July 7, 1931. J. J. SINDLER 1,813,587

METHOD OF APPLYING DESIGNS TO FLEXIBLE SHEET MATERIALS

Filed March 5, 1929

Fig. 1

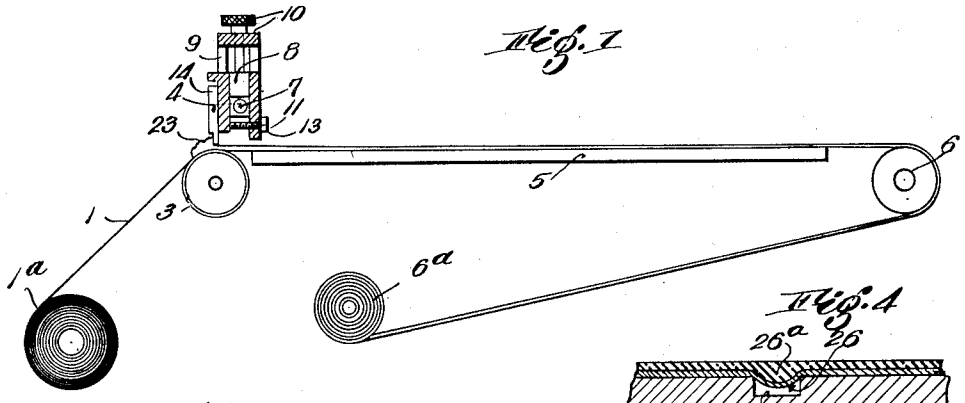


Fig. 2

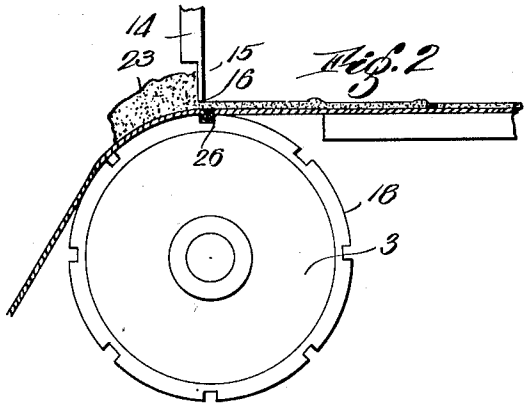


Fig. 3

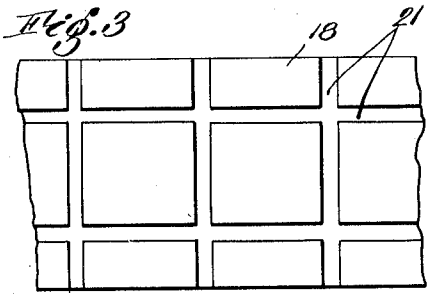
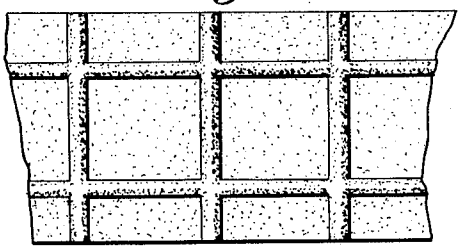


Fig. 4

Fig. 5

Fig. 6

Fig. 7



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UNITED STATES PATENT OFFICE

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METHOD OF APPLYING DESIGNS TO FLEXIBLE SHEET MATERIALS

Application filed March 5, 1929. Serial No. 344,152.

The present invention provides a method of applying predetermined designs or patterns (of any desired character) to resilient sheet materials, such as cloth, paper, and the like.

In the art of waterproofing cloth, for example, it is now common practice to apply one or more thin layers of gummy or plastic materials, such as rubber compounds or cements, by passing the cloth over a "spreading" roller and beneath a fixed "doctor" blade (parallel to the roller and closely spaced therefrom) and simultaneously feeding a mass of the rubber compound to the upper surface of the cloth. The cloth draws the rubber mixture with it as it passes under the doctor blade, thus forcing the plastic material into the cloth and also leaving a thin adhesive film of the rubber upon the surface. Such procedure is effective to produce a sheet of rubberized cloth, carrying a superficial coating of rubber which is firmly adhesive to the cloth and serves adequately to waterproof the fabric as a whole. Successive layers may be applied, in like manner, to build up a composite coating as thick as may be required. The coating is in either case uniformly spread out and distributed evenly over the entire surface of the sheet. Consequently only plain-colored sheets are produced and no pattern is obtainable by this method.

