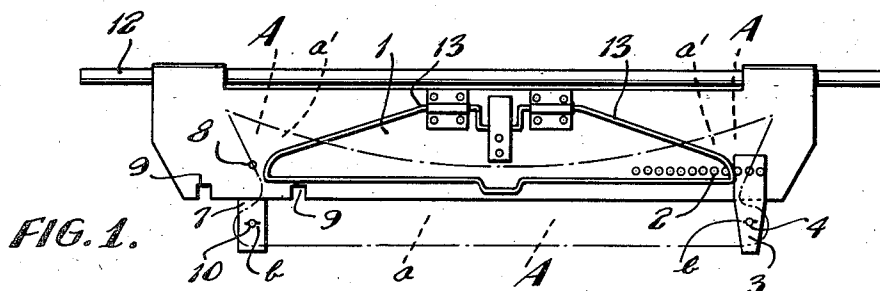
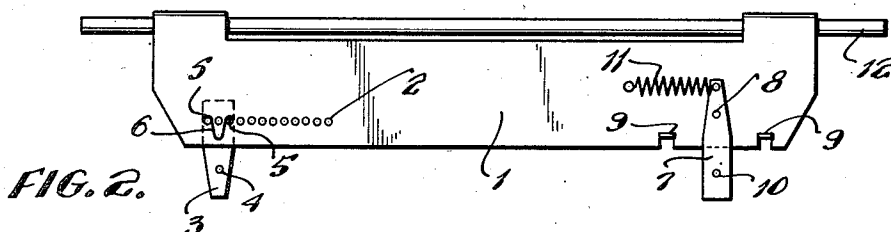
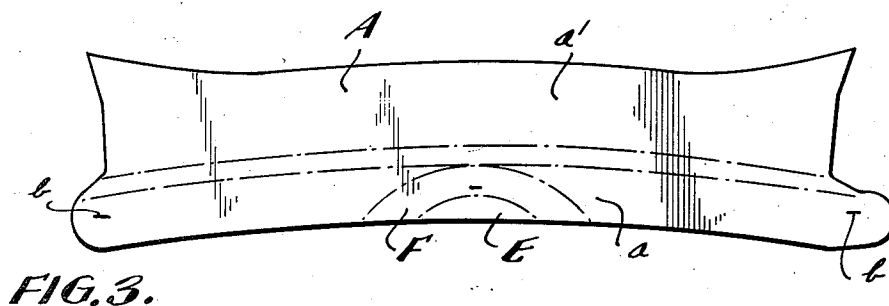
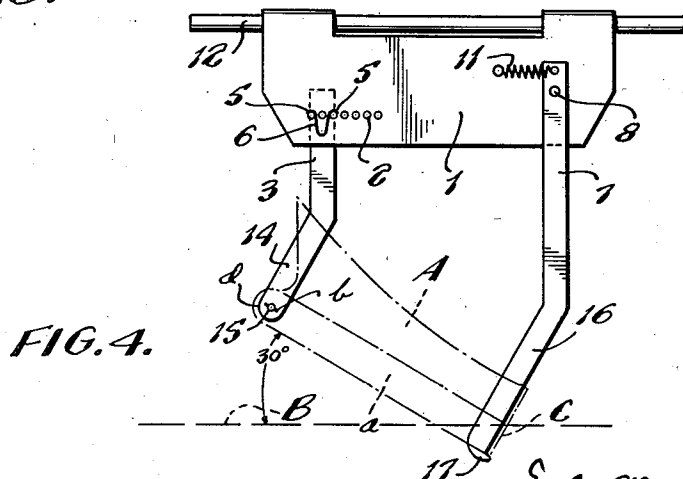


3 E. A. WOOD
CURVING CELLULOSE COLLAR BLANKS BY DIFFERENTIAL
SHRINKING WITH CHEMICAL SHRINKING AGENTS
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CURVING CELLULOSE COLLAR BLANKS BY
DIFFERENTIAL SHRINKING WITH CHEMICAL
SHRINKING AGENTSErnest Alfred Wood, Manchester, England, as-
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The present invention relates to a process for imparting a curvilinear form to oblong pieces of cotton or viscose fabrics, and more particularly to collar blanks made of cotton and/or viscose.

