This invention relates to a process of permanently pleating a fabric and relates more particularly to a pleating process which can be adequately applied to fabrics containing natural fibres, such as cotton fabrics.

Hereofore the provision of permanent pleats and creases was quite difficult since, as a rule, the pleats and creases tend to disappear after one or more washings. Particular difficulties were encountered with fabrics containing natural fibres, such as cotton fabrics. Pleated skirts or other garments made of cotton fabrics had to be subjected to repeated ironing in order to maintain the pleats and creases.

An object of the present invention is to eliminate these drawbacks and to provide a creasing or pleating method by means of which essentially permanent creases or pleats may be imparted to a cotton fabric as well as to any other fabric containing natural fibres.

Another object is the provision of a simple, inexpensive and efficient method of imparting a permanent pleat or crease to a fabric.

The invention is based, to a large extent, on the surprising discovery that a completely soft cotton fabric, which is devoid of any starch may be provided with permanent folds, creases, or pleats provided that the curing of the crease-resistant chemical with which the fabric is impregnated takes place after the pleating operation. Thus, the process of the present invention includes as a preliminary step the impregnation of the fabric with a suitable crease-resistant chemical and catalyst, the mangle, and a preliminary heating of the fabric to eliminate some, but not all, of its moisture, then the pleating of the fabric on a standard pleating machine and, as a final step, the curing of the pleated fabric to evaporate the moisture completely.

Practical experiments carried out by the applicants have shown that the finished fabric which has been provided with creases or pleats on the pleating machine can be subjected to most extensive washing, and yet the pleats will not be affected in any way.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing illustrating diagrammatically the method of the present invention.

The method of the present invention is particularly suitable for all types of cotton fabrics while it may also be applied to wool, silk and other fabrics containing natural fibres, as well as various types of synthetic fibres.

An important requirement for the success of the process of the present invention is that the fabric to be subjected to the process should be completely soft, namely devoid of any starch or starchy material. It was found that the reactions taking place in the fibres and producing the permanent pleats are most detrimentally affected by any starchy materials which may be found in the fabric.

As the first step of the present invention the fabric is passed through a bath indicated by the numeral 10 in the drawing.

The bath consists of a crease-resistant chemical, such as urea formaldehyde, with a suitable catalyst. Excellent results were obtained with melamine formaldehyde textile resins mixed with a suitable catalyst, the purpose of which is to assure a rapid cure of the resin.

Example

By way of example, the bath may consist of 150 pounds of melamine formaldehyde resin sold on the market by the Monsanto Chemical Company under the trademark Resloon M-75, and 10 pounds of a catalyst for the rapid curing of the resin, such as the catalyst sold by the Monsanto Chemical Company under the trademark Catalyst A-C-4.

640 pounds of water are added to the mixture so as to provide a bath of a total of 800 pounds. The bath is maintained at a temperature of about 80° F.

It is apparent that the above proportions and the above ingredients may be varied within wide limits. Of importance to the process of the present invention is the use of a known formaldehyde textile resin mixed with a known curing catalyst at this preliminary stage of the process, while delaying the curing operation to the final end of the process and after the completion of the pleating.

The fabric 11 is passed through the bath 10 at a suitable slow speed sufficient to fully impregnate the fabric. The fabric may be passed over rollers 12 and 13 and, upon leaving the bath, is passed through a suitable mangling device 14.

As shown in the drawing, the mangling device 14 may consist essentially of rollers 15 and 16 which press against the fabric passing between these rollers. The pressure exerted by the mangling device 14 is preferably 12 tons, although it may be as low as 4 tons, or even 2 tons. The amount of pressure depends to a substantial extent upon the speed with which the fabric is moved.

The fabric 11 when leaving the mangling machine still contains a substantial amount of moisture.

The next step of the process of the present invention is a preliminary heating of the fabric. By way of example, the heating is carried out in a dry can 17 the outer walls of which are heated by any suitable heating device 18. The fabric passes within the dry can 17 in a zig-zag manner over rollers 19.

Obviously the dry can 17 may be used in conjunction with or replaced by a battery of heating lamps 20.

An important feature of this preliminary heating is that the heat conveyed to the fabric 11 should be below the curing point of the fabric, namely below 280° F. and that the fabric at the end of the preliminary heat treatment should still contain from 5 to 10% of moisture. A temperature of about 200° F. was found satisfactory. Furthermore, the fabric should be moved through the heating device 17 sufficiently speedily to avoid curing.

After the preliminary heating operation the fabric is introduced into a standard pleating machine designated diagrammatically by the numeral 21 in the drawing. This pleating machine which is of standard construction and indicated only diagrammatically in the drawing operates by reciprocable knives 22 and rollers 23 which impart a crease to the fabric leaving the pleating machine 21. This crease is diagrammatically indicated by the numeral 24 in the drawing. The rollers 23 of the pleating machine are usually heated during the pleating operation to about 300° F. The actual amount of heating depending upon the weight of the material. However, the rollers maintain a very short contact with the material so that the fabric leaving the pleating machine is not cured.

The final step of the process is the curing of the pleated fabric immediately after the pleating. Any suitable curing device 25 may be used for the purpose of this curing. The device 25 may consist of infrared lamps or of other
heating means. Furthermore, the heating may be carried out electronically. Practical experience has shown that complete curing in the course of which the urea formaldehyde evaporates and the fibres are permanently set may take place at a temperature of about 350° F, to which the fabric is subjected for a period of two minutes. It is apparent, however, that the temperature and the duration of the curing treatment may vary, depending on the conditions of the treatment, the type of the fabric, as well as the type of the chemicals employed.

Practical experience has shown that a fabric treated in accordance with this process maintains permanent pleats which do not disappear and are not affected after extensive washing.

It is apparent that the example given above has been given only by way of illustration and not by way of limitation and that it is subject to many variations and modifications. All such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. A method of permanently pleating and creasing an indivisible rolled length of fabric containing natural fibres in one continuously moving operation, said method comprising subjecting a soft starchless and creaseless fabric to a hot aqueous solution of a formaldehyde resin containing a catalyst, mangling the fabric, heating the fabric, forming permanent pleats in the fabric after heating and while it retains about 5 to 10% moisture, and then curing the fabric.

2. The method in accordance with claim 1, wherein the bath consists of a hot aqueous solution of melamine formaldehyde resin containing a catalyst.

3. The method in accordance with claim 1 wherein the bath consists of a hot aqueous solution of melamine formaldehyde resin containing a catalyst.

4. The method in accordance with claim 1, wherein the hot solution consists of about 15 parts by weight of melamine formaldehyde resin, containing about 1 part by weight of a catalyst and about 64 parts by weight of water.

5. A method of permanently pleating and creasing a fabric containing natural fibres, said method comprising subjecting a soft starchless and creaseless fabric to a hot aqueous solution of a formaldehyde resin containing a catalyst, heating the fabric until it retains at most 10% moisture, forming permanent pleats in the fabric, the heating and the pleat-forming taking place below the curing point, and then curing the fabric.

6. A method of permanently pleating and creasing a fabric containing natural fibres, said method comprising subjecting a soft starchless and creaseless fabric to a hot aqueous solution of a formaldehyde resin containing a catalyst, preliminarily heating the fabric below the curing point and until it retains between 5% and 10% of moisture, heat-pleating the fabric to permanently crease the fibers, and then finally heating the fabric to evaporate the formaldehyde until the fabric is cured.

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