METHOD AND APPARATUS FOR CONTINUOUS PRINTING AND FLOCKING

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This invention relates to printing and flocking, more particularly to the flocking and printing of flat surfaces adapted to receive a deposit of color, flock, or other substance in predetermined and pre-selected areas as, for example, a web of cloth, paper, plastic sheetings or other relatively flexible products having a surface suitable for printing or flocking.

The term flocking comprehends the deposition or distribution and fixation of finely divided particles or fragmentary material upon a surface, usually in pattern form or design arrangement. The particles so deposited are referred to as flock and ordinarily comprise very short cotton, rayon or wool fibers or other fibrous or filamentary material less than one-quarter of an inch in length; often one-thirty-second or one-sixteenth of an inch. The diameter of the flock varies also, and usually is based upon the functional requirements of its end uses. In the textile industry flocking is commonly applied for decorative effects to draperies, upholstery, print goods and dress goods. The flock may be attached or affixed to the surface by first applying to the material to be flocked a suitable adhesive of the type of glue, paste, varnish, or other means of a stencil, cylinder roller, spray gun or silk screen, and subsequently depositing the flock fibers on the wet adhesive with a so-called beater bar, which utilizes the beating effect of a flat sided bar rotating against the underside of the sheet to be flocked. Alternatively the flock may be applied electrostatically after the application of the adhesive to the surface of the material or web, by placing the adhesive carrying web in an electric field of sufficient intensity to supplying flock fibers to the region of the electric field wherein the fibers are oriented and deposited on the adhesive covered portions of the web surface.

By printing is meant the production of colored patterns or designs or parts thereof on a suitable surface as, for example, by machine or cylinder printing wherein a hollow copper roller engraved with a design or pattern and carried by a steel shaft working in bearings, revolves in contact with a pressure roller to form a nip through which passes the material to be printed, after the color to be printed has first been applied to the engraved portions of the copper roller.

The invention further relates to the printing and flocking of web material in a continuous operation or process whereby a theoretically endless length of sheet or web may, without interruption, work stoppage, be successively printed and flocked to form a regularly engraved, homogeneous, unitary or composite flocked and printed design on the web surface. There is also comprehended the production of such patterns in multi-color whereby color contrast is added to the striking appearance and effect of composite designs partly flocked and partly unflocked.

Among its other objects the present invention contemplates an assembly or combination of apparatus adapted for printing and flocking a web of material, preferably a textile product, in one continuous and uninterrupted process. It is also applicable to continuously printing and flocking such material in varied-colored combinations, the flocked portions and printed parts having different colors or different shades of color as may be desired, all together forming a unitary composite pattern repeat. A further object is the production of halftones, wherein part of the pattern is a shade or several shades lighter than the color of the main pattern, or, in other words, the production of dark and light tones of the same color in one and the same operation and in the same composite pattern.

Another object is a method and means for successively printing and flocking selected areas of a web, for example, a fabric, whereby the printed areas will register or be in registration with the flocked portions so as to form a homogeneous, unitary, multi-colored composite design.

A further purpose is to provide a plurality of means for continuously printing and flocking composite designs in many different and attractive color combinations. A still further object is the production of multi-colored flock-printed web material as a new article of commerce. As an additional factor the invention proposes the making or manufacture of half-tone, multi-color, composite flock-printed designs on a surface of relatively flexible web material.

The term "flock-printed" as used herein is intended to refer to a web having a composite design thereon, a part of which is flocked and a part of which is printed with or without flock; or alternatively, a composite design which is partially printed without flock and subsequently flocked all over such design.

With the above and other objects in view as will be apparent, the present invention consists in the construction, combination and arrangements of parts all as hereinafter more fully described and illustrated in the accompanying drawings wherein:

Fig. 1 is a schematic side elevation of a combined printing and flocking apparatus adapted to produce multi-color composite printed and flocked patterns on a web in a continuous operation, according to the present invention;

Fig. 2 is a front elevation of portions of the apparatus of Fig. 1 further illustrating the relative arrangement of parts as the cloth travels full width through the printing and flocking zones with provision for an intermediate dry ing interval, if desired, which does not involve interruption of movement of the web or stoppage of the continuous printing-flocking operation;

Fig. 3 is a plan view of a furnisher or doctor blade modified by the insertion of color blocks, plugs or stops so as to section off the transverse length of the furnisher into separate compartments or containers for carrying print stuffs of different colors, one color for each section or container; and

Fig. 4 illustrates diagrammatically apparatus suitable for practicing a modification of the invention wherein a group or collection of printing elements are mounted at spaced intervals about a single pressure roller serving all of the printing units and serving also to form a nip with a stencil cylinder arranged in spaced relation following the last printing unit.

