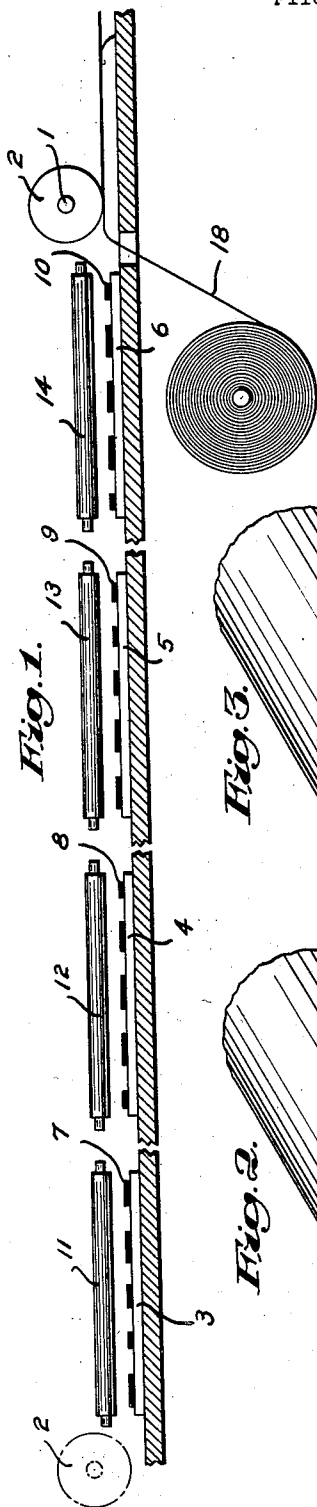
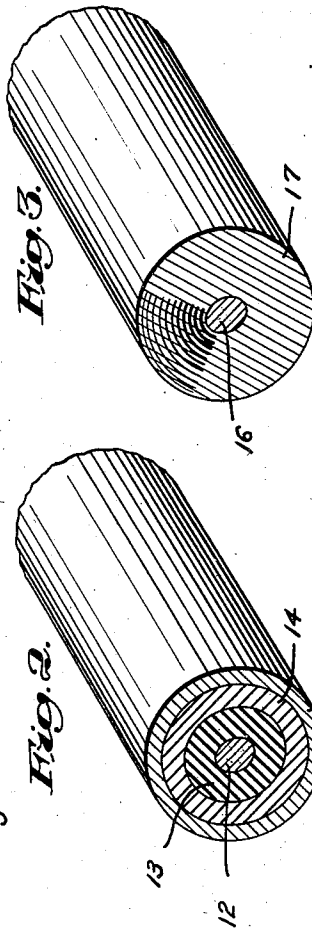
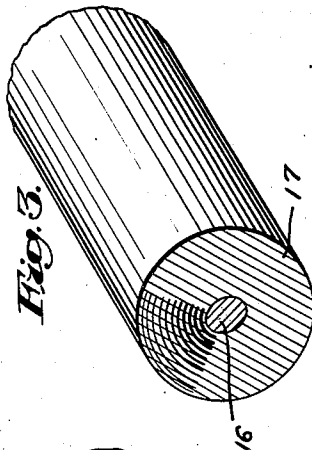
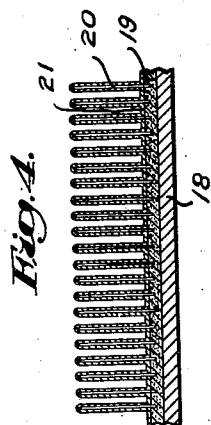
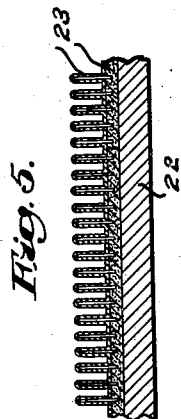
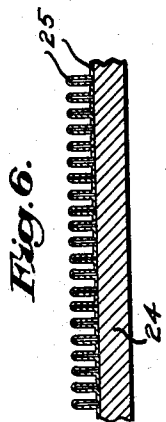


April 13, 1943.

J. J. ORMOND
METHOD OF PRINTING
Filed July 3, 1940

2,316,708



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UNITED STATES PATENT OFFICE

2,316,708

METHOD OF PRINTING

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Application July 3, 1940, Serial No. 343,823

11 Claims. (Cl. 101—211)

This invention relates to piled materials and more especially to printed piled materials, and to methods and equipment for producing same.

