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FABRIC PRINTING

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The present invention relates to a process of printing on fabrics and to the fabrics obtained by applying said process.

It is known to fix aqueous solutions or suspensions of dyes and of pigments on fabrics by means of printing machines or of engraved blocks or of frames permitting the printing known as screen printing. The aqueous solutions and suspensions used have in general gums, dextrine, mucilages and various materials added to them which give them the viscosity necessary for the application by the printing machine. After the printing operation, the dyes or pigments are fixed on the fabric and finally the latter is washed to eliminate the water-soluble thickeners.

The process which has just been described has serious drawbacks: necessity of effecting a fixing operation and a washing operation after the printing, which are costly operations and which furthermore may alter the fabric, difficulties of over-dyeing a printed fabric, owing to the fact that the printed parts are subjected to the over-dyeing in the same manner as the non-printed parts, etc.

One of the objects of the present invention consists in having found that it is possible to replace the aqueous solutions hitherto used for printing by machine, or by means of a block or by the screen process, by colloidal solutions, in organic solvents, of cellulose esters or of synthetic resins or mixtures of same. By means of said colloidal solutions in organic solvents, impressions can be applied to fabrics, for example with printing machines provided with known intaglio engraved cylinders, which impressions have, without a subsequent operation, the flexibility, the colours, the mechanical strength, the fastness to washing of the impressions obtained with the known processes, when the operations of fixing and of washing are completed.

Another object of the invention consists in providing a colloidal solution or dispersion in which the colloidal material, the plasticizer and the solvent are selected to give properties making it possible to employ the solution in the ordinary fabric printing processes.

Previously known colloidal solutions have been unsuccessful for two principal reasons: First, the rate of drying was not satisfactory, either too fast or too slow; Second, the surface tension of the solutions was too high so that difficulty was experienced in obtaining complete removal of the solution from the printing surface, particularly from the deep points of the surface. This second difficulty also caused trouble in screen printing for the solution tended to form threads which streaked the printed surface and marred the effect.

The present invention, therefore, aims to produce a colloidal organic solution for use in these processes and which has physical properties approximating those of the previously used aqueous solutions but which has the advantages attributable to the colloidal substance employed.

Amongst the cellulose esters nitrocellulose and acetylcellulose will be particularly mentioned and amongst the synthetic resins the condensation products of polyvinyl alcohol with one or a plurality of aldehydes.

The choice of the solvents used for making the colloidal solutions used according to the invention is of great importance. Such solvents should have a fairly slow rate of evaporation, preferably approximating to that of water. It has been found in the second place that it is often advantageous to use water-soluble solvents; glycols, monochlorhydrins of glycols, glycol esters, esters of glycol ethers, ethyl lactate, etc. This selection of water-soluble solvents is a purely empirical test of desirability because it is not intended to use water in the compositions but the water-soluble solvents have, in general, been found best adapted by reason of their physical characteristics. The application of such solvents enables:

a. The filling of the engraved parts of the cylinder to be effected without a film forming on the non-engraved parts.

b. The drying of the printed pieces to be effected in the drying chambers or on the heated cylinders of the printing machines.

c. The colloidal solutions to be preserved during a normal time in the tank of the printing machine, or in the work shop.

After being applied by the machine and dried, the impressions are perfectly adherent to the fibers and the printed fabric can be washed without special precautions as though the impressions were effected by the known processes.

The two following examples give compositions which give excellent results for effecting the impressions according to the invention, without limiting it in any way.

Example I

	Grammes
Nitrocellulose, ½ second viscosity	400
Ethyl alcohol	76
Castor oil (plastifier)	300
Tricresyl phosphate (plastifier)	200
Butyl phthalate (plastifier)	150
Ethyl lactate (solvent)	600
Butyl glycol (solvent)	300

In the above example, ethyl alcohol is used only to reduce the hazard of handling nitrocellulose in the dry state. The ethyl alcohol is merely an additional solvent in the example and may be dispensed with or its place taken by an additional amount of one of the other solvents.

In the composition set out above the constitu-

ents have approximately the following proportion:

	Per cent
Nitrocellulose	20
Total plastifier	32
Total solvent	48
	100

Depending on the plasticity desired for the resulting printed film the amount of plastifier may be varied. In like manner, the amount of solvent employed may be varied to change the viscosity and density of the solution.

Example II

	Grammes
Polyvinyl aceto-formal prepared according to the indications of my application Serial No. 748,263, dated the 13th of October, 1934	300
Methyl phthalate (plastifier)	74
Butyl phthalate (plastifier)	74
Ethyl paratoluenesulfamide (plastifier)	147
Ethyl glycol acetate (solvent)	300
Glycol monochlorhydrin (solvent)	400
Butyl glycol (solvent)	300

In the above example, the constituents have the following approximate relation:

	Per cent
Polyvinyl aceto-formal	18
Total plastifier	18
Total solvent	64
	100

As noted above, the plasticity of the film can be varied by altering the proportion of plastifier, and the viscosity and density of the solution can be varied by a change in the proportion of solvent.