This application is a continuation-in-part of patent application Serial No. 767,645, now abandoned, filed August 8, 1947, for Collars and Cuffs for Personal Wear.

It is an object of the present invention to provide a process for imparting a curvilinear form to oblong pieces of the fabrics described which does not result in a cockling of the fabric along the junction of the treated and untreated portions thereof.

It is another object of the present invention to provide a process by which a sufficient degree of curvature is obtained, particularly with collar blanks.

It is a further object of the present invention to provide a process which takes only a short time for carrying out so that it can be applied industrially at a large scale.

It is still another object of the invention to provide a process of the kind described which is simple and inexpensive to carry out.

It is a still further object of the invention to provide a collar having a curvilinear form and being free from cockling.

According to the present invention a process for imparting a curvilinear form to oblong pieces of cotton or viscose fabrics such as collar blanks comprises the steps of applying a shrinking liquid to the fabric, and treating the fabric with a liquid neutralizing any surplus shrinking liquid. For the purposes of the following specification and claims I wish it to be understood that by shrinking liquid I mean to denote any liquid selected from the liquids enumerated hereinafter.

In a preferred embodiment of my invention the shrinking liquid is applied to the fabric so as to cause in the fabric strata of increasing shrinkage in a direction starting at one of the longitudinal edges of the fabric.

Preferably the fabric is subjected to applications of shrinking liquids of different, preferably decreasing strength starting from one of the longitudinal edges of the fabric, and the depth of the applications is successively increased in a direction to the other longitudinal edge of the fabric so as to cause in the fabric strata of decreasing shrinkage from one longitudinal edge of the fabric to the other.

In a preferred embodiment of the present invention the fabric is folded along a line substantially at right angles to one of the longitudinal

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edges of the fabric, the latter is dipped into a shrinking liquid with the longitudinal edge of the fabric arranged at an angle of substantially 30° to the surface of the shrinking liquid, the fabric is withdrawn from the shrinking liquid and treated with a liquid neutralising the surplus shrinking liquid.

According to a preferred process according to the invention for imparting a curvilinear form to collar blanks made of cotton or viscose fabrics, caustic soda is applied to an area adjoining the longitudinal edge of the collar band. Preferably the caustic soda is applied in separate steps of successively decreasing strength to areas adjoining the longitudinal edge of the collar band and successively increasing in size.

The application of the shrinking liquid can be done according to this invention either by dipping the fabric into the liquid or by spraying the shrinking liquid on the fabric or by printing the fabric with shrinking liquid.

Instead of a caustic soda the invention can be carried out with other substances as shrinking agent such as potassium hydroxide, zinc chloride, calcium thiocyanate, sulphuric and nitric acid, and hydroxides of other metals belonging to the alkali group of the periodic system of elements.

The process according to the present invention is applicable to fabrics which consist of cotton, furthermore to a laminated cloth, i. e. cloth comprising a cotton face, an acetate and cotton interlining, and a cotton back. Three separate cloths of the type described may be fused together by a Trubenizing process.

The process according to the present invention is also applicable to three-beam cloth consisting of a cotton face and a cotton back, cotton binders, and acetate padding threads. It is equally applicable to viscose cloths or to cloths consisting of cotton and viscose.

The process is particularly suitable for the following types of collars:

Three-beam heavy collar blanks of the semi-stiff type made solely of cotton; three-beam heavy semi-stiff collars made with heavy back and face, cotton binders, and acetate padding threads. This collar can be fused after curving after fusing in a manner applicable to Trubenized collars;

Collars made from laminated cloth, i. e. having a cotton face and bottom cloth, acetate and cotton lining (Trubenized);

Collars consisting of viscose and cotton.

