

Feb. 18, 1969

I. ROSENTHAL

3,428,047

PROCESS FOR TREATING FIGURE CONTROL GARMENTS

Filed July 13, 1966

Sheet 1 of 2

Fig. 1

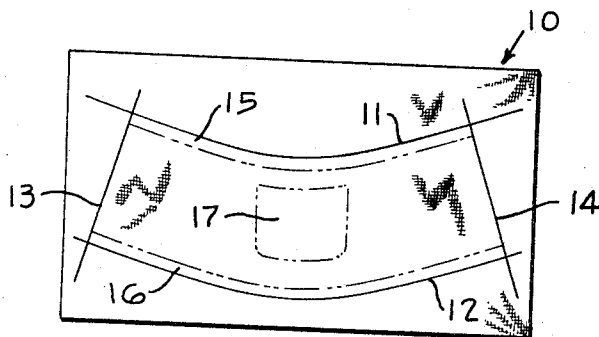


Fig. 2

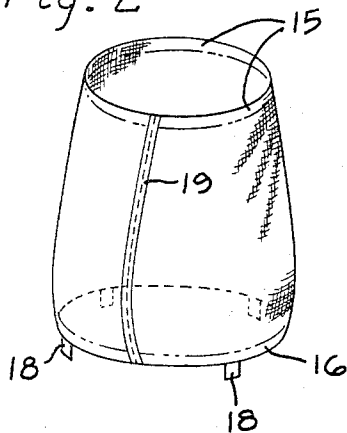


Fig. 3

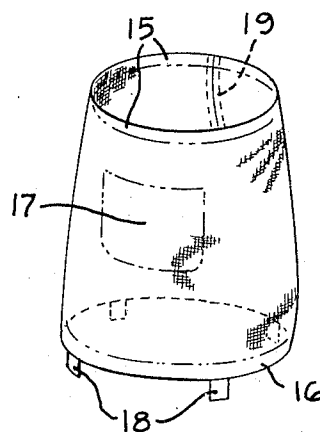
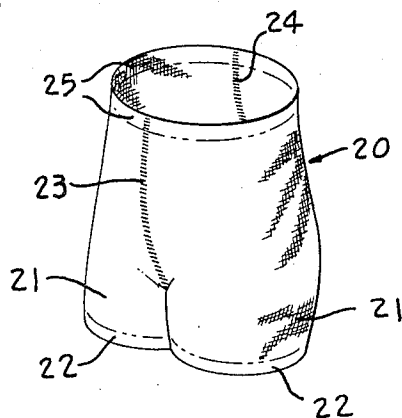