In printing on fabrics such as cotton textiles and the like, the usual practice is to employ vat dyes applied from recessed copper rolls. These procedures are not applicable to printing piled materials such as napped fabrics, flocked goods, and cut-pile fabrics, including velvet and the like. The vat dyes cannot be applied on these materials to provide images having clearcut edges, since they tend to run together with one another and blur. The upstanding fibers, generally characteristic of piled materials, further cause the formation of rough edges in printed subject matter, and tend generally to resist penetration of inks, in any amount suitable for providing a satisfactorily strong print. The use of relieved printing plates, which are known to provide strongest ink impressions, is objectionable due to the pressure these plates require. Such pressure tends to crush a fabric pile or nap and destroy its appearance. Also, the stretchable nature of fabrics, of which the piled material is exemplary, makes it very difficult to obtain fine register of colored ink designs successively applied in juxtaposed relation.

It is a chief object of the invention to provide a printed piled material, and to devise methods and equipment directed to this end, with a view to avoiding the crushing of the fibers of the piled material, and to effecting a substantial impregnation of ink on and between the fibers, which forms a strong print comparing favorably with a print on a flat surface. The invention further aims to indicate a method of printing differently colored inks on piled materials, by which color sections are printed thereon with sharp edges, and with elimination of blurred effects. Still another object of the invention is to provide a cheap, fast, and efficient method of applying printing images of improved quality on piled materials.

Attainment of these and other objects of the invention will appear in the following description of the drawing and discussion relating thereto.

In the accompanying drawing:

Figure 1 is a diagrammatic view illustrating the method of the invention;

Fig. 2 is a view in cross section illustrating an offset roll member employed in the method referred to;

Fig. 3 is a perspective view illustrating another type of offset roll;

Fig. 4 is an enlarged fragmentary detail view illustrating a printed flocked material;

Fig. 5 is another enlarged fragmentary detail view illustrating a cut-pile fabric which has been printed; and

Fig. 6 is still another enlarged fragmentary detail view of a printed nap material.

Referring to the drawing, Fig. 1 is a diagrammatic view illustrating the printing method of the invention. This method falls in the class of color printing known as juxtaposed printing. In such a type of printing, differently colored inks make up the various parts of the complete image, with each color section occurring beside, or closely adjacent to, the others. The customary procedure for applying the color sections consists in directly printing them from separate printing plates. Usually, one color is allowed to dry before a succeeding color is applied. This is required to prevent wet colors from running into one another and blurring, or otherwise smurring, to cause loss of register and sharp edges.

In accordance with the invention, a modified method of carrying out juxtaposed printing is provided by which a number of colored inks are simultaneously applied, in a wet state upon a piled material, with satisfactory preservation of sharply formed edges in the color sections. To effect such simultaneous application of ink, an offset or transfer blanket is made use of. Preferably, a blanket having a special construction is employed, and subjected to special treatments during its use. The invention also provides inks especially designed to function with the offset member and with one another as well as with piled materials.

The special inks referred to are utilized to effect a further modification of juxtaposed printing. This consists in simultaneously printing down beside one another a plurality of wet inks. These inks are composed of bases, or materials, of a character substantially opposed or repellent with respect to one another in much the same way that a greasy ink is repelled by the water-receptive parts of a lithographic printing plate. It has been found that differently colored inks of this character may be abutted, or disposed in contacting relation, without combining or running into one another. This characteristic is made use of to print a juxtaposed colored design with a number of differently colored inks, each of which may be held from running into one another and blurring, and which may be brought together along sharp edges while in a wet state.

As an example of inks having compositions

which are generally repellent to one another, there may be cited in one instance a greasy lithographic printing ink, and in a second instance a letterpress or printing ink containing little, if any, grease and not adapted to mix easily with the lithographic ink. Similarly, a so-called "metallic" ink, formed of metallic dyes or pigments, having a binder of a varnish nature, may be prepared, which is repellent to, or not easily combined with, the first two inks noted. Still other types of repellent ink bodies may be prepared, as for example, those using specific vegetable oils, shellac, and other types of vehicles.

In addition to their ability to refuse to mix with one another, the inks referred to are also specially designed to provide strong printing effects on piled materials. This has been effected by adding heavy coloring agents such as ground lead and other metals and pigments, which form a strong ink consistency, tending to provide substantial opacity in a printed state, especially suitable for effecting a substantial impregnation in piled materials.