The novel features which I consider as characteristic for my invention are set forth in particular in the appended claims. The invention itself,

however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 shows a front elevation of a collar or collar blank mounted on a frame for immersion in a bath;

Fig. 2 rear elevation of same;

Fig. 3 shows the curvilinear form given to a collar after treatment;

Fig. 4 shows inside elevation a second embodiment of a frame for immersing a collar blank.

The fabric after weaving is cut to the shape of or made up into collars the fold line of which is uncurved, each collar being mounted on a frame for lowering into a bath of mercerising liquor. The frame comprises a plate 1 provided with a series of apertures 2 spaced apart at the intervals to correspond with varying sizes of collars. An arm 3 formed with a projecting stud 4 is secured to the plate 1 by pins 5 engaging appropriate pairs of apertures 2, the arm being retained in position by a spring clip 6. A second arm 7 is pivoted intermediate its ends to the rear of the plate 1 on a pin 8 and is capable of movement between two stops 9 on the plate 1. A stud 10 similar to the stud 4 is provided on the lowered end of the arm 7 the upper end being connected to the plate 1 by a spring 11.

The plate 1 is mounted on a rod or spindle 12 by which it may be suspended.

The collar blank A having a collar band *a* and an outer fold *a'* made larger than the required finished size is mounted on the studs 4 and 10 by inserting the studs through the usual collar stud slots *b* in the collar band the outer fold *a'* being held against the plate 1 by a spring clip 13 mounted thereon.

The collar is lowered successively into a plurality of baths containing mercerising solution at differing strengths varying between 56° Tw. and 25° Tw. the first immersion of for example 1½ seconds being the shallowest in the strongest solution, subsequent immersions in succeeding baths being deeper and deeper in weaker and weaker solutions and may include total submersion.

The lower edge of the collar band contracts the maximum amount, the degree of contraction diminishing gradually over the remainder of the collar, bringing the pivoted arm 7 to one extreme position against the action of the spring 11 in contact with a stop 9 which represents the correct length for a collar of the particular size.

The collar on the frame is then passed through water sprays or baths to remove surplus alkali and is then dipped in a bath of weak acid for example hydrochloric acid of say ½° to 1° Tw. to neutralise any alkali remaining in the fabric after which the collar is washed and ironed.

It has been found that in a collar treated as above described the warp yarns contract differentially and draw the fabric into a curvilinear form without puckering to fit the neck of the wearer.

In the embodiment shown in Fig. 4 of the drawing a rod or spindle 12 carries a plate 1 to which are attached an arm 3 by means of a spring clip 6 and pins 5 engaging appropriate pairs of apertures 2. The arm 3 is in this embodiment provided with an inclined extension 14 carrying on each side a stud 15 at its lower end to which the buttonholes of the collar A are at-

tached. On the other end of the plate 1 is provided a second arm 7 which is pivotable about a pin 8. A spring 11 tends to turn the arm 7 so that its lower portion or extension 16 moves away from the extension 14 of the arm 3. The lower portion 16 of arm 7 is provided with an end portion 17 which is projecting outwards in order to hold the center *c* of the collar A in position. The arms 3 and 7 and the extensions 14 and 16 are so dimensioned that the lower edge of the collar band *a* is inclined at an angle of about 30° to the horizontal.

The operation of this device is as follows:

The collar is attached to the extensions 14 and 16 so that the center portion *c* of the collar engages the extension 16 whereas the end portions *d* of the collar having the slots *b* are attached to the extension 14. The collar therefore will be inclined about 30° to the level of the bath B. The collar is dipped in this position in the bath and the central portion *c* is subject to shrinking. The arm 7 is turned a little about its pin 8, the spring 11 holding the arm 7 with extension 16 tight against the middle portion *c* of the collar.

If the shrinking liquid is a solution of caustic soda the collar on the frame shown in Fig. 4 is lowered into a tank for 1½ seconds or any other time sufficient for the immersed portion of the collar to be thoroughly saturated with the caustic soda and allow it to curve. The time can be varied. Similarly the depth of the immersion should be ¾ (three quarters) inches in caustic soda of the strength of about 55° Tw. But the ¾ (three quarters) inches need not be taken as the only effective depth, but does give the desired degree of curvature when the collar is dipped at an angle of about 30° to the horizontal.

