Patented Nov. 15, 1949

2,488,397

UNITED STATES PATENT OFFICE

2,488,397

PROCESS FOR SECURING ORNAMENTAL EFFECTS IN TEXTILES

William P. Hall, Wilmington, Del., assignor to Joseph Bancroft & Sons Co., Wilmington, Del., a corporation of Delaware

No Drawing. Application September 6, 1945, Serial No. 614,806

8 Claims. (Cl. 8—71)

1

This invention has to do with the production of patterns or ornamental effects on cellulose fibers such as cotton and rayon fabrics and is a continuation-in-part of my application Serial No. 484,780, filed April 27, 1943, and now abandoned.

Heretofore, chintzes have been produced with permanent luster or finish through the use of urea formaldehyde and other resins. It has also been proposed to produce patterns or ornamental effects (such as have been ordinarily obtained by resists) with resin, but to the best of my knowledge the processes heretofore proposed have been either impractical or too expensive.

It is a primary object of the invention to produce such effects with resin in a highly practical and economical fashion.

Generally considered, I propose to obtain the desired pattern or ornamentation by printing the fabric with a resin solution such as hereinafter described, and then glaze the printed fabric in a friction glazer to impart luster and to institute polymerization. However, in most cases, the fabric is sized before the printing. The sizing employed may be impermanent or permanent, in whole or in part. It should be such as has or gives substantially the same frictional characteristics as that of the printed portions of the fabric, so that the entire surface of the fabric has substantially uniform frictional characteristics or resistance. Thus the fabric acts frictionally uniformly in all portions with respect to the glazer and all difficulties, such as "chewing" of the cloth, which would otherwise be encountered, are avoided. It will, of course, be understood that the sizing employed should not be such as interferes with the setting and curing of the resin or with the pigmentation, should pigments or other coloring matter be employed in the resin solution. It is to be understood that sizing is to be employed where the fabric, after bleaching, is in substantialy the pure state. If the bleaching is conducted so as to leave behind a substance or subtances functioning like the sizing, this would be the equivalent of the sizing. Moreover, where the "coverage" of the printed portions is large, say, for example, 80%, it is unnecessary to size.

The following is a typical example of how the process may be carried out. The grey goods are first desized, boiled and bleached according to well known bleach house procedure. If the pattern is to be obtained on a dyed piece of goods, the fabric is dyed in the dyehouse in the usual manner.

2

The fabric is now sized (when necessary) with a sizing of the characteristics described and which, for example, may be applied by padding, dipping, spraying and the like. A sizing suitable for the purpose may be made up of approximately 40 parts by weight of yellow dextrin as a stiffening agent and approximately 4 parts by weight olein oil as a friction reducer, in 356 parts of water, bringing the total to 400 parts or 50 gallons. In this connection a gallon weighs 8 lbs. (In the textile industry, "on 50 gallons" means water to make 50 gallons where one is dealing with an aqueous solution, as is the case here.) While this concentration is found to give very satisfactory results, the concentration may be substantially varied, so long as the desired friction characteristics are obtained, and sufficient penetration, as hereinafter pointed out, is assured. Other stiffening agents and oils not injurious to the process may be employed.

The fabric is now dried, as, for example, in the customary tenter frame.

The printing solution is now applied in the usual manner with printing rolls. The printing solution may be prepared, for example, as follows on weight: 90 parts of urea formaldehyde resin are dissolved in 120 parts of water, preferably at room temperature, and to this is added approximately 25 parts of 50% sulphonated castor oil and then 100 parts of 6% gum tragacanth solution, with stirring. The resultant mixture is then strained, and shortly before printing 5 parts by weight of a catalyst, such as ammonium thiocyanate, ammonium phosphate, or the like, separately dissolved in 10 parts of water, is added. The printing then follows. The gum tragacanth is employed as a thickener, to give to the printing solution the desired consistency to remain in the depressions of the printing rolls. Any other of the customary thickeners employed in printing, not harmful or detrimental in the process, such, for example, as starch or methyl cellulose, may be employed. These are ordinarily termed "printing gums." The thickener also by reason of the viscosity it imparts, prevents too deep penetration of the resin into the fibers, although permitting sufficient penetration to secure firm adherence. Because of this, the concentration of the resin solution is not critical and stronger concentration of resin than usual may be employed. In the example there is approximately 22.5% resin in the solution. The thickener also tends to prevent spreading of printing solution, during and immediately following

printing, which helps to maintain a clear sharp print.

