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CREPE FABRIC CONTAINING ORGANIC DERIVATIVES OF CELLULOSE

Camille Dreyfus, New York, N. Y., and William Whitehead and Herbert Platt, Cumberland, Md., assignors to Celanese Corporation of America, a corporation of Delaware

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This invention relates to the manufacture of fabrics containing yarns of organic derivaties of cellulose that have a uniform delineated crepe effect and/or a predetermined crepe pattern formed by a true creping of the said fabric.

This invention is a continuation in part of our application 19,410, filed May 2, 1935.

An object of the invention is the economic and expeditious production of crepe fabrics having a uniform delineated crepe throughout and having no blank areas of lesser crepe such as weft or warp bars. Another object of the invention is the production of crepe fabrics having a predetermined pattern in different crepe effects. Other objects of the invention will appear from the following detailed description.

In creping fabrics containing organic derivatives of cellulose it has been difficult, with certain types of weaves, to produce an even shrinkage in the material and also to form a material free from uncreped areas, or areas in which the pebble of the crepe materially differs from that of the general fabric. However, by employing this invention, which in general consists in passing the material through embossing devices or the like under conditions such that the fabric is not embossed but so that the pebble or pucker of the crepe is merely marked or delineated on the material by the embossing machine, the later treatments, such as the creping baths, etc. produce a true crepe in the material of a pattern similar to that delineated in the material by the embossing device. By employing this invention, the type or size of pebble of the crepe may be predetermined yet the crepe is produced by a shrinking of the material and not by an embossing of the material. Thus, a true crepe may be produced that has a very fine pebble or pucker, or one that has a very coarse pebble or pucker.

By treating the fabric in accordance with this invention, the creping or shrinking of the fabric in the creping bath is made uniform and breaks evenly throughout the length of the fabric being treated. Thus, the fabric produced is of even width and there is no difference in the degree or type of crepe imparted thereto in desired areas.

The fabric treated in accordance with this invention, some of the filaments of the fabric having been slightly distorted, bent or otherwise effected due to their thermoplastic properties by the action of the delineating device, readily crepes at those places. In this manner the crepe effect in the fabric is produced as a true crepe in a continuous manner. Prior to this invention, several minutes were required in the creping baths to produce a crepe. However, by treating the fabric in accordance with this invention the material may be run through the creping bath continuously and the speed of creping is sufficiently fast that the fabric is removed from the other end of the bath fully creped. For this reason the fabric may be processed on a commercial scale in the full width, thereby preventing the development of boil-off creases and hard creases.

By selecting suitable designs in the delineating rollers or other aids and treating fabrics with the same, there may be produced in the fabric designs in different types of crepe. The designs may be in the form of isolated areas or they may be diagonal, longitudinal or cross-wise bars and stripes. Further, the fabric may be caused to contain a design in more than one type of crepe. Thus, one area may be caused to crepe in large longitudinal shaped pebbles or puckers, while other areas may be caused to crepe in a circular shaped pebble or both of these may be superimposed on a background of fine pebble effect. Also, one area may be caused to crepe in one direction while another area is caused to crepe in a direction, say, at a 90° angle thereto.

In accordance with this invention, we pass a fabric containing crepe yarns through a device adapted to delineate the desired crepe pattern on the fabric, the temperature of which and the pressure it exerts on the fabric being such that the design applied to the fabric is not permanently embossed into the fabric, and then treat the fabric in a creping bath as normally employed in the art. By this method of temporarily bending or distorting of some of the filaments of the fabric such that the true creping produced, in a regular creping bath, breaks at a point where the filaments have been bent may be employed to produce any suitably predetermined, yet uniform, creping action in the material.

By the term "delineating", used in the specification and claims, it is intended to cover the light contacting the yarns of the fabric with a raised design under such temperature and pressure that there is not produced in the fabric a permanent embossing. The temperature may be so low and the pressure may be so light that the delineated pattern is not readily visible to the eye. The pattern may, however, be more heavily set in the fabric, but in no case should the fabric be treated so vigorously as to emboss the pattern therein, as the raising of the pattern is preferably left to the shrinking of the material to produce a true crepe.