The present invention contemplates an assembly or combination of printing and flocking units co-registering and printing and flock successfully selected areas of a web in a continuous operation: the printed and flocked portions combining to form a unitary composite design of the same color or, if desired, of more than one color. To this end the ends as recited above and as will be hereinafter more apparent, it is proposed in one embodiment of the invention to mount the engraved printing roll so as to form a nip with a co-acting pressure roller, and color print a part or portions only of a predetermined pattern on a web as the web passes through the nip of the printing and pressure rolls. A rotatable stencil cylinder is also provided to form another nip, preferably with the same pressure roll, in a continuous operation whereby the remaining portions of the web or the pre-selected design are printed with an adhe rently adapted to receive and to retain a deposit of flock thereon. Following the color printing, the color flocked in stenciling, the moving web of material may be fed into a flocking zone or station where flock is electrostatically or otherwise deposited on the wet adhesive, the flock fibers being desirably of a different color than the color printed portions of the design. After the flocking operation, the web may be passed through a drier and from there to be take up roll for storage or other use.

If a variation in the depth of the engraving cut or depression on the printing roll is indicated. For example,
for ordinary purposes on textile fabrics of the marquisette or open weave type, an average depth of .007 of an inch is suitable for a full tone effect. For the halftone, a depth of about .002 has been found satisfactory. Thus the present method of producing halftones is distinguished from the conventional methods of stippling and the use of half-resists which is an advantage because stippling is carried out as a hand operation by highly skilled craftsmen or photographically, and the resist method requires not only the extra expense of the resist composition, but also two printing operations, first to print the resist, and then over the printing of the pattern color on top of the resist.

With the arrangement or assembly of a combined printing and flocking machine mentioned above, and excluding the use of the halftone feature, attractive and striking patterns may be flock-printed as previously defined. For example, the design of a tree may be reproduced on an open weave fabric by pigment printing the trunk and limbs thereof with it was also noted that the half tone portions of the tree design, by varying the depth of the depressions cut in the engraved printing roller as described, parts of the trunk and the limbs were printed as half tones or a shade or several shades lighter than the full tone color of the other portions thereof.

In a modification of the foregoing embodiment, added effects can be induced by incorporating in the supply or reservoir of printing paste an adhesive adapted to receive and retain a deposit of flock fibers. In the practice of this embodiment, it has been found that after the web has been printed and flocked successively, the flock fibers adhere not only to those portions of the design printed with a flock adhesive by the stencil, but also to the full tone portions of the color printed parts of the design on the web or fabric. The flock did not adhere to the halftone printed portions. Thus, in another example, cotton marquisette type fabric was run through apparatus of the invention modified, as stated, by adding an adhesive for the flock to the printing ink. The flock fibers were white and the print color was rose. The same design of a tree was reproduced and the pattern found to be flocked all over on the trunk, limbs and leaves except for the halftone printed parts of the limbs and trunk which did not take the flock to any extent noticeable by the unaided eye. At the same time, the tree run through the apparatus to be actually several shades darker, not lighter, than the full tone portions of the design due, perhaps, to the over-layer of white flock fibers adhering to the full tone areas. The use of a doctor blade as a fencer or printing composition supplier rather than merely as a cleaner, and inserting plugs or stops at intervals along its length for the elimination of multi-color effects may be obtained.

In this application of the invention, the stops serve to establish a series or a plurality of individually separate composition containers or compartments and a different one of the colors being used, the total number of colors being limited only by the number of stops inserted or employed on the fencer. Thus, for example, in the case of the tree design mentioned above, if it is assumed that the height of the tree runs with the length of the fabric being printed and flocked, the limbs on one side of the tree may be printed blue for instance, those on the other side green and the trunk itself may be of a third color. The pattern of the fencer is also feasible by the addition of more plugs thereto.

It is to be noted that whether or not stops for the fencer blade are employed, the design may be flocked all over after first color printing only selected portions thereof. On the other hand, if desired, only the portions of the pattern stippled with an adhesive may be flocked. Similarly, half-tone effects may be produced or omitted whether desired, while the use for multi-color printing parts of the pattern are utilized or not.