The fatty or oily material acts as a lubricant when the cloth passes through the glazer. Practically any fatty, waxy or oily lubricant not detrimental to the process or fabric, may be used.

The fabric after leaving the printing rollers is threaded over the cans in such way that when it leaves the printing machine drying cans, it is slightly damp. In other words, a small amount of moisture in excess of the normal regain of the fabric is left in the printed part of the cloth, say approximately 10%. Care must be taken not to overheat the fabric on the hot cans in order to avoid substantial polymerization of the resin. As a simple test, if the fabric feels slightly damp and not hot, it has not been overheated. We prefer to use one or more cold cans following the hot cans, so that the fabric after leaving the hot cans, will be completely cold before being folded or batched. This gives the best results.

Other methods of drying well known in the arts, such as, for example, hot flue and loop dryers, may be used instead of the hot cans provided the principles of drying above set forth are followed.

The fabric is now given one or more runs through a friction glazer, such as a three-roll glazer, the upper roll (i. e., faster rotating roll) of which is made of steel and heated to a temperature of approximately 300° F. to 400° F., the middle roll of which is the usual husk roll, and the bottom roll of which is usually made of metal. The middle and bottom rolls are not directly heated but derive heat from the top roll. The printed side of the fabric is against the steel surface of the top roll, and the friction ratio is preferably approximately 4:1. The friction ratio may be as low as 1½:1 and perhaps slightly lower (especially where extremely high pressures are employed), but generally the higher ratios are more desirable. The amount of pressure exerted by the glazer varies with the type of machine (from approximately 5 to approximately 75 tons), but those which exert the greater pressure usually produce superior results. The fabric is desirably not threaded on the glazer in the usual way, but is passed directly through the friction nip (i. e., between the top friction roll and the middle roll), and travels at the speed of the middle roll.

The glazing simultaneously imparts luster and institutes polymerization or setting of the resin. Since the cloth moves at substantially the same speed as the cotton bowl of the glazer, the glaze is obtained solely by the pressure, the heat, and the friction of the upper steel bowl. It would seem reasonable to expect under these conditions that a smearing of the pattern would result but such is not the case. The drying of the cloth to not more than the 10% moisture hereinbefore referred to, prevents squeezing out of the printing solution. The printing solution of resin, thickening agent and lubricating material, has such characteristics that it will not detrimentally adhere to the hot upper steel bowl, but, on the contrary, adheres strongly to the cloth. The waxy, oily or fatty lubricating material acts as a lubricant between the printed pattern and the steel surface which tends to decrease the possibility of any of the printing solution sticking to the steel bowl. It is probably due to the foregoing that smearing of the pattern does not result. Usually it is desirable to follow a glazing operation with a cure in a curing chamber, at approximately 290° F. for preferably 2 minutes. The

temperature may be lower or higher, in which case the time may be longer or shorter, respectively. The preferred range is from 290° F. to 340° F. and from 5 minutes to about ½ minute.

The temperature and time of curing may vary somewhat, depending upon the temperature of the glazer and the number of glazing runs, type of fabric, etc. In some cases, depending upon the number of runs through the glazer, upon the type of resin used, the type and amount of catalyst employed, and the particular finish desired, the curing in the curing chamber may be dispensed with. In this case a temperature of 400° F. to 450° F. is preferred for the heated steel roll of the glazer.

The fabric is now given a light soaping with a dilute solution of a synthetic detergent followed by washing in warm water to remove the catalyst and other non-permanent material. A small quantity of alkaline or acid material, depending upon the catalyst, may be used with the detergent in order to neutralize the catalyst.