It is very desirable in such fabrics, however, to be able to produce definite patterns or designs on the finished sheet. These may be for decorative purposes or may consist of distinctive markings such as the maker's name on the selvedge, or suitable indicia to designate the style of goods, quality, etc. It is also desirable to enable the manufacturer to employ designs in more than one color, and thus to increase the variety of fabrics which he may offer to the trade. At the same time, the designs should be well defined, weather-proof, and water-proof, and not exhibit any tendency either to migrate into other parts of the fabric or to fade. Moreover, the coating material should be light, pliable, and tenaciously adherent to the cloth or other backing material used. At the same time, it is important that the equipment required be inexpensive and the procedure adaptable to present practices of the art.

Accordingly, an object of this invention is to provide a simple method and convenient means for positively imparting definite, predetermined designs or patterns to surfaces or sheet materials of the character described, which may extend either lengthwise or transversely of the sheet, or both. It is also an object to attain the development of such designs in one or more colors and/or materials, as may be desired. Other objects of the invention will appear from the following disclosure and claims.

This invention includes the discovery that by drawing a flat sheet of resilient material (such as cloth) through a narrow constricting aperture or slot, such as the space defined between a spreader roll and a doctor blade, with a mass of plastic material on its upper surface and (below the cloth) a relatively rigid stencil sheet or surface having a relief pattern therein, the plastic material will be applied to the surface of the resilient sheet in accordance with the pattern on the stencil. The spreading action may be effected upon the plastic material by suitable movement of the sheet against a fixed doctor blade or of the doctor blade against the sheet in fixed position or both doctor blade and sheet may be given relative movement.

The upper surface of the coating material is determined by the straight edge of the doctor blade, while the depressed or cut out areas of the stencil permit the overlying sheet to yield to the constricting pressure exerted upon it by the plastic material as it enters between the doctor blade and the spreader roll. The depth to which the sheet is thus depressed will be determined by various factors among which may be mentioned, the size and depth of the relief or cut out portion of the stencil, the viscosity or plasticity of the compound used, the spacing of the doctor blade, the elasticity of the sheet of goods under treatment and the tension under which it is drawn through the aperture.

On the portions of the sheet overlying the plane (or uppermost) portions of the stencil

(if the doctor blade is forced firmly against the sheet, as by setting it down close against the sheet, and so forcing the sheet close to the stencil) the deposit of plastic material will be relatively thin. By very close setting of the blade, the sheet may be left entirely free from any deposit whatsoever in these areas. In the application of successive layers of plastic compositions to the sheet, the doctor blade may be set sufficiently tight against the flat or high portions of the stencil not only to prevent the application of the plastic material at such points but to scrape off a portion of the previous layer. This is not ordinarily desired but may be employed to advantage for obtaining special effects, in accordance with the invention.

The stencil may be of the ordinary type used for marking or stamping purposes, having the desired pattern formed therein by perforations passing completely through the stencil sheet. However, the stencil may merely bear the pattern depressed into its surface in intaglio or formed upon the surface thereof in cameo relief. If the former is employed, the perforations of the pattern will permit deep deposits of the coating material upon the backing sheet and the design produced thereby will stand out in bold relief. If an intaglio or depressed pattern stencil is used, the design will assume a varied relief accordingly. If the latter type of stencil is used,—that is a cameo pattern,—the deposit of plastic material will be applied to the cloth intermediate the elements of the design or pattern, while those areas of the sheet overlying the design will be thin or scraped clean by the doctor blade, thus retaining little or none of the plastic material. The thickness of the applied layer is thus in part determined by the thickness or height of the stencil and in part by the space between the spreader roll and the doctor blade. A plurality of layers of the material may be applied before the design layer, and successive matching or overlapping design layers in different colored mixtures or mixtures of different materials may be applied in like manner.