In another aspect or embodiment of the present improvements, greater use of color variations and combinations may be obtained by printing on the web in one continuous operation by mounting a plurality of printing units about a single pressure roll as illustrated diagrammatically in figure 4. By using a doctor blade as a fencer, a doctor blade used as a fencer will print a different color, the number of colors being limited to some extent, of course, by the periphery of the pressure roll common to each printing station. After the material being processed passes around the pressure roll and through the last of the individual spaced printing zones, it may be led through the nip of the pressure roll coating with a stencil cylinder where a flock adhesive is applied in the form of the balance of the composite design after which flock is deposited either all over the pattern or only on the areas containing color printed by the printing rolls. It will be understood, of course, that where it is desired to deposit flock all over the design or all over the pattern except for those portions, a suitable adhesive for this purpose may be added to the coloring or printing composition. Moreover, if such all-over flocking is not desired, it is advisable to provide a drying interval after or between the printing stage to prevent reading or other objectionable defects. The use of a quick drying printing composition is also indicated and suggested wherever it is desirable to flock the color printed portions of the composite flocking design.

A virtually unlimited variety of shades and color combinations may be produced by inserting stops of the character previously described in one, some or all of the fencer compartments, an adhesive for flocking, and in some instances, depending from all the other colors or colors previously added in the flocking process. It is also pointed out that where a plurality of printers is employed, each printing station may be equipped with a keel block which may be incorporated in one, some or all of such compartments and conversely a quick drying composition without flock adhesive may be incorporated in one, some of all of the compartments. Thus the possible combinations and permutations of color and flock that may be produced are enormous.

Referring now more particularly to the several figures of the drawings, in Fig. 1 is diagrammatically illustrated apparatus suitable for practicing at least one embodiment of the present invention. As these show, a web 10 of the material to be flock-printed may be unwound from a creel or support 11 to move in the direction of the arrow toward the printing and flocking zones, wherein the web 10 is first printed with a portion of the desired pattern and subsequently penciled with an adhesive and flocked at least over the balance of the pattern, run through a dryer and finally wound up on a take-up reel 12.

As the web 10 to be printed and flocked leaves the stand 11 in the open width, it may be fed as by means of the tension rods 12, 13 over an idler 14, to the printer 15, suitably engraved as at 16 to reproduce on the web 10 only a portion of the desired pattern, for example in the form of a series of separate zones, each containing a different letter of the alphabet which is to be placed on the web. The web 10 then passes through the nip 17 formed by rolls 18, 19 and through the nip 20 then through the nip formed by rolls 15, 21 and up to a stenciling cylinder 22 where it is passed, and the flocking cylinder where it is stained to the web 10 and the stenciling cylinder 22.

As will be understood, when the doctor blade 20 is pressed lightly against the working surface of the engraved roller 15. As roller 15 is rotated about its longitudinal axis, the smooth surface parts of the pattern are cleaned of color by the sharp knife edge of the doctor blade 20. The edges of the engraved divers of the roller 15 will be scraped only at the peripheral surface of the roller 15 and the engraved letters will be cut and the edges of the pattern are cut and the engraved letters will be cut and the entire web 10, which carries the color to the cloth 10.

If the printed portions of the pattern are not to be flocked as well, it is advisable to incorporate a quick drying composition in the color printing paste so that the printed matter will be dry on the web 10 before it reaches the stencil cylinder. In some instances, depending
upon the type and construction of the material being processed, it may be advantageous to light up a bank of the process, 21 may be carried into the nip of the bank of lamps 24 or other suitable drying means fixed to the type and construction of the material being processed, it may be advantageous to light up a bank of lamps 24 or other suitable drying means fixed to the 25 the printer 20 and stencil 28, when the pressure roller in turn is driven as by means of a pulley 29 from a motor 30, the speed of the motor 30 being synchronized with the speed of the motor 19 driving the printing roller 15. In the stenciling zone, the web 10 is intermediate its ends, said doctor blade being mounted adjacent said print roll to coat, and a rotatable stencil mounted at the periphery of the said pressure roll spaced from said print rolls and adapted to coat with said pressure roll.

6. Apparatus for continuously printing and flocking a 25 the combination in a web printing and stenciling device of a pressure roller, a plurality of spaced print rolls rotatably mounted about the periphery of the pressure roll as shown in Fig. 6, and further if each of the 8 printing rolls being equipped with a multi-color furnisher comprising a doctor blade having at least one color block intermediate its ends, said doctor blade being mounted adjacent said print roll to coat therewith, a rotatable stencil mounted at the periphery of the said pressure roll spaced from said print rolls and adapted to coat with said pressure roll.