After the initial dip of 1½ seconds the collar is withdrawn for 2½ seconds. Then it is redipped in the same bath for a further 1½ seconds to insure that thorough saturation has resulted. More than two dips can be given if required.

By this time the collar has started to curve, this being denoted by spring 11 being under tension.

The collar is then allowed to idle for 10 to 20 seconds to insure that the caustic soda has been effective. Then the article is dipped in another tank up to the fold line. This tank acts as a modifier and its main function is to neutralize the cockling that may have developed at the juncture of the treated and untreated portions after the treatment in the first bath. The strength of this bath may be 35 to 30° Tw. or below that, depending on the texture of the collar to be treated. The collar may receive one or more dips before the desired effect is obtained.

After curving the caustic soda in the collar may be neutralized by immersing the collar in a weak bath of hydrochloric acid of ½° to 1° Tw. or the collar may be washed in a wash wheel for half an hour until it is freed from caustic.

Alternatively a process similar to the one just described may be applied, but one tank only of strength 15 to 18° Tw. is provided into which the collar is dipped up to the fold line and then left on the collar holder overnight. The caustic liquid accumulates under gravity along the bottom edge of the collar band and owing to evaporation the strength of the residual caustic is increased and causes the collar to curve. Puckering can be removed by ironing after the caustic has been removed by washing.

Alternatively a spraying method can be applied in which the collar is held in a frame according

to Figs. 1 and 2 and sprayed with caustic soda of 50 to 55° Tw. in an area E adjoining the lower edge of the center portion of the collar band (Fig. 3) and reaching upwards for about half the height of the collar band. The spraying time should be about 5 seconds and sufficient caustic should be used to soak the cloth. A further 10 seconds is allowed for the collar to curve and then it is resprayed in an area F starting from the lower edge of the collar band and reaching up to the fold line (Fig. 3) with a caustic strength of 35 to 40° Tw. for 5 seconds. This will act as a modifier and counteract any tendency to pucker after the first treatment. Then the caustic is neutralized with hydrochloric acid of $\frac{1}{2}$ to 1° Tw. or washed in water in a wash wheel.

Instead of spraying with caustic soda a printing process may be applied. The caustic soda is applied to the collar in a series of dots. Preferably only one strength of caustic soda is used in this method throughout.

Potassium hydroxide may be used as a shrinking liquid in which case the collar is held on the frame shown in Fig. 4 and lowered into a bath of potassium hydroxide of maximum strength of 38° Tw. up to the fold line. The collar is allowed to absorb the liquid for about 5 seconds. It is then removed and left to stand for two minutes or less. Then it is washed with cold water after which treatment it will have taken on a curvilinear form. This is followed by a further wash in hot, preferably boiling water. To insure complete freedom from the potassium hydroxide the collar should be soured in a weak acid.

In an alternative method two or more tanks of various strength of potassium hydroxide are used. In the case of two tanks, the strengths to be applied are 38° Tw. and 30° Tw. in which the collar is dipped for 5 seconds and 3 seconds, respectively.

The procedure is the same as that hereinbefore described, the intermediate time between tanks being 9 seconds.

Another example of a shrinking liquid is a solution of zinc chloride which is prepared as a bath containing 59% by weight of zinc chloride at a temperature of 65° and 71° C. In 5 to 10 seconds the collar will react to the chemical and obtain a curvilinear form. The zinc chloride is removed from the cloth by washing in cold water followed by a further wash in hot water.

Alternatively calcium thiocyanate may be used as a shrinking liquid. The collar is dipped at an angle of 30° into a bath containing 60% by weight of calcium thiocyanate at room temperature. In about 8 seconds the collar attains a curvilinear form. The calcium thiocyanate is then removed by washing in cold water followed by a washing in hot water which is followed by souring the collar in weak hydrochloric acid.