This invention is applicable to the treatment of

fabrics produced from or containing crepe yarns of organic derivatives of cellulose. Examples of organic derivatives of cellulose are the organic acid esters of cellulose and the cellulose ethers. Examples of the organic acid esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of the ethers of cellulose are ethyl cellulose, methyl cellulose and benzyl cellulose. The yarns may contain the organic derivative of cellulose in the form of substantially continuous filaments twisted together, short lengths of filaments spun together or relatively long discontinuous lengths of filaments so twisted that they appear in the yarn as a staple fiber.

Fabric to be treated may be woven in any suitable manner and from any suitable yarns, some of which contain organic derivatives of cellulose. The fabric may be woven from single or doubled yarns or threads, or combinations of these. Thus, there may be used threads of organic derivatives of cellulose that are formed by doubling a thread of high twist and a thread of low twist or two threads of uniformly high twist. The crepe yarns containing organic derivatives of cellulose may be twisted to their high degree of twist say from 40–100 turns or more per inch in one or two stages with or without sizing, with resins, synthetic resins, gums, etc. before either or both stages. Yarns, containing an organic derivative of cellulose, may be employed that have a high degree of twist and that have been treated by precipitating lead sulphate in the threads, or the threads before twisting may be treated with materials such as ferrocyanides, thiosulphates, citrates, lactates, etc., or the threads may be pretreated before twisting with a latent solvent, such as chloroform, tetrachlorethane, ethyl acetate, etc., or the yarns may be treated before twisting with hot water, steam, solvent vapors, etc. with or without stretching. Although any method of imparting a twist to the yarn may be employed, it is preferable to twist the yarn, containing an organic derivative of cellulose, or at least insert part of the twist in the yarn in the presence of steam or water vapor. The steam or water vapor may be applied to the yarn either immediately before twisting, during twisting or immediately after twisting.

One method of producing crepe threads is to subject the filaments to the action of wet steam during the insertion of at least a part of the crepe twist, i. e., the twist above 10 turns per inch. Another process for the production of highly twisted crepe threads of organic derivative of cellulose filaments or fibers is to insert the crepe twist in the threads in two or more stages, and during the insertion of twist in at least the final stage the threads are steamed under conditions such that moisture is present. Another process for the production of crepe threads of organic derivative of cellulose filaments or fibers is to insert the crepe twist in the threads and during the insertion of at least the last part of the crepe twist steaming the thread with dry steam. Still another process for the production of crepe threads of organic derivative of cellulose filaments or fibers is to insert the crepe twist in threads and either just before, during or immediately after the insertion of at least the last part of the crepe twist treat the threads with hot water. Combinations of these processes may be employed. The thread may also be treated with a dressing containing oils, latent solvents, diluted solvents, swelling agents, plasticizers, etc.

The processes above described involve essentially, therefore, the insertion of a crepe twist in threads of an organic derivative of cellulose by processes wherein crepe twist is inserted while the thread is under the influence of steam or hot water. The threads obtained by these processes not only yield fabrics exhibiting very good crepe effects but are very much stronger than similar threads which have been twisted as much as possible without the special treatment with steam or hot water.

The twisting of the organic derivative of cellulose threads according to this invention may conveniently be conducted so that at least the last part of the track of the running thread in which twisting actually takes place, lies through a body of steam or hot water. For example, the thread may be twisted on a device of the kind in which the thread is drawn off over the end of a rotating package and allowed to pass through steam or hot water on its way to a winding device.

The twisting of the threads is very advantageously effected on a device of the kind in which the thread is drawn off over the end of a rotating package through a guide fixed substantially in line with the axis of rotation of the package and is thereafter wound on a bobbin or the like, the thread being passed through steam or hot water on its way from the guide to the bobbin. In this way the thread is subjected to the action of the steam or hot water during the actual application of twist.

On the other hand, any other suitable crepe twisting device may be employed. For example a ring twister may be used for the crepe twisting. The ring twister is especially adapted to crepe twisting thread consisting of discontinuous organic derivative of cellulose filaments or fibers.