The cloth is then dried as on the regular tenter frame.

The print shows up in the finished product as lustrous glazed portions like glazed chintz. It withstands water and washing and for all practical purposes is permanent.

Thus far, I have described the invention as employing urea-formaldehyde resins. Other resins or resin-like materials setting to an insoluble hard product under the conditions of the process, and which after setting will not undesirably soften at the temperature of boiling water, may be employed. Thus, for example, I may employ other amino-aldehyde resins such as: melamine-formaldehyde, dicyandiamide-formaldehyde and the like. I may also employ phenol-formaldehyde resins, or ketone-aldehyde resins such as, for example, acetone-formaldehyde. Here, of course, it may be desirable to adjust proportions as is well understood in the art. For example, it is known that one-half part of melamine-formaldehyde will give substantially the same results as one part of urea-formaldehyde. The above is well understood in the art of glazing. Mixtures of the above resins may also be employed.

Carbohydrate - aldehyde, protein - aldehyde, polyvinyl alcohol-aldehyde and like products may also be employed, such material acting at the same time, if so desired, as the thickening agent in the printing solution. In such cases the thickening agent becomes a durable part of the print. For example, I may use a printing mixture of starch and formaldehyde containing the other desirable ingredients previously described.

It is further to be noted that while the formulations above given secure highly satisfactory results, they are not critical, as is well understood in the art. For example, with respect to the resin content of the printing solution, this may vary, depending upon the softness or stiffness desired. In place of the olein oil, other sulphonated or non-sulphonated oils or waxes, such as sulphonated tallow, lecithin, or fatty amides, may be employed. It is also possible to employ a protein such as casein or albumen as a thickening agent. In this case, the protein material will remain as a permanent part of the size after washing. Mixtures of permanent and non-permanent thickening agents may also be employed. The amounts of oil and thickener may also vary so long as the desired characteristics are obtained. The viscosity or consistency of the printing solution should be such that the paste is properly held by

the printing rolls. This is a good measure of the amount of thickener to be employed in any particular formulation.

For a clear printing solution, i. e., one not containing pigments or other coloring matter, 60 parts of dimethylol urea 50% solids may be dissolved in 150 parts of dimethylol urea 40% solids to which is added 100 parts of 6% gum tragacanth solution and then 25 parts of olein oil, with 5 lbs. of ammonium thiocyanate previously dissolved in 10 lbs. of water, added as a catalyst, just prior to the printing.

As additional examples of clear printing solutions, attention is directed to the following:

Example II

	Parts
Dextrinated tapioca starch	600
Formaldehyde (37%)	300
Ammonium thiocyanate	40
Olein oil (50%)	50
Water	150

Example III

	Parts
Methylated hexamethylol melamine 80%	300
A mixture of karaya and gum tragacanth	400
Olein oil (50%)	50
Ammonium thiocyanate	25
Water	200

Example IV

A ketone-aldehyde resin was prepared by reacting together 450 parts of acetone, 150 parts formaldehyde (37%) and 10 parts of potassium carbonate, the reaction product was obtained by vacuum distillation. A printing mixture was now prepared by mixing together the following ingredients:

	Parts
The product obtained	100
6% gum tragacanth solution	100
Polyethylene glycol	10
Potassium carbonate	15

As to the amount of fatty oil in the sizing solution, this will vary somewhat with the particular composition of the printing solution. Enough oil is added to the sizing solution to obtain the desired frictional characteristics. This can be readily determined by trial in any given case.

The catalyst employed may vary with the particular resin used. The catalyst should always be one which for the particular resin will give the proper pH during the curing of the resin. Since the resinous materials mentioned above cure both on the acid and the basic side a large variance in pH on the cured fabric is desirable. For example, the acetone-formaldehyde resins cure satisfactorily at a pH of 10 while the melamine-formaldehyde resins cure satisfactorily at a pH of 4.