Having reference to the offset roll, numeral 1 denotes a metal core provided with a transfer blanket 2 of resilient character, such as may be obtained by the use of rubber or other materials. The roll is adapted to be advanced in some suitable manner, as by gears and a rack, over a number of color printing plates indicated by the numerals 3, 4, 5 and 6. These plates are of the relief type and formed with printing image portions 7, 8, 9 and 10 respectively. Each of the plates carries a differently colored ink; as for example, plate 3 may carry a black ink, plate 4 a green ink, plate 5 a yellow ink, and plate 6 a red ink. The plates are furnished with these colors by means of inking rolls 11, 12, 13 and 14 which may be applied transversely of the plate in some conventional manner. While a diagrammatic illustration of the assembly of the roll and plates referred to has been illustrated, it should be understood that these plate members are arranged in register and locked up in a chase so that they present a uniform height to the advancing surface of the roll 2.

A feature of the invention is to successively collect all of the colored inks, while wet, upon the surface of the blanket 2 in juxtaposed relation to one another, and then simultaneously print them on the piled material, indicated in a roll form at the right-hand side of Fig. 1. To effect this, it is necessary to space the centers of each of the colored printing plates apart from one another a distance corresponding to the circumference of the blanket 2. This provides for the several color sections being brought together in register quickly and efficiently, and by supporting the roll in a continuous rack, such register may be maintained during a number of impressions.

It should be observed that offset blankets, particularly those of rubber, are usually only adapted to use with inks of the lithographic type, which are of a pronounced greasy nature. It will also be noted that the inks described as specially designed for use on the plates, may or may not be of a type adapted to being handled on the surface of a rubber blanket 2. The invention provides, therefore, means, consisting of a film or films, developed on the blanket surface particularly designed to facilitate handling of ink of various types, both in respect to picking up such inks, in large amounts, from the surface of a series of printing plates, and in re-

spect to releasing such inks upon a material to be printed.

In forming a film on the blanket 2, various materials may be resorted to, which will create a body more adapted to attracting ink than the rubber surface. For example, certain liquid hydrocarbons, of which gasoline and acetone are exemplary, may be mixed with a material such as hydroquinone, to form one satisfactory agent for this purpose. Various other organic liquids of a film-forming nature may be employed. It may also be desirable to utilize a film for the purpose of preventing impregnation of ink into the pores of the rubber; and to effect this, certain other materials may be employed as, for example, hydrocarbon solids which are of a grease-repellent character, as camphor, various water-repellent organic compounds, and others. In a preferred treatment of the roll, a first coating or film may be applied to protect it from penetration of ink, and thereafter a second coating or film may be formed on the first film for facilitating ink handling as described.

By utilizing a film-treated blanket of this nature, it is possible to make use of various types of ink, and in particular, inks which are sufficiently repellent with respect to one another to cooperate in forming clearcut edges in an image in which several colors are disposed beside one another. For example, the black ink on #3 plate may be composed of a heavy pigment mixed with a heavy, greasy oil such as linseed oil, the mixture generally resembling the mixture of conventional lithographic printing ink. This type of ink is readily picked up from a relief plate by the film of organic material described, and released therefrom upon a piled material. The green ink used for plate #4 may be of the metallic type, consisting of metallic dyes and a base which is not miscible with grease, as for instance a varnish, and is similarly readily handled by the film. A third type of ink would be used in yellow plate #5. This ink might be composed of still another type of base, as for example, a vegetable oil which is repellent to grease, but which is also receptive to the film.

It should be observed that a considerable number of colors may be used, relying on different bases which are repellent to one another. However, it is possible to employ a considerable number of colors, using only two groups of repellent bases for these colors. This can be effected by simply applying colors from one group alternately with colors of the other group. For example, there may be provided a greasy red and a greasy black, while a non-greasy green and a non-greasy yellow are formed. It then remains to arrange the color sections so that a red or a black will always fall adjacent a green or a yellow at both sides thereof.

The invention also provides for a novel continuous procedure of collecting a plurality of wet inks upon the surface of a blanket and then simultaneously applying the inks to a napped surface. This is effected by continuously collecting fresh amounts of ink on the offset roll without cleaning the roll between each impression. A further function of the film or coatings, in combination with relatively repellent or immiscible inks, is to make possible a continual application on the already inked blanket of fresh amounts of ink of different colors, without changing the sharp edges of the original design, or having the colors run into one another. Such a procedure is very efficient since it saves the

cost of cleaning equipment and its operation makes possible a faster and cheaper printing process.

Another important feature of the invention consists in a special construction of offset roll, as has been more particularly shown in Figs. 2 and 3 of the drawing. This roll construction is particularly designed to effect proper impregnation of inks, on and between the fibers of a piled material, in such amounts as will provide a strong printing image, and without modifying or distorting the edges of one color image with respect to the edge of an adjacent color image by the squeeze of the roll on the cloth. To do this, it is necessary to maintain a cushion effect in the roll, and at the same time to eliminate distortion of the roll surface as it moves into contact with the material to be printed, since any such distortion of the roll surface would tend to flatten out or distort the edges or lines of subject matter contained on the roll surface.