A typical and preferred instance of the application of the invention will be described with respect to the coating of cloth with rubber cement compositions, for making waterproof material such as that used in light weight raincoats,—reference being had to the accompanying drawings, in which:

Fig. 1 is a side elevation, more or less diagrammatic, of a spreading machine;

Fig. 2 is a detail cross section, somewhat enlarged, of the doctor blade and roll shown in Fig. 1, showing a stencil, a sheet and a charge of plastic rubber thereon;

Fig. 3, is a developed view of the stencil, shown in Fig. 2;

Fig. 4 is an enlarged cross section of the stencil of Fig. 3 and of the superposed sheet of cloth and rubber coating thereon;

Fig. 5 is a cross section of a modified type of stencil;

Fig. 6 is a cross section of another type of stencil and of the superposed sheet of cloth and the rubber coating applied with the doctor blade set tight; and

Fig. 7 is a plan view of a sheet of cloth coated by means of the stencil shown in Figs. 3 and 4.

In operation, the sheet of cloth or like material 1 may be fed to the spreader roll 3, and thence drawn under the doctor blade 4 and over a heated table 5 by means of roll 6 to a take-up mechanism 6^a. The rolls and take-up mechanism are positively driven by any suitable power means (not shown) gradually to advance the sheet along the path indicated.

The doctor blade 4 is preferably ground to accurate parallelism with the surface of the spreader roll and is mounted upon a horizontal axis 7 between a pair of slides 8, which in turn are vertically adjustable in guideways 9 by means of hand-screws 10. The doctor blade 4 may be swung forward upon its axis 7, to permit the feeding of the sheet through the machine, but is then swung back again to vertical position or any angle desirable for proper operation in which it is retained against further backward movement by abutting members 11. These are likewise rendered accurately adjustable by means of screw threads 13. The doctor blade 4 is preferably relatively thick at its upper edge 14 to provide the requisite strength but the portion 15 adjacent to its lower edge 16 is preferably thin. The lower edge 16 is parallel to the upper portion of the spreader roll and spaced therefrom in accordance with the work to be performed. It may be of square cross section as shown or sharpened to a knife edge if required,—e. g., to completely remove the plastic material from the surface of the sheet.

The spreader roll 3 (Fig. 2) is a plain cylindrical roll, over which the stencil 17 may be fitted in the form of a cylinder 18 (or it may be in the form of a long sheet, passing continuously over the spreader roll) beneath the sheet of cloth. The cylindrical stencil 18, as shown in the developed view of Fig. 3 and in cross section by Fig. 4, carries the design in recessed depressions 20 or in perforations 21 as shown in Fig. 5 which pass completely therethrough. Obviously any pattern may be provided and used on the same apparatus, by fitting it over the spreader roll 3 and fixing it in position as by a key and slot (not shown) or by cementing or gluing or other means, depending on the nature of the material of which the stencil is made. After adjusting the stencil in appropriate manner and threading the sheet 1 through the apparatus as described, a mass of the plastic coating ma-

terial is applied to the upper surface of the cloth. The following rubber cement, for example, may be used:

	Pounds
Pale crepe rubber	25
White factice	25
Lithopone	10
Whiting	35
Dry color lakes	5
High test gasoline	100

This material may be spread in a thick roll 23 as shown and confined to that portion of the doctor blade which covers the width of the cloth upon which the design is being applied by means of adjustable guides (not shown). It is distributed by a knife or wooden paddle, if necessary, so that the full width of the cloth shall be covered at all times.

The driving mechanism may now be started, to draw the cloth 1 from the supply roll 1^a over the spreader rolls 3, beneath the doctor blade 4 over heating means 5 and to the take-up roll 6^a.

As the sheet passes upward over the roll 3 and comes into contact with the under surface of the mass of plastic composition 23, it draws the same forward by friction and also adheres to it. At the same time the plastic mixture penetrates into the sheet (especially with a fibrous or porous sheet, upon the first pass) being forced against it under increasing pressure as it approaches the doctor blade, and a still greater pressure as it passes beneath the knife edge of the same.

