Feb. 27, 1940. G. SCHNEIDER 2,191,545

WEARING APPAREL

Filed July 1, 1937

Fig. 1.

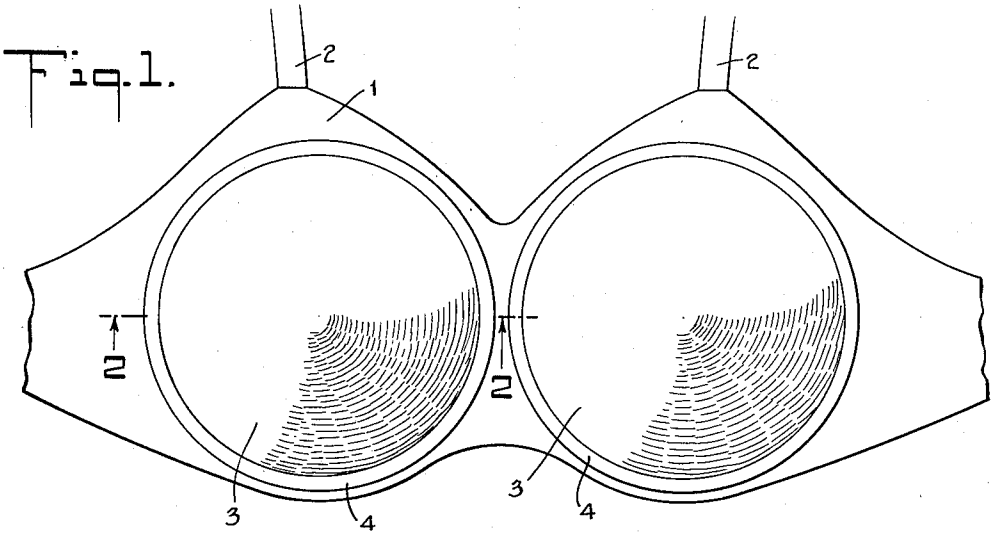


Fig. 2.

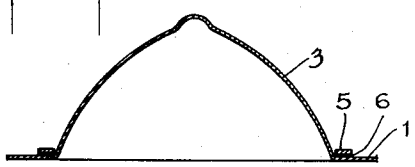


Fig. 3.

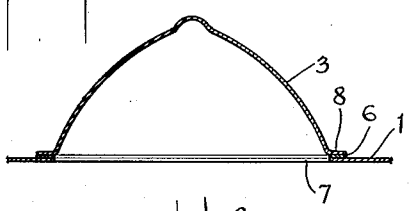


Fig. 4.

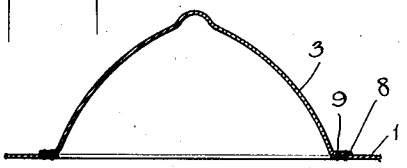


Fig. 5.

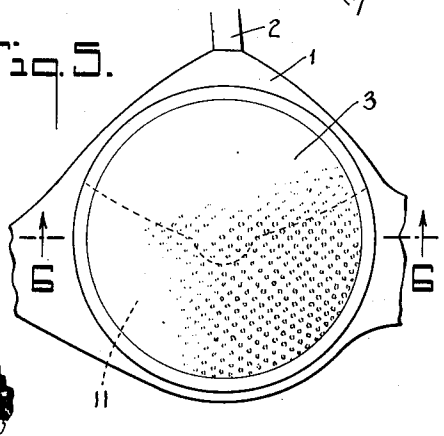


Fig. 6.

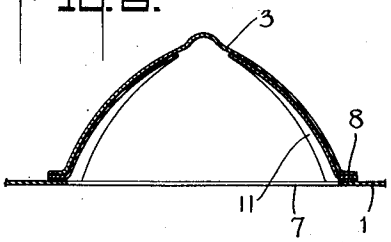
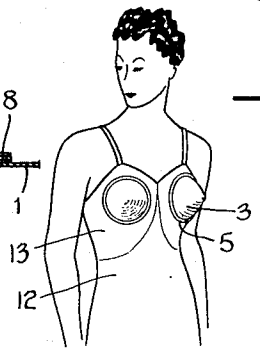


Fig. 7.