Accordingly, the roll is constructed with an outer surface portion which is relatively soft to furnish the cushion desired. At the same time, the roll is provided with a relatively harder inner portion which tends to resist any substantial deformation of the roll surface. Such a roll construction may be obtained in several ways. For example, in Fig. 2 there has been shown a steel core 12 which is provided with an extremely hard rubber layer 13, formed, for instance, from a rubber which has been vulcanized with a large percentage of sulphur, or which is loaded with a filler. 14 denotes another layer of rubber of relatively less hardness, and 15 denotes an outer layer of a definitely soft resilient rubber, or similar resilient material. It will be seen that by the means described, a graduated hardness is obtained, extending inwardly toward the center of the roll. This construction tends to resist deformation of the roll and substantially avoid blurring of the lines or sharp edges referred to. At the same time, a degree of resiliency is retained in the roll surface which is capable of impregnating ink in the pile fibers and forming a strong print.

In Fig. 3, I have shown another type of roll in which a steel core 16 has a single coating of rubber 17 which is formed with a graduated hardness, being very hard in its inner portions adjacent the steel core, and being relatively soft at its outer peripheral portions. Other means of forming a roll of this general character may be resorted to.

In Figs. 4, 5 and 6, I have shown a number of piled materials in a printed state. With reference to Fig. 4, 18 denotes a base for a flocked material which is coated at one side with an adhesive 19, in which has been supported a plurality of fibers 20, occurring in an upright position. The inks applied on the material by the method of the invention become dry almost instantaneously, and thoroughly impregnated about the bottoms of the fibers in a thin film 21, as shown. Also, the ink film is applied on and about the fibers themselves without sticking the tips together. It is pointed out that in previous attempts to print piled materials with relief printing members, the inks used have tended to become thickly disposed at the top of the fibers, and to stick these fibers together. This greatly impairs the appearance and character of the piled material. In applicant's printed stock, the fibers remain in an unchanged position so that

the physical appearance of the goods is not substantially altered.

The impregnation of ink all the way around the fibers and down to their bottom portions, is useful in several respects. It provides a strong print which has not heretofore been obtainable, and which favorably compares with a print on a flat surface. Impregnation of ink throughout the depth of the pile also tends to develop changeability in color values, governed by the angle from which the print is viewed. This is particularly desirable, for example, in wall coverings. If desired, certain other novel effects may be imparted to piled material by the impregnation of ink on and between the fibers in the manner described. For instance, with a piled material made from harsh, bristle-like fibers, the application of a printing image which is composed of soft, oily inks may be utilized to soften the texture of the material. Still other novel effects may be secured such as water-proofing, sizing, soundproofing and the like.

Printing of the character described may also be effected on other types of piled materials as for example the cut-piled stock 22 illustrated in Fig. 5 with an ink film 23, or a napped material 24 illustrated in Fig. 6 with an ink film 25, or others not necessarily of a piled character, as cotton goods, jute cloths, and the like. In each case, ink is impregnated on and between the fibers to form a strong print without materially changing the disposition of the fibers.

The principle of simultaneously applying with an offset member, a plurality of wet inks, may be utilized in other ways. For example, instead of the relief printing plates illustrated in the diagrammatic showing of Fig. 1, it is possible to employ, with the film-treated blanket, intaglio printing plates. This may necessitate change in the inks since for intaglio plates an ink of a slick character, suitable for operation with a doctor blade, is required. It has been found that a number of intaglio inks, repellent with respect to one another, may be compounded which will function in a manner similar to that described in connection with the relief printing inks set forth above. It will be seen that changing the base character of a series of colored inks, such as would be required in changing from relief plates to intaglio plates, tends to affect the character of the fibers upon which the inks are applied. Therefore, this use of different types of plates and inks may be resorted to in securing various effects on the surface of the piled material.

It will be observed that a number of advantages are attained by the invention. A strong colored print, comparing favorably with a colored print on a flat surface, is effected upon a piled material. The piled material may either have its texture preserved in its original state, or beneficially modified by the printing ink. Changeable color effects are presented by impregnating colored inks through the depth of the piled material. The method resorted to is characterized by the furnishing of sharply cut edges in a juxtaposed printing image, by the simultaneous application of wet inks, on napped material and by the continuous nature of these operations in which an inked offset roll is repeatedly employed without any cleaning being carried out thereon. The method of developing films on the surface of an offset roll makes possible novel combinations of an offset printing member with relief printing plates, and other

types of printing plates for treatment of fibers. A novel principle of effecting juxtaposed colored printing images has been disclosed, utilizing different kinds of inks to avoid smurring of the edges of colored ink sections. The inks further provide special opacity and drying effects. The use of the offset member is made more efficient by a special construction thereof, consisting of graduated resiliency in the blanket, which is instrumental in properly impregnating inks of a relatively heavy consistency on and between the fibers of a piled material without crushing such fibers. The entire procedure is characterized by speed, quality and cheapness.