Fig. 4



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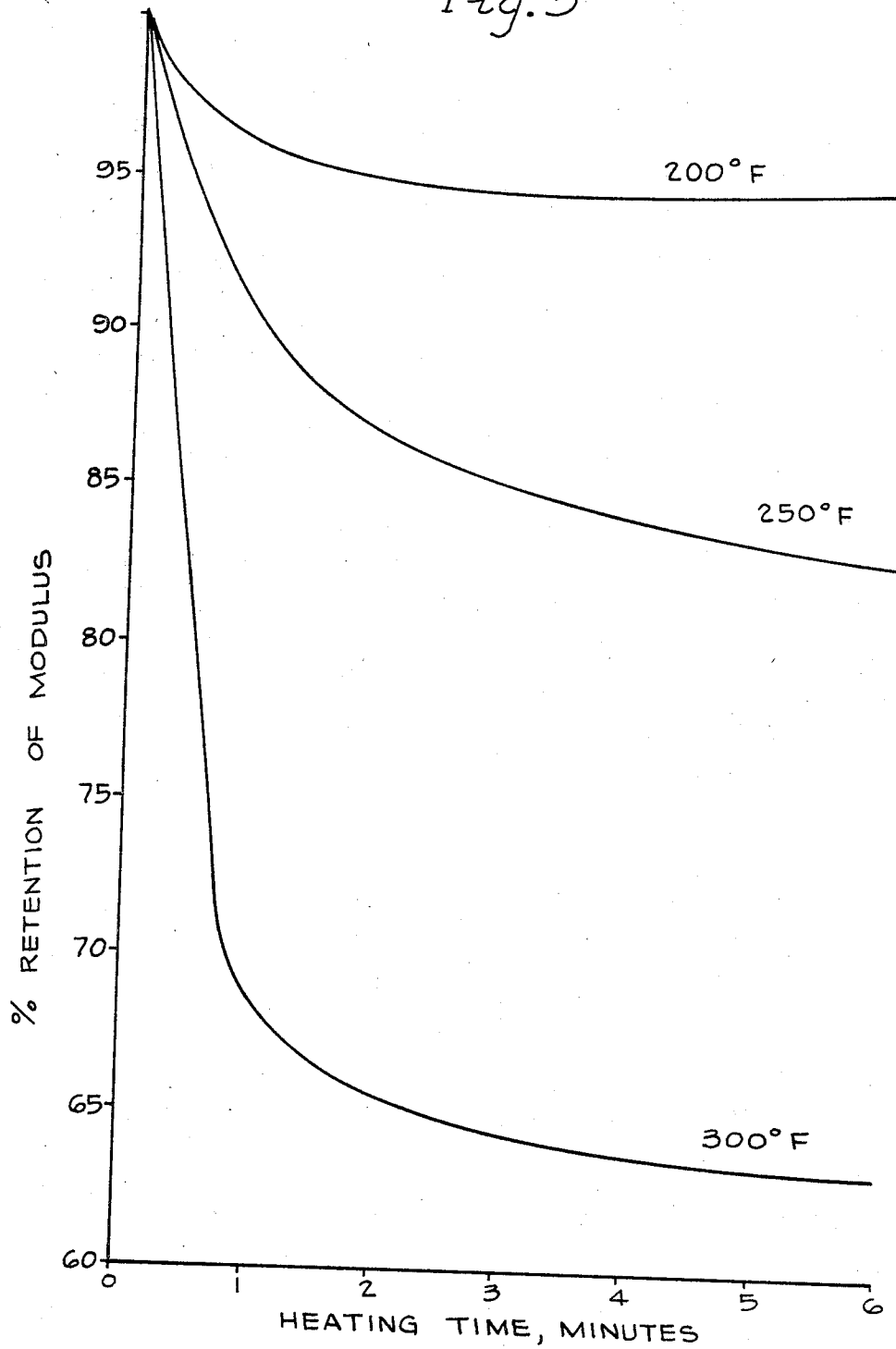
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PROCESS FOR TREATING FIGURE CONTROL GARMENTS

Filed July 13, 1966

Sheet 2 of 2

*Fig. 5*



1

3,428,047

## PROCESS FOR TREATING FIGURE CONTROL GARMENTS

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5 Claims

### ABSTRACT OF THE DISCLOSURE

A method for preparing figure control garments. More particularly this method deals with a process for controlling the modulus in critical areas of figure control garments without the necessity for varying the denier, knit or fabric construction.

#### Introduction

In a number of garments, such as foundation garments, girdles, brassieres, swim suits, support stockings, surgical hose, etc., one of the prime functions of the garment is to smooth out unsightly contours of the body by redistribution. This function is accomplished by the power exerted by an elastic fabric which comprises the body of the garment and by the relationship of the size of the garment to the size of the wearer. For example, a small garment on a large woman would exert maximum power, but would be very uncomfortable to wear. Further, the control exerted in this manner is applied approximately equally around the entire circumference of the garment whereas it is desired to exert greater control in some areas, as the stomach, than in other areas. In order to provide garments of suitable size with varying degrees of control over the area of the garment, it is conventional to incorporate control panels into the garment design to permit emphasis on specific body areas by increasing power at those points without changes in the size of the garment and while still permitting the use of uniform powernets in the construction of the garment.

The advent of elastic fibers having increased modulus and power, such as the spandex fibers and elastomeric acrylic fibers, has made possible the production of relatively shear fabrics in powernets. Spandex fibers almost completely dominate the field of figure control garments. Control garment manufacturers produce a variety of powernets offering differing amounts of power or modulus. The power of compressive force of the powernet is adjusted in a variety of ways as by regulating the degree of fabric tightness, the yarn denier, particularly the denier of the elastic fiber component, and by controlling the amount of elastic fiber relative to the amount of non-elastic fiber. Where the elastic fiber is covered, the compressive force is also controlled by varying the wrapping tension utilized in combining the elastic and nonelastic fibers to produce the covered yarn. Control panels affixed to the basic powernet afford the final degree of control in the figure control garment. The control panel itself normally consists of lighter weight, one-way stretch fabric attached to the body of the garment at strategic areas. Non-stretch fabrics may also be used for control panels. The necessity to cut and shape control panels to achieve the desired variation in control over the garment adds significantly to the cost of the garment. Moreover, the addition of an extra ply or plies of fabric by reason of the attachment of the control panel to the powernet renders such areas thicker and thus less desirable from both a style and comfort aspect.