Thus far the invention has been described in connection with a clear printing solution—one not containing pigments or other coloring matter. The pattern, whether on white or dyed cloth, is glazed.

Where the pattern itself is to be colored and glazed, I make use of the type of dyestuff formed on the fabric by there coupling a diazo compound with a base. This class of dyestuff is usually divided into the diazo-developed type (D. D.) and the naphthol type, the latter being the more important, since the colors obtained by this method usually have superior durability to light and washing.

Essentially as far as printing is concerned, the process consists in applying to the fabric, usually

by impregnation, an alkaline solution of a base followed by printing with a diazotized salt.

Under these conditions a coupling reaction between the base and the salt occurs, forming a permanent coloration on the fibers.

When using the above method in obtaining a colored durable printed chintz effect on fabrics, I first impregnate the fabric uniformly with say, for example, a Naphthol AS base solution, and then dry in the conventional manner. I then print the fabric with a suitable diazotized salt, such as for example, Fast Red Salt RL, the print being of the desired pattern and containing in addition to the salt other desired ingredients necessary in printing and in obtaining the durable glazed effect. These ingredients as previously described, consist of thickening agents, resinous materials, or materials forming resinous products, catalysts, if desired, and lubricants. The fabric is now dried to dampness as hereinbefore described and this is followed by a glazing operation which brings out the finish and causes setting of the resin. As described, the glazing may be followed by additional curing in the oven to further set the resinous material.

After curing, the fabric is washed thoroughly in hot water to remove all uncoupled naphthol base and also the soluble ingredients of the printing size. The resulting fabric has a sharp, distinct, brightly colored glazed pattern imposed upon a dull background.

Since the diazotized salt is present in the printing mixture, the naphthol color is only produced within the confines of the pattern.

In printing and glazing with other colored printing solutions, mark-off from the glazer becomes a serious problem. These mark-offs are caused by the deposition of the colored printing size upon the upper hot steel bowl and the redeposition of this colored size upon the fabric. Where this deposition occurs a more or less heavy imprint of the colored pattern will show.

With the process above described this trouble may be decidedly reduced or entirely eliminated, since the diazotized salt in the printing size on the dried fabric, when deposited upon the hot steel bowl (300–400° F.), is quickly decomposed and when redeposited upon the above is incapable of combining with the naphthol base to form the naphthol color. Thus smearing is avoided.

It is evident that since the coupling takes place between the alkaline base and the acid salt, the pH of the fabric may be varied, depending upon which is present in excess. This makes possible the use of both the acid and basic setting resinous materials previously described. In general, however, an acid condition favors the formation of the naphthol colors and acid setting resins are therefore generally used. It is to be understood that if the proper pH for the curing of the resin is not obtained from the naphthol base and salt, catalyst is added to obtain the proper pH during curing.

It is evident that the pH obtained is dependent also upon the quantity of printing size deposited upon the fabric and this should be taken into account in preparing the printing formula.

The presizing with a thickener and a softener to obtain a fabric of uniform friction characteristics as previously explained, may be combined with the application of the naphthol base as will be further shown.

It is, of course, to be understood that where the coverage of the printed portions is large, say,

for example, 80%, it is unnecessary to employ the presizing heretofore described since substantially uniform friction characteristics over the entire fabric are obtained.

The printed pattern may be applied to undyed fabrics and thus obtain a brightly colored glazed pattern on a dull white ground or it may be applied to a previously dyed or printed fabric and thus obtain a brightly colored glazed pattern on a dull dyed ground.

It is also possible to afterdye the fabric provided the dye procedure used does not detrimentally affect the glazed printed pattern; in this way a brightly colored glazed pattern will again be imposed on a dull dyed ground.

Since there are a large number of naphthol bases available and since each produces a different shade when coupled with a salt, a wide variety of combinations is possible. The textile colorist, therefore, is afforded a large selection of unusually bright colors on white or dyed ground.