3. The combination in a web printing and stenciling device of a pressure roller, a plurality of spaced print rolls rotatably mounted about the periphery of the pressure roll as shown in Fig. 6, and further if each of the 8 printing rolls being equipped with a multi-color furnisher comprising a doctor blade having at least one color block intermediate its ends, said doctor blade being mounted adjacent said print roll to coat therewith, a rotatable stencil mounted at the periphery of the said pressure roll spaced from said print rolls and adapted to coat with said pressure roll.

4. Apparatus for continuously printing and flocking a 25 the combination in a web printing and stenciling device of a pressure roller, a plurality of spaced print rolls rotatably mounted about the periphery of the pressure rolls mounted on a rotatable means to rotate the shell of the composite pattern, and, if necessary, a dam 31 of hardened soap or other readily removable matter may be inserted at the ends of the stencil 28 to prevent escape of the adhesive except, of course, through the pattern perforations 32 on the composite design which previously have been color printed as described.

An adhesive adapted to receive and retain a deposit of flock fibers may be supplied to the interior of the contents or stencil 28 through an aperture at either end thereof and, if necessary, a dam 31 of hardened soap or other readily removable matter may be inserted at the ends of the stencil 28 to prevent escape of the adhesive except, of course, through the pattern perforations 32 on the composite design which previously have been color printed as described.

When the moving web 10 has passed successively through the printing zone 15 where it receives printing only a part of the intended composite pattern, the range of drying lamps 24 and through the nip of pressure roll 21 and stencil cylinder 28 where it is adhesive printed with the balance of the design, it may then be fed as by means of idler roller 33 or preferably from a moving blanket and driving roll 21 into and through an electronically operated driving roll box 34 where the web 10 is flocked with flock fibers of any desired color, the flock adhering only to the adhesive printed portions of the web 10, not to the color printed portions thereof. If desired, however, the entire composite pattern area may be flocked by using the flocking operation, by dispensing with the drying lamps 24 intermediate the step of color printing and adhesive depositing and by substituting in the color printing paint an adhesive suitable for flocking in place of the quick drying composition mentioned above.

After emerging from the flock box 34, the moving web 10 now flock-printed with a regularly repeated composite multi-color pattern, may be passed into a drying chamber 35 from whence to take a take up roll 36 for storage or other use.

Fig. 4 of the drawings illustrates diagrammatically a further embodiment or an extension of the present invention consisting in the combination of a plurality of cooperating printing rolls, each engraved with only a portion of the desired pattern and each having a furnish 38 (only one being illustrated) which may or may not be sectioned off into multi-color compartments as previ

ostly described. If 8 of the print rolls 37 be incorporated in the device and further if each of the 8 printing rolls 37 is sectioned off into 4 compartments, a total of 32 different colors can be pigment printed as parts of a composite design and the remainder of each flocked as by means of a stencil cylinder 39 and flock box (not shown in Fig. 4) or flocking device as described. In this embodiment each print roll 10 may be printed with half-tones and if desired may also be flocked all over the composite design or merely in those portions of the design which are not pigment printed with color by the several printing rolls.

Although the drawings herein illustrate only one pressure roll common to the printing and stenciling units, it will be appreciated that if desired, an individual pressure roll may be substituted in the assembly for each print roll. Further, if more than one stencil cylinder is made use of, additional pressure rollers may be added, one for each stencil. The addition of pressure rollers may be made without interrupting the continuous flock-printing of composite designs according to the present improvements.

What is claimed is:

1. The combination in a web printing and stenciling device of a pressure roller, a plurality of spaced print rolls rotatably mounted about the periphery of the pressure roll to coat therewith, at least one of said print rolls being equipped with a multi-color furnisher comprising a doctor blade having at least one color block intermediate its ends, and means for flocking at least the remainder of the design on the web after it has been multicolor printed with a portion of said predetermined design, without interruption of movement of the web.

2. Assembly for continuously printing and flocking a moving web comprising coating print and pressure rolls constructed and arranged to print a portion of a predetermined design on a web passing therebetween, a doctor blade in contact with the print roll in advance of the pressure roll for supplying a plurality of colors to the surface of the print roll, said doctor blade having a color block intermediate its ends, and means for flocking at least said pressure roll spaced from said print rolls and adapted to coat with said pressure roll.

3. Apparatus for continuously printing and flocking a moving web lengthwise in open width form comprising in combination, print roller means for color printing with a coloring composition including an adhesive adapted to receive and retain a deposit of flock fibers, a portion of a predetermined composite design on a surface of the web as it advances, stencil roller means for stencil printing the balance of the composite design on the moving web with an adhesive for flock, and means for applying flock to both the color printed and stencil printed portions of the composite design without interruption of movement of the web.