The initial thread may already be twisted to a small degree, for example up to 10 turns per inch, e. g., to 2 to 5 turns per inch or to such small degree as is commonly applied in the production of artificial threads by dry spinning organic derivative of cellulose solutions and winding and twisting the resultant filaments on a cap twisting device.

The duration of the treatment with steam or hot water may be relatively short, such as may be secured when the thread is travelling at a speed of 2 to 10 metres per minute and is in contact with steam for about 3 to 6 inches of its travel or with hot water for 1 to 3 inches of its travel. Lengthier treatments may, however, be employed. Preferably the steam or water should be as hot as possible and temperatures of, for instance, 95° to 100° C. and particularly 98° to 100° C. are to be recommended. If desired, the steam or hot water may be employed under pressure.

The total twist applied in accordance with the new process will in general be considerably less than the twist applied in accordance with prior processes. For instance, by prior processes it was customary to employ threads having 60 to 80 turns per inch when the threads were of about 150 denier but, by employing this invention, twists of only 40 or 50 to 65 turns per inch are satisfactory for the same size threads.

The crepe yarns, i. e., yarns containing a high degree of twist, formed of organic derivatives of cellulose, may be doubled with yarns, for instance, those having a twist of from 40 or more turns per inch and made of the same material or with yarns of such twist formed of reconstituted or regenerated cellulose, cotton, silk, wool, etc.

The crepe yarns of organic derivatives of cellulose may also be doubled with threads formed of organic esters of cellulose that have been continuously saponified, partially saponified or intermittently or periodically saponified. Also the crepe yarn or threads containing organic esters of cellulose may be partially or intermittently saponified after their formation into the crepe threads.

These threads and yarns may be woven in any manner into a fabric. The yarns and threads containing organic derivatives of cellulose may be woven alternately with yarns or threads of other materials, such as silk, cotton, etc. The crepe yarns containing organic derivatives of cellulose may also be employed for the weft or warp. For large pebble effects the fabric may be formed having three or more yarns of right hand twist alternating with one or more yarns of left hand twist or vice versa. Fine pebble crepe fabric may be produced by laying either in the warp or weft, or both, one yarn of right hand twist and one yarn of left hand twist. Any arrangement of weaves and sequence of yarns may be employed.

The fabric after formation is preferably treated by a delineating action under such conditions that there is not imparted to the fabric a permanent raised figure. The raising of the crepe pebble or figure on the fabric is preferably limited to the shrinking and buckling of the thread and not caused by the delineating treatment. The delineating may be so light as to be difficult of detection with the naked eye or it may be more obvious, but in all cases should not be permanent. The delineated pattern preferably is removable by washing and scouring and even by shaking out the fabric. The delineating action is preferably only sufficient to make the crepe break evenly. The delineating action is preferably performed while the fabric is in a moist or dampened condition. This damp condition may be acquired by treating the fabric just prior to entering it into the delineating device with steam, hot water, etc. In place of steam or hot water the fabric may be softened by treatment with plasticizers such as glycerol, glycol and their derivatives and/or weakly polar plasticizers such as dibutyl tartrate, tributyl phthalate, etc.

Any suitable device may be employed to delineate the pattern on the fabric, such as the customary engraved roller which intermeshes with the roller raised in intaglio. This device should be used with caution. The temperature and pressure should be regulated so that the fabric is not weakened or too much of the intended figure raised in the fabric by a permanent embossing action. Other methods of delineating the desired pattern on the fabric may be employed, such as pressing the fabric against an endless blanket of woven material, for instance, cotton duck, terry, etc. between smooth rollers. Alternatively, the fabric may be passed, sandwiched between a blanket and another piece of fabric, for example, an open weave cotton fabric, thus causing the weave of the cotton fabric to impress slightly its pattern on the fabric to be creped. Another modification of the process may be the delineating, at one time of two pieces of fabric containing organic derivatives of cellulose filaments. In this case, there may be employed two engraved rolls of similar or dissimilar pattern and two layers of fabric with an endless blanket sandwiched between them may be passed between these rolls at a close and set gap.