If desired sulphuric acid may be used as a shrinking liquid. At a strength of 100° Tw. sulphuric acid gives a limited shrinkage but has the disadvantage of causing parchmentsation of the fabric. A treating time of 30 seconds maximum is sufficient. The acid is removed by washing with cold water and finishing off with a weak ammonia wash.

Other shrinking liquids are nitric acid of a strength of 83 to 84° Tw., lithium hydroxide, rhubidium hydroxide, and caesium hydroxide.

When employing lithium hydroxide in a single tank a 10% solution in water is used and the time of immersion of the collar is 7 to 10 seconds.

For caesium hydroxide or rhubidium hydroxide

a 60% solution in water is employed in each case and the time of immersion is again 7 to 10 seconds.

The collars to be dipped in lithium hydroxide, caesium hydroxide or rhubidium hydroxide are treated as hereinbefore described with reference to the neutralising of the surplus shrinking liquid.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of processes for imparting a curvilinear form to oblong pieces of cotton or viscose fabrics differing from the types described above.

While I have illustrated and described the invention as embodied in processes for imparting a curvilinear form to collar blanks made of cotton or viscose fabrics, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. A process for imparting a curvilinear form to a collar blank made of a cellulose fabric, comprising the steps of chemically shrinking to a first predetermined degree, with a chemical shrinking solution for cellulose fabric, a first area of said collar blank located along the free longitudinal edge of the collar band of said collar blank; chemically shrinking to a second predetermined degree less than said first predetermined degree, with a chemical shrinking solution for cellulose fabric, a second area of said collar blank located about and next to said first area; and removing from each of said areas the chemical shrinking solution with which it is shrunk.

2. A process for shrinking a collar blank made of a cellulose fabric so as to impart a curvilinear form to the collar blank, comprising the steps of dipping a first area of said collar blank located along the free longitudinal edge of the collar band into a first chemical shrinking solution, for the cellulose fabric, of a first predetermined strength; removing said first area of said collar blank from said first chemical shrinking solution after said first area of said collar blank has shrunk to a desired degree; subsequently dipping a second area of said collar blank which is greater than and includes said first area into a second chemical shrinking solution, for the cellulose fabric, of a second predetermined strength which is weaker than said first predetermined strength; removing said second area of said collar blank from said second chemical shrinking solution after said second area has shrunk to a desired degree, so that said first area is shrunk to a greater degree than the portion of said second area located beyond said first area; and removing the shrinking solutions from said areas.

3. A process for shrinking a collar blank made of cellulose fabric so as to impart a curvilinear form to the collar blank, comprising the steps

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of spraying with a first chemical shrinking solution, for cellulose fabric, of a first predetermined strength a first area of said collar blank located along the free longitudinal edge of the collar band of said collar blank; then spraying with a second chemical shrinking solution, for the cellulose fabric, of a second predetermined strength weaker than said first predetermined strength a second area of said collar blank which is greater than and includes said first area, so that said first area is shrunk to a greater degree than the portion of said second area located beyond said first area; and removing said chemical shrinking solutions from said collar blank.

4. A process for shrinking a collar blank made of a cellulose fabric so as to impart a curvilinear form to the collar blank, comprising the steps of dipping a first area of said collar blank located along the free longitudinal edge of the collar band into a first chemical shrinking solution, for the cellulose fabric, of a first predetermined strength; removing said first area of said collar blank from said first chemical shrinking solution after said first area of said collar blank has shrunk to a desired degree; subsequently

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dipping a second area of said collar blank which is greater than and includes said first area into a second chemical shrinking solution, for the cellulose fabric, of a second predetermined strength which is weaker than said first predetermined strength; removing said second area of said collar blank from said second chemical shrinking solution after said second area has shrunk to a desired degree, so that said first area is shrunk to a greater degree than the portion of said second area located beyond said first area; and washing the thus dipped areas to remove the shrinking solutions therefrom.

ERNEST ALFRED WOOD.

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