4. Apparatus for continuously printing and flocking a moving web lengthwise in open width form comprising in combination, print roller means for color printing with a coloring composition including an adhesive adapted to receive and retain a deposit of flock fibers, only a portion of a predetermined composite design on a surface of the web as it advances, means including the same pressure roll means for stencil printing the balance of the composite design on the moving web with an adhesive for flock, and means for applying flock to both portions of the composite design without interruption of movement of the web.

5. Apparatus for continuously printing and flocking a moving web lengthwise in open width form comprising in combination, print roller means for color printing with a coloring composition including an adhesive adapted to receive and retain a deposit of flock fibers, only a portion of a predetermined composite design on a surface of the web as it advances, means including the same pressure roll means for stencil printing the balance of the composite design on the moving web with an adhesive for flock, and means for applying flock to both portions of the composite design without interruption of movement of the web.
7. Apparatus for continuously printing in half tone and flocking a web moving lengthwise in open width form, comprising in combination print roller means for color printing, partially in full tone and partially in half tone, only a portion of a predetermined composite design on the surface of the web as it advances, with a coloring composition including an adhesive adapted subsequently to receive and retain a deposit of flock fibers, stencil roller means for stencil printing the balance of the composite design on the moving web, with an adhesive for flock, and means for securing flock only to the portion of the composite design printed in full tone and the stencil printed portion.

8. Method of continuously printing and flocking composite designs on the surface of a web, which comprises moving the web into a printing zone, color printing part of the composite design on the web with a coloring composition comprising an adhesive adapted to receive and retain a deposit of flock fibers, stencil printing the balance of the composite design on the moving web with an adhesive for flock without allowing the adhesive comprising the color printed part of the composite design to dry, moving the partially color printed and partially stencil printed web into a flocking zone without allowing the color printed and stencil printed portions to dry, and applying flock to the undried color printed and stencil printed portions of the composite design on the surface of the moving web.

9. Method of continuously printing in half tone and full tone and flocking composite designs on a web surface, comprising the steps of moving the unprinted and unflocked web into a printing zone, color printing with a coloring composition containing an adhesive for flock, partially in full tone and partially in half tone, only portions of the composite design printed in full tone and partially printed in half tone, into a stenciling zone without permitting the adhesive in the coloring composition to dry, stencil printing the balance of the composite design on the moving web with an adhesive adapted to receive and retain additional flock, moving the web, partially printed in full tone and partially printed in half tone and partially stencil printed, into a flocking zone without permitting the stencil portion and the full tone color printed portions to dry, and applying flock to the stencil portion and the full tone color printed portion of the composite design on the surface of the moving web, while leaving the halftone color printed portion free of flock.

10. Assembly for continuously printing and flocking a moving web comprising coating print and pressure rolls constructed and arranged to color print only a portion of a predetermined composite design on a web passing therebetween, a doctor blade in contact with the print roll in advance of the pressure roll for supplying a plurality of colors to the surface of the print roll, said doctor blade having a color block intermediate its ends, and means for subsequently flocking the color printed portion and the remainder of the composite design on the web without interruption of movement of the web.

11. A web having a tri-partite composite design comprising a portion color printed in full tone and flocked, a portion free of flock and color printed in half tone, and a flocked and stenciled portion.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,533,985</td>
<td>Aronstein et al.</td>
<td>Dec. 12, 1950</td>
</tr>
<tr>
<td>2,387,929</td>
<td>Monroe</td>
<td>Feb. 7, 1945</td>
</tr>
<tr>
<td>2,396,663</td>
<td>Overlack</td>
<td>Oct. 3, 1945</td>
</tr>
<tr>
<td>2,294,513</td>
<td>Pearson</td>
<td>Sept. 1, 1942</td>
</tr>
<tr>
<td>2,217,133</td>
<td>Johnston</td>
<td>July 2, 1940</td>
</tr>
<tr>
<td>2,206,370</td>
<td>Schwartz et al.</td>
<td>June 22, 1937</td>
</tr>
<tr>
<td>2,084,827</td>
<td>Tone</td>
<td>Jan. 2, 1934</td>
</tr>
<tr>
<td>1,941,962</td>
<td>Cadgene et al.</td>
<td>June 19, 1928</td>
</tr>
<tr>
<td>1,673,933</td>
<td>Spear</td>
<td>May 24, 1921</td>
</tr>
</tbody>
</table>