INVENTOR
George Schneider
BY
Welsh & Wenman
ATTORNEYS

Patented Feb. 27, 1940 2,191,545

UNITED STATES PATENT OFFICE

2,191,545

WEARING APPAREL

George Schneider, Montclair, N. J., assignor to Celanese Corporation of America, a corporation of Delaware

Application July 1, 1937, Serial No. 151,385

5 Claims. (Cl. 2—42)

This invention relates to articles of wearing apparel, or other articles, and relates more particularly to the production of wearing apparel by shaping textile materials comprising thermoplastic derivatives of cellulose by the use of heat, with or without plasticizers or solvents, and then locking the shape in the article by means of a hem or a bind, or by laminating a strip of material to the article along at least a marginal edge of the molded portion.

An object of my invention is to produce wearing apparel in an economical and expeditious manner by molding to shape a textile material comprising filaments or fibers of a thermoplastic derivative of cellulose with the aid of heat and pressure and then locking the shaped portion against loss of shape. Another object of my invention is the method of forming shaped wearing apparel or similar articles that will withstand vigorous washings, etc. without losing their fullness. Another object of my invention is to produce a brassière having breast retaining portions free of hems or other disfiguring and skin irritating ridges. Other objects of the invention will appear from the following detailed description and drawing.

In the drawing, wherein like reference numerals refer to the same or similar elements in their respective views,

Fig. 1 is a front elevational view of a part of a brassière made in accordance with this invention,

Fig. 2 is a cross-sectional view on line 2—2 of Fig. 1,

Fig. 3 is a cross-sectional view of a modified form of the invention taken on a sectional line similar to Fig. 2,

Fig. 4 is a cross-sectional view of another modification of my invention taken on a line similar to that of Fig. 2,

Fig. 5 is a front view of a part of a brassière, the body portion of which is reinforced to give an "uplift" effect,

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 5, and

Fig. 7 is a perspective view of a slip having a built-in brassière.

The production of wearing apparel such as brassières, caps, hats, suspensories, etc. having shapes in three dimensions is relatively complicated, since in order to obtain the desired shape it is necessary to form them from a relatively large number of small pieces of fabric, usually by sewing the small pieces together. This method is not only cumbersome but also results in an article having seams in the shaped portion which, as in the case of a brassière, shows through the outer garments in an undesired manner. The seams also form ridges which may be uncomfortable to the wearer.

I have now found that shaped wearing apparel can be formed very simply and expeditiously without seams in the shaped or three dimensional portion by molding by means of a suitable forming device relatively flat textile materials, such as fabrics comprising filaments or fibers of thermoplastic derivatives of cellulose. The shaped or three dimensional portions of the article may be formed of a single piece of textile material, eliminating any necessity of sewing the article except for hems, tape, decorations, etc. around the edges. Under the influence of heat and pressure the filaments of thermoplastic derivatives of cellulose become sufficiently soft or plastic to assume the shape of the forming device and upon cooling harden into such shape. Because of the thermoplasticity of the fibers comprising the fabric, the articles so formed retain their shape substantially permanently and, therefore, do not become distorted when exposed to the elements. However, when subjected to repeated and vigorous washings and roping for the purpose of wringing, particularly in heated baths, there is a tendency for the shaped portion to resume its original flat form. This may be due in part to the heavy stress placed upon only part of the filaments or yarns of the fabric, while the stretched filaments receive none of the strain. In such operations there is also a slight tendency for the yarns of the fabric to slip over one another to equalize any strain, thereby tending to flatten out the three dimensional portion when part of that three dimensional portion is formed by distortion of the stitch shape instead of molding action. I have now found that articles having permanent shape and which may be subjected to repeated vigorous washings even in heated baths may be formed by shaping relatively flat pieces of fabric and placing seams, hems, strips or like expedients at the marginal edge of the molded section to lock the shape therein in order to prevent a stitch distortion from running from the unmolded part to the molded part and also to equalize over the entire area of the unmolded part any stress thereon.

In forming the shaped portion of the article under the influence of heat, it is preferable to have the temperature sufficiently high, or to employ plasticizers, so that substantially all of the distortion of the fabric is formed by a molding

of the thermoplastic cellulose derivative fibers and only a relatively small percent be caused through stitch distortion or a physical stretching of the yarns. Steam may be employed as a plasticizer. The steam may be applied to the article while in the mold by means of steam-ducts leading from a suitable header to the molding surface or the article may be sprayed with or dipped into water prior to the molding operation and thereby developing steam in situ.