The salts available are very numerous and well known in the arts. I am giving below as examples a list of salts and in parentheses, to the best of my knowledge, the bases from which the salts are obtained by diazotization:

Fast Orange Salt GR (Ortho nitro aniline)
Fast Red Salt GG (Para nitro aniline)
Fast Red Salt RL (4:nitro ortho toluidine)
Fast Red Salt 3GL (4:chlor ortho nitro toluidine)
Fast Red Salt AL (Amino anthraquinone)
Fast Red Salt BN (4:nitro ortho anisidine)
Fast Bordeaux Salt GPN (2:nitro para anisidine)
Fast Blue Salt BB (4:benzoyl amino 2:5 diethoxy aniline)
Variamine Blue Salt BD (4:amino 4' methoxy diphenyl amine)
Fast Black LB (2:ethoxybenzene azo alpha naphthyl amine)

The diazotized salts mentioned above are usually referred to as active stabilized salts since they immediately form the active diazo compound when dissolved in water. As shown in Example IV it is possible to prepare these diazotized salts from the proper base by diazotization and add the freshly diazotized salt to the printing solution instead of using the active stabilized salt already prepared.

The naphthol bases are also numerous and well known in the arts. I mention, for example, the following, giving in parentheses their chemical constitution, to the best of my knowledge:

Naphthol AS (Anilide of beta oxy naphthoic acid)
Naphthol AS-RL (Para anisidide of beta oxy naphthoic acid)
Naphthol AS-OL (Ortho anisidine of beta oxy naphthoic acid)
Naphthol AS-SW (Beta naphthalide of beta oxy naphthoic acid)
Naphthol AS-ITR (2:4 dimethoxy-5-chlor anilide of beta oxy naphthoic acid)
Naphthol AS-G (Diaceto acetyl ortho toluidine)

More than one type of mechanical treatment may also be used on the same fabric, for example, after printing and drying the fabric may be glazed twice and embossed once and novel effects obtained.

Mechanical treatment such as calendering may be applied to the fabric before printing and also to the finished glazed fabric, but such auxiliary treatments form no part of this invention.

The process may be used in conjunction with other processes, such as sizing, mildewproofing, waterproofing, coating and so forth, provided such processes do not detrimentally alter the effect obtained.

Example I

A cotton fabric previously desized, scoured and bleached was impregnated with the following solution:

	Parts
Naphthol AS-OL (Ortho anisidine of beta oxy naphthoic acid)	50.0
Sodium hydroxide sol. (75° Tw.)	50.0
Olein Oil (50%)	50.0
Ammonium Alginate	100.0
Water to make 400 gallons	

The cloth was then dried by passing directly from the impregnating mangle into an airflow dryer-tenter frame drying unit. The cloth should be dried quickly and uniformly to prevent uneven deposit of the naphthol base and also decomposition of the sodium naphtholate which would give rise to uneven and weak colors when printing.

Since the substantivity of the naphthol base is greatest in the cold and diminishes as the temperature increases, the sizing is desirably applied with a small padding box frequently replenished, the padding liquor being kept uniformly hot at substantially 180° F.

The impregnated dried cloth was then printed with the following composition of printing paste:

	Parts
Dimethylol urea 50% solids	155.0
Dimethylol urea 40% solids	50.0
Methylated hexamethylol melamine resin 80%	40.0
A mixture of karaya and gum tragacanth	210.0
Olein oil (50%)	20.0
Fast Red Salt AL (diazotized amino anthraquinone)	22.5
Fast Red Salt 3GL (diazotized chlor ortho nitro aniline)	6.25
Water	130.0

This paste was prepared by mixing together the olein oil, dimethylol urea 50% solids, dimethylol urea 40% solids, methylated hexamethylol melamine 80% and of a mixture of karaya and gum tragacanth. To this mixture were added the Fast Red Salt AL and Fast Red Salt 3GL dissolved in water, with stirring. No catalyst was used since a satisfactory pH of 4.5 is obtained with this mixture when curing.