Of course the foregoing examples relates to colourless colloidal solutions. Soluble dyes or mineral or organic pigments can be added to them if desired.

When it is desired to mix metallic powders such as bronze powder with aqueous solutions or suspensions of gums or mucilages, considerable practical difficulties are encountered, as such aqueous solutions attack the metallic powders to a considerable extent, or at least substantially alter their hue.

Moreover, it has been found that nitrocellulose colloidal solutions such as those described in Example I, very quickly gelify when brought into contact with bronze powder.

For effecting metallic and, in particular, bronze impressions according to the invention, the composition of Example II gives very satisfactory results, or the following composition may also be used, without being in any way limitative:

Example III

	Grammes
Polyvinyl aceto-formal prepared according to my application Serial No. 748,263, dated the 13th of October, 1934	300
Methyl phthalate (plastifier)	74
Butyl phthalate (plastifier)	74
Ethylparatoluolsulfamide (plastifier)	147
Ethyl glycol (solvent)	300
Xylene (solvent)	300
Ethyl lactate (solvent)	200
Ethyl glycol acetate (solvent)	200

The same relative proportions exist here between the polyvinyl aceto-formal and the total plastifier and total solvent as in Example II above.

A suitable quantity, for example 200 grammes, of bronze powder is added to this colloidal solution, and no substantial thickening effect is produced thereby, so that the composition can be used industrially without danger of gelification.

The suspension thus obtained can be used for printing by machine or by means of a block, or by the screen process. It remains very stable with age, in particular it has no tendency to gelify, and its tendency to turn green decreases with the purity of the solvents.

Another point of the present invention consists in having found that the application of the above described colloidal solutions, effected under the normal conditions of use of the printing machines or the intaglio engraved cylinders, renders the fibres impregnated with said colloidal solutions impervious to water while preserving their flexibility.

This operation consequently makes it possible to effect the most varied subsequent treatments of the printed fabrics. Amongst such treatments will be cited:

a. The dyeing of the non-printed parts.

b. The physical and chemical treatments of the non-printed parts such as the mercerizing or the immunisation of cotton or of fibres of regenerated cellulose by complete immersion of the printed fabrics in suitable aqueous solutions.

c. The carbonizing of the parts which are not protected by the colloidal solutions and the resist over-printing of the parts protected by said solutions. In this case the necessary products are applied to the fabrics by the known means.

The following examples will enable the second object of the present invention to be better understood.

Example 1

A crepe de chine made of natural silk is first printed, by the means described, with a colloidal solution according to the invention.

Dyeing is effected, to obtain a navy blue with:

Naphthylamine 5 BCL navy blue	per cent	2
Naphthylamine 4 BCL black	do	1
Sodium sulphate crystallized	do	20
Water (relative to the volume of the fabric)	volumes	30 to 40
Formic acid per litre of water	gr.	0.5

Dye with 30 to 40 volumes at about 60° C.

Example 2

A cotton veil is first printed by the means described then padded in a bath of concentrated sulphuric acid (between 55 and 62° Beaumé) at 10° C. This impregnation lasts a few seconds and is followed by a very abundant rinsing effected in width. It is well known that concentrated sulphuric acid acts on cellulose and renders it relatively transparent or very translucid ("parchmentization"). Consequently, in the present instance, the printed parts are not altered by the acid treatment whereas the non-printed parts undergo the usual parchmentizing effect.

The fabric is then mercerized, rinsed, acidified, rinsed and tentered according to the known methods. The printed parts remain intact from the actions both of the acid and of the mercerization.

Example 3

A fabric composed of a backing of natural silk (warp and weft) and of a second reinforcing warp sateen weave made of rayon is first printed

by the means described. It is again printed with a suitably thickened solution of alumina chloride or of alumina sulphate. The dry fabric is carbonized according to the known processes and the rayon parts printed with the colloidal solutions of the invention remain intact.

The invention is not limited to the specific disclosure, but it is to be limited only by the scope of the following claims.

What is claimed is:

1. In a fabric printing process, the step of printing on the fabric with a composition containing polyvinyl aceto-formal approximately 18%, plastifiers totaling approximately 18%, and solvents totaling approximately 64%.

2. In a fabric printing process, the step of printing on the fabric with a composition containing polyvinyl aceto-formal approximately 18%, plastifiers totaling approximately 18%, and approximately 64% of water soluble organic solvents having a rate of evaporation approximating that of water.

3. In a fabric printing process, the step of printing on the fabric with a composition containing polyvinyl aceto-formal; plastifiers including methyl phthalate, butyl phthalate, ethyl paratoluenesulphamide; and solvents including ethyl glycol acetate, glycol monochlorhydrin, butyl glycol.

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