Even more significantly there have recently appeared some cases of pedal edema caused by the constricting

2

effect of the basic powernet used in figure control garments. To date, such cases have been found only in connection with wearing of pantie girdles (from which fact the ailment has been termed "pantieleg syndrome"). The syndrome is caused by the too tight gripping of the thighs by the pantie girdle which causes a decrease in circulation in the legs. As some 70% of all foundations sold are pantie girdles, the problem is significant. While the problem can be solved by placing compensating inserts in the thighs of pantie legs or by custom fitting, such solutions are expensive and, therefore, undesirable. While the problem is accentuated in the case of the pantie girdle, similar problems are present in other figure control garments. Thus there is a need for a means to precisely vary the compressive force of a powernet in the finished garment without resort to control panels, expensive shaping, etc.

Accordingly, it is an object of the invention to provide a means of constructing figure control garments embodying varying degrees of control as desired in different areas of the garment without the use of control panels.

It is further an object of the invention to provide an economic and efficient manner of controlling the modulus of the powernet.

Again, it is an object of the invention to provide a process for reducing the modulus of a powernet in desired areas in a controlled and reproducible manner.

Yet again, it is an object of the invention to provide a means for producing pantie girdles free from a tendency to produce pantieleg syndrome and without the necessity of using compensating inserts.

These and other objects of the invention will best be understood from the following description of the invention, together with the accompanying drawings in which:

FIG. 1 is a diagrammatic view of a powernet used for making a girdle.

FIG. 2 is a rear view of a garment produced from the girdle blank of FIG. 1.

FIG. 3 is a front view of the girdle shown in FIG. 2 as applied to a wearer.

FIG. 4 is a front view of a pantie girdle processed in accordance with the invention.

FIG. 5 is a graph showing the effect of temperature on a powernet as a function of time.

Now, in accordance with the instant invention, it has been found that by a controlled heating of a powernet containing a heat-settable elastomeric fiber, the modulus of the powernet may be reduced as desired in the heated area without reducing or otherwise affecting the portions of the powernet not being heated. The extent to which the modulus is reduced can be regulated by controlling the extent of the heating step, i.e., its temperature and duration. The method of heating is not critical. Where a minor area of the powernet, as the hem, is to be treated, a roller heated by steam, electricity, hot oil, etc., may be used either by itself or in conjunction with a heated platen. A stream or jet of hot air or steam may also be passed through the area to be treated. If desired, the hot air or steam may be directed through an apertured pattern plate or through screened portions of such a pattern plate. Alternatively, the area contacted by the hot air or steam may be limited solely by the configuration of the nozzle and the velocity of the hot air or steam directed therethrough. Conversely, an unheated roller or disk may be used to press the powernet into contact with a heated platen. Where a specific area of a powernet is to be treated to reduce the modulus of that area, a vertically actuated heated press moving in timed relation to the passage of the powernet therethrough may be used. Where all of a powernet except for a specific area is to be heat-treated, a mold having the appropriate configuration of heated and cooled

areas may be used. Alternatively, a pattern of insulating material cut in the desired configuration may be attached to the area to be protected and the entire powernet subjected to a source of heat as infrared lamps. This description is far from exhaustive. A wide variety of processes and apparatuses for the controlled heating of fabrics is available and any of such means known to those skilled in the art may be used.

Referring now to the drawings, in FIG. 1, 10 is a standard Raschel powernet containing nylon and 28% by weight bare spandex and having a 100% modulus out of 2.3 lbs./inch of width. In the standard process of producing a girdle, the girdle blank is marked off on the powernet by line 11 (which constitutes the top of the finished girdle), line 12 (which constitutes the bottom of the finished girdle) and side lines 13 and 14 (which are joined to form a vertical seam in the finished girdle). To produce a girdle as shown in FIG. 2, area 11, 12, 13 and 14 is cut out, sides 13 and 14 are attached to each other either by sewing or by using a seam-closure strip 19 as described in application Ser. No. 390,064 filed Aug. 17, 1964 by M. Storti, and, with the attachment of tabs 18 on the bottom of the girdle to act as garters, the girdle is completed.