After printing, the cloth was dried and then cooled until the printed portion contains approximately 15% moisture. It was then glazed three times in a hot friction glazer, (325° F.), as previously described, and then cured 2 minutes at 300° F. A final washing treatment was used to remove undesirable soluble materials. Since the background in this case was white a light bleaching treatment and wash was used to improve the white.

The resulting fabric had a beautiful red, clear sharp, glazed pattern on a white background, the glaze being durable to soaping and drycleaning treatments.

Example II

A cotton fabric previously desized, scoured,

bleached and dyed was impregnated, as previously described, with the following size:

	Lbs.
Naphthol AS	50
Caustic soda (75° Tw.)	50
Yellow dextrin	300
Polyethylene glycol	40
Made up to 500 gals. with water	

The fabric was then dried, as previously described and then printed with the following paste:

	Parts
Polyvinyl alcohol	90.0
Formaldehyde (37%)	200.0
Olein oil (50%)	50.0
Variamine Blue Salt BD	30.0
Ammonium thiocyanate	25.0
Water	690.0

The paste was prepared by first dispersing the polyvinyl alcohol in water and then adding the formaldehyde. The color was dissolved separately in water and with the olein and was added to the polyvinyl-alcohol-formaldehyde mixture. The ammonium thiocyanate catalyst was added with the remaining water just prior to printing.

After printing the fabric was dried and cooled so that approximately 15% moisture remains in the printed portion. It was then glazed in a hot friction glazer (350° F.) three times and then cured 3 minutes at 320° F. The cloth was finally washed and dried.

This example, in which the polyvinyl alcohol and formaldehyde produces the hard durable part of the print, does not use any auxiliary printing gums since the polyvinyl alcohol itself serves as the thickening agent.

The finished fabric had a firm, sharp, brightly colored pattern on a dyed dull ground, the printed part showing good durability to soaping and dry-cleaning treatments.

Example III

A fabric was sized and dried as previously described, using the following size:

	Lbs.
Naphthol AS-RL	50.0
Caustic soda (75° Tw.)	50.0
Olein oil	50.0
Ammonium alginate	100.0
Made up to 400 gallons with water	

The cloth was then printed and carefully dried, as previously described, using the following printing size:

	Parts
Methylated hexamethylol melamine 80%	250
A mixture of karaya and gum tragacanth	425
Olein oil (50%)	40
Ammonium thiocyanate	25
Fast scarlet salt 2G (diazotized 2:5 dichloro aniline)	40
Water	220

The fabric was then glazed three times at 350° F. and then cured 2 minutes at 300° F.

The washed and dried fabric had a sharp, brightly colored, glazed, yellow print imposed upon a dull white ground.

Example IV

A cotton fabric previously desized, scoured, and

bleached was impregnated, as previously described, with the following size:

Naphthol AS	pounds	50.0
Caustic soda (75° Tw.)	do	50.0
Olein oil	do	50.0
Yellow dextrin	do	300.0
Water to make	gallons	500

The cloth was then dried, as previously described, and then printed with a printing paste which contained a Fast Color base, previously diazotized. The composition of the diazotized base was as follows:

14 oz. Fast Red GL base	pounds	16
Hydrochloric acid	quarts	21
7 oz. of nitrite of soda	pounds	8
Acetate of soda	do	17
Water to make	gallons	50

In the above procedure the Fast Red GL base was first pasted with some hot water and the hydrochloric acid. This mixture was cooled down and the sodium nitrite, dissolved in cold water, was then added with stirring. The whole mixture was kept cool by the addition of ice and allowed to react in this way for approximately ½ hour. Finally sufficient sodium acetate (approximately 17 lbs.), dissolved in some water, was added to neutralize the excess mineral acid. This was usually determined by checking with Congo red paper until it did not turn blue. The rest of the water added to bring up to volume, completes this procedure.