When employing woven or knitted fabric blankets, or other material as the pattern in the delineating device, this blanket or other material may be furnished with a little diethylene glycol or similar plasticizer or softening agent, the blanket being passed through a mangle to control the amount of the plasticizer or softening agent applied thereto prior to being sandwiched with the fabric to receive the creping design. In employing a blanket or other sheet material as a means of assisting in the delineating of the pattern, it may be treated with water and then it may or may not be heated by the nip rolls to cause it to generate steam or other vapor to assist the delineating action.

Patterns and designs may be formed in crepe in the fabric. Thus, the crepe design can be modified in such a way that stripes running along the fabric are embossed with one pattern and other stripes with another pattern causing the crepe to break differently at intervals across the warp. Alternatively, the delineating action may be intermittent and controlled in design so as to produce any form of design. For example, circles may be delineated on the fabric with an extremely fine design and the background or field of the design delineated with a coarse design. Any suitable geometric, regular or irregular designs may be delineated on the fabric in differing types of pebble, and the design developed in the normal creping baths. The crepe starts to form where the pebbles are marked or delineated. The crepe thus formed is a true crepe caused by the shrinking of the highly twisted threads and is not an embossed crepe. The fabric having a true crepe may be washed, ironed and otherwise handled without materially destroying either the design or crepe formed therein.

Another modification that may be employed when using designed or engraved rolls as a part of the delineating device, is to smear the raised portions of the roll with 10, 20 or 30% solution of sodium hydroxide or other saponifying agent by means of contact with a furnishing roll or other known means and in this way saponifying the portions coming in contact with the alkali and thus sensitizing and changing the affinity in these places to cotton dyes and other direct dyes.

It is to be understood that the foregoing detailed description is merely given by way of illustration and many alterations may be made therein without departing from the spirit of my invention.

Having described our invention what we desire to secure by Letters Patent is:

1. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of an organic derivative of cellulose, which comprises delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

2. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of cellulose acetate, which comprises delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

3. Process for the manufacture of crepe fabrics,

in which the crepe threads contain filaments of an organic derivative of cellulose, which comprises delineating in the presence of moisture a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

4. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of cellulose acetate, which comprises delineating in the presence of steam a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

5. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of an organic derivative of cellulose, comprising relineating in the presence of a plasticizer or softening agent a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

6. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of cellulose acetate, which comprises delineating different patterns of lines over different areas of the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated patterns.

7. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of an organic derivative of cellulose, which comprises delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently continuously passing the fabric through a heated aqueous bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

8. Process for the manufacture of crepe fabrics, in which the crepe threads contain filaments of cellulose acetate, which comprises delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently continuously passing the fabric through a heated aqueous bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

9. Process for the manufacture of crepe fabrics, in which the crepe threads contain cellulose acetate, which comprises crepe twisting threads containing cellulose acetate and during the crepe twisting subjecting them to a softening medium, forming a fabric with said yarns, delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

10. Process for the manufacture of crepe fabrics, in which the crepe threads contain cellulose acetate, which comprises crepe twisting threads containing cellulose acetate and during the crepe twisting subjecting them to steam, forming a fabric with said yarns, delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

11. Process for the manufacture of crepe fabrics, in which the crepe threads contain cellulose acetate, which comprises crepe twisting threads containing cellulose acetate and during the crepe twisting subjecting them to hot water, forming a fabric with said yarns, delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

12. Process for the manufacture of crepe fabrics, in which the crepe threads contain an organic derivative of cellulose, which comprises crepe twisting threads containing an organic derivative of cellulose and during the crepe twisting subjecting them to a softening medium, said degree of twist being less than that normally required to produce a crepe fabric, forming a fabric with said yarns, delineating a pattern of lines on the fabric under such conditions that there is imparted to the fabric a non-permanent raised figure, which figure may be difficult of detection by the naked eye, and subsequently treating the fabric in a creping bath whereby a pebble is produced which is bounded by the lines of the delineated pattern.

CAMILLE DREYFUS.
WILLIAM WHITEHEAD.
HERBERT PLATT.