-

sign formed of a large number of coalesced droplets of an adhesive imprinting solution having a distribution of about 100 to 400 per inch, said continuous design having a maximum thickness at the center of the droplets and a minimum thickness between the droplets, said method comprising applying a plurality of droplets of the adhesive imprinting solution to the fabric, said droplets having a distribution of about 100 to 400 per square inch and said droplets being applied to the fabric through a stencil, and then pressing the fabric so as to cause the droplets to flow together and form a continuous design.

5. A printing apparatus comprising a pressure roller, a rotating perforated cylindrical stencil having a plurality of fine perforations thereon to form imprinting areas, means to hold an imprinting fluid inside of said stencil on the side opposite said pressure roller, consisting of plates extending longitudinally of the cylindrical stencil parallelly to the axis of the cylindrical stencil on both sides of the line of contact between the cylindrical stencil and the pressure roller, and means pressing against the interior of said cylindrical stencil to prevent return of said fluid, said means being located at the point of application of said pressure roller, said perforations consisting of small circles having dimensions varying from about 50 to 68 wire mesh, about 100 to 400 of said perforations being employed per square inch.

6. A printing apparatus comprising a pressure roller, a rotating perforated cylindrical stencil having a plurality of fine perforations thereon to form imprinted areas, means including a well to hold an imprinting fluid inside of said stencil on the side opposite said pressure roller, and means to prevent return of said fluid at the point of application of said pressure roller, said holding means consisting of two inclined blades extending longitudinally of the cylindrical stencil spaced substantially away from the point of application of said stencil with said pressure roller and said preventing means being positioned substantially at said point of application and consisting of an elongated element extending between and parallel to said inclined blades and having substantially the same length as said inclined blades and being positioned to press interiorly against said perforations at said point of application, said elongated element being covered by the fluid in the well and said fluid flowing freely past said element.

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