To produce a girdle having controlled modulus in accordance with the invention, the girdle blank 10 is sandwiched between sheets of glass coated with polytetrafluoroethylene and the assembly placed in a hot press adapted to heat all areas of the blank except area 17. The blank is then heated at 320° F. for 10 seconds and removed from the press. The edge areas 15 and 16 (designated by the dotted lines running equidistant from the top and bottom edges, 11 and 12 respectively, of the girdle) are then heated for an additional 15 seconds at 320° F. The girdle is then cut out and assembled as in the regular process described above. The finished girdle so produced has a basic power of 2.0 lbs./in. giving general support over the whole girdle area, a special control area (no extraneous panel is necessary) 17 having a power of 2.3 lbs./in. to provide extra support in the abdominal area, and a power of only 1.8 lbs./in. in edge areas 15 and 16 to provide maximum freedom for walking with minimum interference with circulation.

Thus, by a simple controlled heat treatment it is possible to either insert a control panel or to reduce the constricting force of the girdle in selected desired portions of the girdle while leaving the remaining areas of the girdle completely unaffected. Moreover, this is obtained without special fitting, inserts or tailoring.

FIG. 4 illustrates a pantie girdle according to the present invention. In the particular girdle illustrated no control panels are used. The girdle 20 is prepared from a standard nylon (70 den.)-spandex (420 den., 16% inlay) powernet having an 80% modulus of 2.0 lbs./in. out and front and back seams 23 and 24, respectively, using conventional assembly techniques. The girdle 20 is then fitted on a form and given a mild heat treatment to shape and press the girdle 20. While on the form, bands clamp on the edge area 25 encircling the waist and on the edge areas 22 encircling the leg portions 21 of the girdle 20. The bands are heated to 350° F. for 30 seconds lowering the power in the edge areas 25 and 22 to 1.44 lbs./in. Applying exactly the same process to a pantie girdle made from a nylon (70 den.)-spandex (560 den., 9% inlay) powernet having an 80% modulus of 3.36 lbs./in., the power in the edge areas 25 and 22 is lowered to 1.76 lbs./in. The girdles so produced may be worn without fear of pantieleg syndrome and the circulatory difficulties previously associated with mass-produced pantie girdles. By controlling the degree and duration of the heat treatment the modulus of the powernet in these areas can be varied as desired to reduce the modulus in the selected areas to a point where interference with circulation is eliminated.

In general, the higher the temperature of the treatment, the shorter the time necessary to obtain the desired reduction in modulus. Where the heat-settable elastomeric fiber

in the garment is covered, as with nylon, cotton, polyester fiber, etc., either by core spinning, plying or helical wrapping, slightly longer heat treatments are necessary due to the insulating action of the covering fiber. Almost all commercially available powernets use spandex for the elastomeric fiber. Two general types of spandex fiber are now commercially available: the one based on a polyether and the other based on a polyester. Both types of spandex may be heat set as described to reduce the modulus in a controlled manner.

A recently discovered heat-settable elastomeric fiber is disclosed in U.S. patent application Ser. No. 372,476 filed on June 4, 1964 by Minton and Melamed. This fiber is useful in powernets and may be used in the process of the instant invention. Unlike spandex fibers whose modulus declines progressively with time at any one temperature, the fiber of Minton and Melamed declines in modulus during the first part of the heating cycle and then shows little further decline in modulus as the temperature is maintained for a longer period of time. For example, a fill stretch leno woven powernet containing the new fiber (600 den.) double covered with cellulose acetate (75 den.) and having the warp of polyethylene terephthalate (50 den.) has a modulus of 2.40 lbs./in. (This and the comparative modulus values are determined on an Instron at a crosshead speed of 20 cm./min., the specimen being cycled from 0-50% elongation and the stress measured at 40%, outgoing). A similar fill stretch leno woven powernet containing 280 den. spandex double covered, first with 75 den. nylon and then with 75 den. cellulose acetate, and having the warp of polyethylene terephthalate (50 den.) has a modulus of 1.55 lbs./in. These two fabrics have the following heat treatment properties:

| Fiber                       | Minutes of Heating | Modulus (lbs./in.) at |         |         |
|-----------------------------|--------------------|-----------------------|---------|---------|
|                             |                    | 300° F.               | 325° F. | 350° F. |
| Minton, <i>et al.</i> ----- | 0.5                | 2.15                  | 1.89    | 1.18    |
|                             | 1.0                | 2.07                  | 1.81    | 1.21    |
|                             | 5.0                | 2.17                  | 1.71    | -----   |
| Spandex-----                | 0.5                | 1.29                  | 1.10    | 0.87    |
|                             | 1.0                | 1.25                  | 0.99    | 0.84    |
|                             | 5.0                | 0.89                  | 0.70    | -----   |

To obtain a setting action in a reasonable length of time the temperature should be at least 250° F. The upper temperature limit is not critical and will depend mainly upon the nature of the fibers in the powernet. FIG. 5 is a graph illustrating the time and temperature dependence of modulus when treated in accordance with the invention. The fabric is a 56 gauge commercial powernet, bare knit containing 280 den. spandex and 50 den. nylon and is padded with an emulsion of a copolymer of ethyl acrylate, acrylonitrile, acrylamide and methylol acrylamide, the pickup being about 3% by weight. The modulus values are determined on an Instron at a crosshead speed of 40 cm./min., the specimen being cycled from 0-200% elongation and the stress measured at 75% elongation, outgoing. The degree and duration of the heating must be such as to cause neither discoloration nor decomposition of the materials comprising the powernet. Temperatures as high as 500° F. can be used when the time of heating is extremely short. It is obvious that under these conditions the fibers themselves do not actually reach the indicated temperature due to the short period of heating. The method of applying the heat also is not critical. In general moist heat as wet steam has a plasticizing and setting action on many yarns used in powernet construction as nylon. However, water vapor is not believed to contribute to the setting of the heat-settable elastomeric yarns which constitute the mechanism for controlling modulus used in the instant invention. Thus, steam has no specific advantage in producing the desired setting action in spandex or in the fiber of Minton and Melamed. If the other fibers in the powernet are detrimentally affected by water vapor, the use of steam should be avoided.

The process of the invention can also be used in the

5

production of support hose. At present, to get even power over the leg or to get power that varies in a controlled manner, it is conventional to feed in the elastomeric fiber (generally spandex) under varying degrees of stretch or draft so that those areas of the leg which are thick do not have the same amount of fiber at the same stretch as does, for example, the ankle. In accordance with the instant invention it is possible to construct a support stocking putting in the elastomeric fiber evenly at the highest power needed at any section in the stocking and then, during the conventional boardig step, apply different amounts of heat to the different areas of the stocking, thereby producing the desired variations in modulus. By this means, the laborious variable feed techniques now used can be avoided while retaining maximum flexibility in shaping power and fit. These and other variations of the process of the invention will be apparent to those skilled in the art.

By the term "powernet" as used herein in the specification and claims is meant any knitted or woven fabric containing an elastic fiber in at least one dimension and also containing at least one hard fiber, i.e., nonelastic fiber. See, for example, Fairchild's Dictionary of Textiles, copyright 1959.

What is claimed is:

1. A process for controlling the modulus in a powernet containing a heat-settable elastomeric fiber comprising heating only selected areas of said powernet at a temperature of at least 250° F. until the modulus of said selected

6

areas has been reduced to a desired value and then cooling said powernet.

2. A process according to claim 1 wherein the elastomeric fiber is a spandex fiber.

3. A process for controlling the modulus in a spandex-containing powernet comprising masking selected areas of said powernet with a heat-protective material, heating the remaining areas of said powernet at a temperature of at least 250° F. until the modulus of said selected areas has been reduced and then cooling said powernet.

4. A process for controlling the modulus at least in the thigh areas of a girdle constructed of a powernet containing a heat-settable elastomeric fiber comprising heating said thigh areas at temperature of at least 250° F. until the modulus of said thigh areas has been reduced to a desired value and then cooling the heated areas.

5. A process according to claim 4 wherein the elastomeric fiber is a spandex fiber.

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U.S. Cl. X.R.

128—516; 139—419