In accordance with my invention, I form shaped wearing apparel or similar articles from relatively flat pieces of textile material comprising filaments of thermoplastic derivatives of cellulose by imparting a desired shape to such textile materials under such conditions, for instance heat and/or steam or other plasticizers, that the filaments are rendered at least partially plastic, and then locking the shape of the molded portion of the material by means of a hem, an adherent strip, a turned portion or otherwise rendering substantially permanent the shape in the molded portion.

Any suitable wearing apparel or similar articles may be made by this invention. Examples of such wearing apparel are brassières, suspensories, men's and women's hats or hat shapes, girdles and the like.

The filaments contained in the textile material to be treated may be made of any suitable thermoplastic derivative of cellulose, particularly organic derivatives of cellulose such as organic esters of cellulose and cellulose ethers. Examples of organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose. The filaments may be present in substantially continuous lengths or they may be in the form of short or staple lengths associated together in the form of "spun" yarn. The textile material may consist wholly of such filaments or yarns containing such filaments, or it may contain yarns or filaments of organic derivatives of cellulose together with yarns or filaments or other materials. The textile material may also be heavier material such as may be made by weaving or braiding heavier filaments, such as artificial hair, bristles, or straws of the organic derivatives of cellulose.

The shaping of the textile materials is effected while they are heated with or without the aid of steam, etc., to such a degree that they are at least partially plastic under the prevailing conditions. The temperature of treatment will vary not only with the nature of the particular thermoplastic derivative of cellulose present in the textile material, but also with the prevailing conditions, such as the amount of water present. Thus, if a fabric made of yarns of acetone-soluble cellulose acetate is shaped between or on forming devices in the absence of water or steam, the temperature of such devices should be preferably above 100° C., while the upper temperature limit should be below 180° C. if it is desired to avoid coalescence of the cellulose acetate filaments and the consequent stiffening of the material; while temperatures above 180° C. but below the temperature of decomposition may be employed when coalescence of the filaments and stiffening of the material is desired.

When employing plasticizers with the yarns or filaments of organic derivatives of cellulose the temperature at which the article is shaped is considerably reduced. For example, when shaping with dry heat an article containing yarns or filaments of an organic derivative of cellulose together with a plasticizer, a temperature 30° C. or more than that used when shaping an article of unplasticized material may be employed. The plasticizer may be so selected that it is removable by water or an organic solvent after the desired shape has been imparted to the article. The removal of the plasticizer raises the softening temperature of the material of the article above that of the normal ironing temperature. Any suitable plasticizer may be employed and in any suitable amount, say from 5 to 40% or more on the weight of the organic derivative of cellulose. The amount and kind of plasticizer employed may be selected in accordance with the organic derivative of cellulose employed and the size of the cross-section of the filaments employed. Examples of plasticizers that may be employed are tricresyl phosphate, triphenyl phosphate, diethylene glycol, paratoluene sulphonamide, dimethyl tartrate, dimethyl phthalate, etc.

I have found that the presence of water in the form of liquid or vapor permits of the use of lower temperatures to obtain the degree of plasticity of the thermoplastic derivative of cellulose required for imparting permanent shape to the textile material. If steam is present during the shaping operation, temperatures of about 100° C. are generally sufficient. If the textile material is wet with water during the shaping operation, temperatures of 90 to 100° C. will usually produce the desired result.

The fabric to be molded to form a three dimensional shape may be cut to the desired pattern prior to or after being shaped. For instance, a fabric may be cut to a suitable pattern to form a single brassière and then shaped, or a whole length of fabric may be molded or shaped in the form of a plurality of the desired shapes, and then cut to individual pieces suitable for a single brassière. Regardless of whether the fabric is cut to pattern before or after shaping, the sewing of the pieces together, or the hemming and binding of the material, should not be performed until the material has been shaped so that there will be a locking or fixing of the shape.