At this stage each portion 26 of the sheet 1, which lies over the perforated areas 20, 21, of the stencil is depressed (as shown in Fig. 2) and thus receives a deposit 26^a of the plastic material of correspondingly increased thickness. The amount of depression of the sheet 1 will govern the thickness of the deposit 26^a. Hence, shallow or small depressions in the stencil will produce thin deposits of the plastic while deep and large depressions will produce thicker deposits. The top of the layer of material being applied is defined by the edge 16 of the doctor blade.

Upon emerging from beneath the doctor blade 4, therefore, the sheet will have the appearance indicated and will appear in plan view as shown in Fig. 7, the thicker portions appearing dark and the thinner portions correspondingly light.

If the doctor blade is set sufficiently close and tight to the sheet 1, those portions of the sheet overlying the upper or plain portions of the stencil will acquire none of the plastic coating material (if the sheet has been previously coated to render it nonabsorbent of the plastic material) which will consequently be applied only to the areas (26, 26^a, 27) which are depressed into the stencil openings. The product will then have the clearly defined pattern as shown in Fig. 7.

The thus printed sheet may be run through the spreading machine a second time, employing a differently designed stencil—(which may be, for example, complementary to the first,) and with a differently colored coating composition,—to produce a composite multicolored pattern. This may be repeated several times,—especially with closely set doctor blades, when each coating treatment results in the application of the fresh plastic material only to the correspondingly colored design portions of the sheet as indicated in Fig. 6. Otherwise, one layer may more or less obscure the preceding layers although in some cases this may be a desirable result.

I claim:

1. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired pattern thereon, in relief, and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portions of said sheet overlying the depressed areas of said stencil.

2. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired pattern thereon, in relief and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portions of said sheet overlying the depressed areas of said stencil and scraping it off those portions of the sheet overlying the raised areas of the stencil.

3. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired pattern thereon in relief, and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portion of said sheet overlying the depressed areas of said stencil, and subsequently drying the thus coated sheet.

4. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired perforated pattern therein, and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portions of said sheet overlying the depressed areas of said stencil and scraping it off those portions of the sheet overly-

ing the raised areas of the stencil, and subsequently drying the thus coated sheet.

5. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired pattern thereon in relief, and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portion of said sheet overlying the depressed areas of said stencil and scraping it off those portions of the sheet overlying the raised areas of the stencil to leave a thin coating only upon such portions of the sheet.

6. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired pattern thereon in relief, and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portions of said sheet overlying the depressed areas of said stencil, and scraping it off those portions of the sheet overlying the raised areas of the stencil to leave no coating upon such portions of the sheet.

7. A method of producing predetermined patterns or designs upon sheet materials comprising the steps of applying a suitable plastic coating material to the surface of the sheet, supporting the sheet upon a stencil bearing the desired pattern thereon, in relief and forcing the stencil, sheet and plastic material through a constricting aperture or slit, thereby to force the plastic material upon and into the portions of said sheet overlying the depressed areas of said stencil and scraping it off those portions of the sheet overlying the raised areas of the stencil, to leave a deposit thereof, in relief, corresponding to the relief depressions of the stencil.

8. A printed sheet material characterized by bearing a pattern or design upon the surface thereof composed of flexible rubber coating material, in relief.

9. A printed sheet material characterized by bearing a pattern or design upon the surface thereof composed of a plurality of different flexible rubber coating materials, in relief.

10. A method of coating sheet materials in designated patterns, comprising passing said sheet in contact with a mass of suitable plastic material to form said coating, simultaneously with a relatively rigid sheet, bearing the desired design or pattern thereon in intaglio, through a constricting aperture defined by a pair of spaced edges substantially parallel thereto.

11. A method of coating sheet materials in designated patterns, comprising passing said sheet between a fixed blade and a spreading roll, substantially parallel thereto, said spreading roll carrying the desired pattern thereon, in intaglio, and applying to the surface of the sheet a mass of suitable plastic coating material.

Signed by me at Boston, Massachusetts, this first day of March, 1929.

JAY J. SINDLER.