While I have shown preferred embodiments of the invention, it should be understood that various changes therein may be resorted to, in keeping with the spirit of the invention.

Having described my invention, I claim:

1. In a method of printing, the steps which include applying a plurality of colored inks on printing plate members, preparing on the surface of an offset blanket a film which is receptive to the said inks, then collecting the inks on the said film, and then simultaneously printing.

2. A method of printing a piled material which comprises providing a plurality of inks which are of a repellent character with respect to one another, applying the said inks upon relief printing plates, treating an offset blanket to form on the surface thereof a film receptive to each of the said inks, then collecting the said inks upon the film in juxtaposed relation, and then simultaneously transferring the inks to the said piled material.

3. In a method of printing a piled material, the steps which include applying a heavy-bodied ink on a printing plate member, preparing on the surface of an offset blanket a film having relatively greater affinity than the printing plate member for the ink, said film further having relatively less affinity than the said piled material for the ink, collecting ink from the said printing plate member on the said film in juxtaposed relation, and then printing the ink from the film on the piled material.

4. In a method of printing a piled material, the steps which include applying a plurality of heavy-bodied differently colored inks on a series of printing plate members, preparing on the surface of an offset blanket a film having relatively greater affinity than the printing plate member for the said inks, said film having relatively less affinity than the piled material for the inks, transferring the inks from the printing plate members to the film on the offset blanket in juxtaposed relation, and then printing the inks from the film-covered offset blanket on the piled material.

5. A method of printing a piled material which comprises providing a plurality of differently colored inks which are repellent with respect to one another, said inks being of a heavy-bodied character adapting them to be applied to a piled material along substantially clearcut lines, applying the inks on the surface of printing plate members, preparing on the surface of an offset blanket a film, said film having strong affinity for the heavy-bodied inks for the purpose of removing relatively large amounts of the inks from their respective printing plates, transferring the inks from the plates to the said film in juxtaposed relation, and then printing the inks from the transfer member on the piled material.

6. In a method of printing a piled material, the steps which include applying a plurality of differently colored printing inks on printing plate members, preparing on the surface of an offset blanket a film of a material adapted to prevent impregnation of the transfer member by the colored printing inks, then applying on the said film an ink-trapping film for modifying the ink-trapping character of the transfer member, then collecting inks from the said printing plates in juxtaposed relation on the ink-trapping film, and then printing.

7. In a method of printing, the steps which include applying a printing ink on a printing plate member, preparing on the surface of an offset blanket a film of a protecting material, applying over the film of protecting material an ink-trapping film, then collecting ink from the printing plate on the ink-trapping film, and then printing.

8. In a method of printing a piled material, the steps which include applying a plurality of differently colored printing inks on a series of printing plate members, preparing a transfer blanket with a film of material adapted to resist penetration by the said colored printing inks, applying a second film over the offset blanket, said second film having relatively greater affinity than the printing plate members for the said differently colored printing inks, collecting the inks from the printing plate members on the second film, and then printing.

9. In a method of printing a piled material, the steps which include applying a plurality of differently colored printing inks on a series of printing plate members, preparing a transfer blanket with a film of material adapted to prevent impregnation of the transfer blanket by the said colored printing inks, applying a second film over the offset blanket, said second film having pronounced affinity for the said colored inks, collecting the inks on the said second film in juxtaposed relation, and then printing from the second film on the piled material.

10. That improvement in methods of printing which comprises providing a plurality of colored inks which are repellent with respect to one another, applying the said inks upon printing plate members, treating an offset blanket to form on the surface thereof a base film of protective material, applying an ink-trapping film over the base film, then collecting the inks on the said ink-trapping film in juxtaposed relation, and then printing.

11. That improvement in methods of printing a piled material which comprises applying a plurality of heavy-bodied differently colored printing inks on a series of printing plate members, preparing on the surface of an offset blanket a film which is resistant to penetration by the differently colored printing inks, applying an ink-trapping film over the said first film, said ink-trapping film having relatively greater affinity than the printing plate members for their respective printing inks, said ink-trapping film further having relatively less affinity than the piled material for the differently colored printing inks, collecting the differently colored inks in juxtaposed relation on the said ink-trapping film and then printing the inks on the piled material.

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