In carrying out the shaping operation, any suitable devices and expedients may be employed. For instance, the flat textile material may be placed between the male and female members of mold-like devices of suitable shape, which devices may be heated internally or externally by steam, superheated steam, steam under pressure, electrical resistance, open flame and the like. Such devices may be provided with means, such as perforations to jets, to supply steam to the textile material in order to facilitate the shaping of the same. Alternatively, the flat textile material may be placed over a heated form and drawn, under suitably applied tension, over such form until the desired shape is imparted to the material.

If it is desired to impart stiffness to the wearing apparel or parts thereof, such as in the case where hats or hat forms are being made, this may be done in several ways. Thus, if the temperatures employed in the shaping are high enough to cause coalescence of the filaments of the thermoplastic derivative of cellulose, stiffness is imparted. However, when it is desired that the stiffness be in the form of a given shape, such as in an "uplift" brassière and in suspen-

sories, without changing the fabric-like structure or appearance of the textile materials, I prefer to impart stiffness by laminating, by means of heat and pressure, auxiliary pieces of fabric of the desired weight to the shaped portion to give the stiffness desired for the particular purpose. The laminating of the fabrics may be accomplished during the molding operation or the fabrics may be laminated together and then molded, or a shaped non-thermoplastic material may be welded onto the shaped fabric. Also, I may impart a less permanent stiffness by employing in the textile materials either prior to, during or subsequent to the shaping operation, sizes or stiffening agents comprising suitable solids, such as dammar, copal, elemi or other resins dissolved in turpentine or other liquid which has no appreciable action on the thermoplastic derivative of cellulose present in the textile material, or by means of gelatin, or by using an active solvent such as acetone, methyl acetate, dioxane, etc., in concentrations which do not coalesce the fibers, or by means of nitrocellulose or ethers of cellulose dissolved in solvents which do not attack the cellulose derivative forming the material, or by means of a cellulose acetate solution where cellulose acetate is the derivative of cellulose employed in the article.

The above described molding processes are preferably carried out prior to any sewing on the fabric, thereby allowing for some stitch distortion in knitted material or distortion in the weave where woven material is employed. After the material has been shaped and the stretching and distortion set therein by cooling the shaped material in air or by artificially chilling same by contact with cooled forms, the finished article may be formed by sewing a hem in the material or edging the material with tape, lace, binding material, etc. and attaching, if desired, straps, bands, fasteners, etc. The sewing of the material after it has been molded or shaped is of great importance as it acts to lock the stitches, weave, etc. of the yarns in their molded or shaped relationship. It is preferable when the three dimensional portion is integral with the flat material which acts as the body portion that a tape be sewed to or fused onto the body portion at the marginal edge of the three dimensional portion. The same results are obtained when the three dimensional portions are in one piece and are sewn or fused onto the body portion or otherwise attached to the body portion. The stitching or fusing locks the stitches in place and prevents an unmolding or loss of shape when subjected to heated baths as in laundering.

In the drawing wherein there are shown several modifications of my invention, Fig. 1 shows a part of a brassière having a body portion 1 and shoulder straps 2. In the body portion 1 there is a molded cup or pocket 3 adapted to hold the breast. About the molded portion 3 is a band or hem 4 for preventing the molded portion 3 from losing its shape and for preventing a running of the molded portion into the body portion 1, especially at that point between the two molded cups.

In Fig. 2 is shown one modification of my invention wherein the molded portion 3 is of the same fabric as the body portion 1. The article is formed by taking a flat piece of material and molding the breast pockets therein as described above. To prevent the cup or molded portion from losing shape and stitch distortion in the part 1 a suitable piece of material 5, which may be the same as the body portion or of a different material, is fused onto the body portion by means of an inner layer 6 of a plasticized fabric comprising yarns of organic derivatives of cellulose.

Fig. 3 shows another modification of my invention wherein the cup 3 is of a piece of material different from that of the body portion 1. In making this modification the body portion 1 is suitably shaped and holes 7 cut therein. The cup 3 is molded from a piece of material comprising thermoplastic derivatives of cellulose and the cup cut therefrom in such a manner that there is left around the marginal edge of the cup a flange 8. This flange and the body portion 1 may be fused together by an inner liner 6 of plasticized organic derivatives of cellulose.

Fig. 4 shows another modification of my invention similar to the one shown in Fig. 3 except that the cup portion and the body portion are attached together by sewing the flange 8 to the body portion 1 by means of stitches 9.