The formulation of the printing paste was as follows:

	Lbs.
Methylated hexamethylol melamine 80%	16.0
A mixture of karaya and gum tragacanth	24.3
Sulphonated castor oil 50% solution	3.2
Diazotized Fast Red GL base	15.0
Ammonium thiocyanate 50% solution	2.0
Water	4.5
	65

After printing, the fabric was dried, as previously described, and then glazed three times at 340° F. The fabric was then cured 2 minutes at 320° F. and finally washed.

The desired results were obtained.

Example V

The following is an example using diazo and developed colors (D. D.). Cotton fabrics were dyed on the jig with 2% Diazo Sky Blue BA New and then diazotized in the usual manner, using sodium nitrite, sulphuric acid and ice. After rinsing the fabric was carefully dried at low temperature.

The fabric was then printed with the following solution:

	Parts
Beta naphthol	10
Caustic soda (100° Tw.)	10
Acetone formaldehyde resin solution (60°)	350
Sulphonated olein oil	20
A mixture of karaya and gum tragacanth	300
Water	310
	1000

under which condition coupling takes place. The fabric was then dried until 15% moisture was left in the printed part and then glazed three runs through a hot glazer, followed by curing at 340° F. for 1 minute.

After washing and drying a dark blue glazed

pattern was superimposed upon a dull light blue background

I claim:

1. The process of imparting durable lustrous dyed pattern effects to fabrics which comprises subjecting the fabric all over to an aqueous solution of an organic base capable of combining with a diazo compound to form a dye, printing on the fabric the desired pattern with an aqueous printing solution comprising thermo-setting resin insoluble in water when polymerized, a diazo compound combining with said base to form the dye, a printing gum and a textile lubricant, drying the printed fabric to dampness, passing the dried fabric through a friction calender and heating the fabric to polymerize the resin to the water insoluble state.

2. The process of claim 1 in which the polymerization of the resin to the water insoluble state is completed during the friction calendering.

3. The process of claim 1 in which the polymerization of the resin to the water insoluble state is completed by oven curing following the friction calendering.

4. The process of claim 1 in which, when the coverage of the pattern is less than substantially 80%, the fabric is initially presized with a textile sizing solution compatible with the printing paste and containing a printing gum and a textile lubricant in proportions which give substantially the same frictional characteristics as those of the printing solution.

5. The process of claim 1 in which, when the coverage of the pattern is less than substantially 80%, the fabric is initially presized with a textile sizing solution compatible with the printing paste and containing a printing gum and a textile lubricant in proportions which give substantially the same frictional characteristics as those of the printing solution, the said base being incorporated as a part of said presizing solution.

6. The process of claim 1 in which, when the coverage of the pattern is less than substantially 80%, the fabric is initially presized with a sizing solution compatible with the printing solution and containing a printing gum and a textile lubricant in proportions which give the same frictional characteristics as those of the printing solution, the same base being incorporated as a part of said presizing solution and the sizing solution containing water and a printing gum from substantially 3% to 13% and a textile lubricant from substantially 1% to substantially 2%, both by weight of the sizing solution.

7. The process of claim 1 in which the resin is acid setting.

8. The process of imparting durable lustrous pattern effects to fabric which comprises subjecting the fabric to an aqueous sizing solution, drying the fabric, printing on the fabric the desired pattern with an aqueous printing solution containing a water-soluble thermosetting resin, a printing gum and a textile lubricant, drying the fabric to dampness and friction calendering and heating the fabric to polymerize the resin to the water-insoluble state, the process being characterized in that the aqueous sizing solution contains, by weight in relation to the total solution, from about 3% to about 13% of a printing gum compatible with the printing paste and from about 1% to about 2% of a textile lubricant, the proportion used being such as to impart substantially the same frictional characteristics to the unprinted areas as to the printed areas of the fabric.

WILLIAM P. HALL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,121,005	Rener	June 21, 1938
2,121,205	Lippert et al.	June 21, 1938
2,123,153	Rivat	July 5, 1938
2,181,481	Gray	Nov. 28, 1939
2,185,746	Goencz	Jan. 2, 1940
2,369,613	Schubert	Feb. 13, 1945