In Fig. 5 there is shown another modification of my invention in which a brassière is reinforced in such a manner that it has an "uplift" effect. The cross-sectional view of this modification is shown in Fig. 6. The brassière consists of any suitable body material 1, having shoulder straps 2 and holes 7 are cut in the body portion 1. The breast cups or pockets 3 are molded from any suitable thermoplastic material, the one shown on the drawing being a porous knit fabric made from yarns containing organic derivatives of cellulose. This porous knit material is molded by the methods described above into pockets having flanges 8 around the marginal edge of the molded portion. This flange may be formed by molding a piece of material slightly larger than that necessary for the cup and then trimming the excess material away from the cup leaving a small amount to form the flange. The cup is reinforced to hold its shape when in use by causing a piece of fabric 11 to adhere to at least the bottom portion of the molded cup. This material may be cotton or it may be of thermoplastic derivatives of cellulose material, or silk or mixtures of any of these. The fabric 11 of itself need not be stiff as the fusing of the fabric 11 to the cup 3 joining the two fabrics together effects the necessary stiffness in the same manner that collars on men's shirts are stiffened. If desired, the fabric 11 may be a thermoplastic fabric molded to shape. However, as this fabric does not necessarily cover the complete cup the same may be cut to shape and bent into place. The stiffening 11 and cup 3 may be attached to the body portion 1 by stitching or by fusing as explained with reference to Fig. 2.

In Fig. 7 there is shown a combination slip and brassière in which a slip 12 is provided with a body fitting portion 13 which acts as the body portion 1 of the brassière above described. In the body portion 13 are holes about which are fitted the cup portions 3 in any manner described above. If desired, the top portion of the slip 12 may be formed of a fabric containing a thermoplastic derivative of cellulose and the cup portion 3 molded from the body portion 13 and their shape locked in place by means of a ring 5 fused around the marginal edge of the molded portion.

The fusing of the rings around the marginal portion on brassières or the fusing of similar strips of material around the marginal edge of the three dimensional portion or cup in other articles as well as laminating of the stiffening

fabric 11 to the cup 3 may be performed in any suitable manner, for example that described in U. S. Patent No. 1,903,960 and in U. S. application S. Nos. 127,774 filed February 25, 1937, 106,802 filed October 21, 1936, 96,910 filed August 20, 1936, 743,835 filed September 13, 1934, 17,930 filed April 24, 1935 and 42,718 filed September 28, 1935.

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

Having described my invention, what I desire to secure by Letters Patent is:

1. A brassière comprising a body portion of textile fabric containing filaments or fibers of a thermoplastic derivative of cellulose and having seamless pockets therein produced by molding said body portion, said pockets and body portion being formed of the same continuous piece of fabric, and reinforcing means at the junction of said molded pockets and said body portion for preventing said pockets from assuming the flat form of said body portion.

2. A brassière comprising a body portion of textile fabric containing filaments or fibers of cellulose acetate and having seamless pockets therein produced by molding said body portion, said pockets and body portion being formed of the same continuous piece of fabric, and reinforcing means at the junction of said molded pockets and said body portion for preventing said pockets from assuming the flat form of said body portion.

3. A brassière comprising a body portion of textile fabric containing filaments or fibers of a thermoplastic derivative of cellulose and having seamless pockets therein produced by molding said body portion, said pockets and body portion being formed of the same continuous piece of fabric, and a band fixed to said body portion at the junction of said molded pockets and said body portion for preventing said pockets from assuming the flat form of said body portion.

4. A brassière comprising a body portion of textile fabric containing filaments or fibers of a thermoplastic derivative of cellulose and having seamless pockets therein produced by molding said body portion, said pockets and body portion being formed of the same continuous piece of fabric, and a band stitched to said body portion at the junction of said molded pockets and said body portion for preventing said pockets from assuming the flat form of said body portion.

5. A brassière comprising a body portion of textile fabric containing filaments or fibers of cellulose acetate and having seamless pockets therein produced by molding said body portion, said pockets and body portion being formed of the same continuous piece of fabric, and a band fused to said body portion at the junction of said molded pockets and said body portion for preventing said pockets from assuming the flat form of said body portion.

GEORGE SCHNEIDER.