April 11, 1967 M. H. McGUIRE ETAL 3,312,981

NETHER GARMENT

Filed Nov. 22, 1963

Fig. 1.

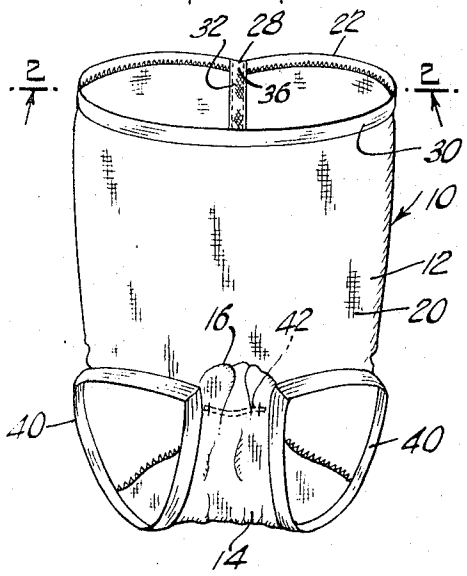


Fig. 2.

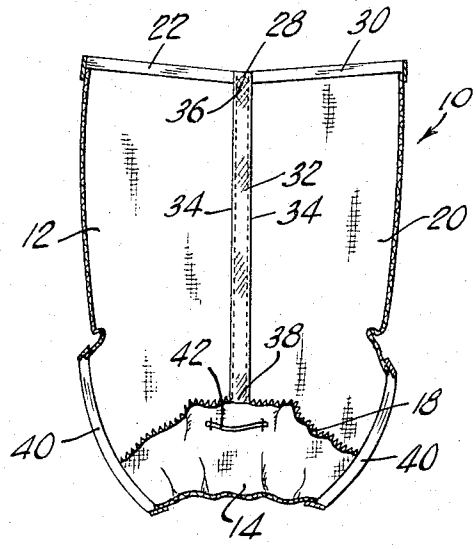


Fig. 3.

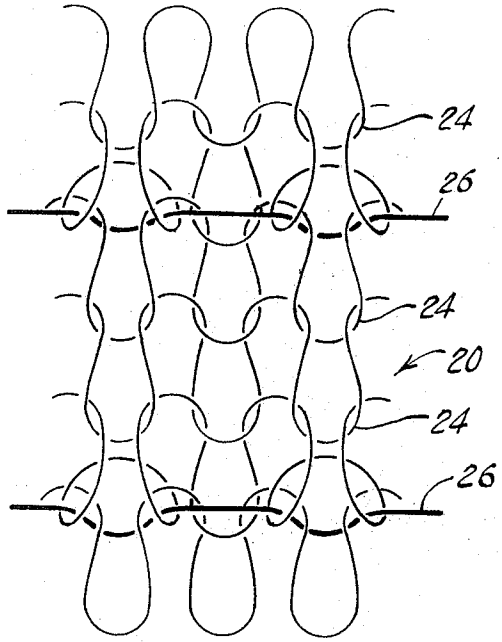
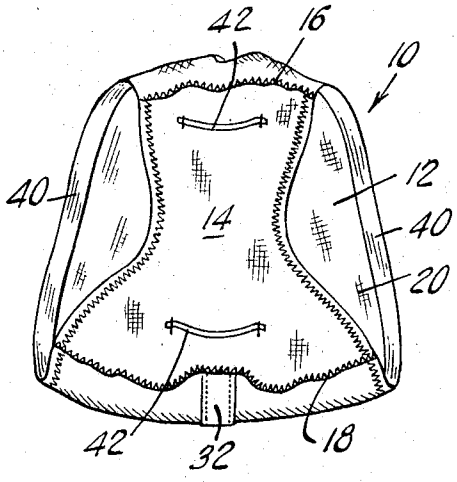


Fig. 4.



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NETHER GARMENT

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This invention relates to undergarments and more particularly to undergarments of the sanitary panty type which are designed to hold and retain a sanitary napkin in position on the body of the wearer.

A sanitary panty-type undergarment which is adapted to hold a sanitary napkin should fit comfortably and snugly on the body without being unduly restrictive. It should not fit as loosely as a conventional sanitary panty, nor as tightly as a girdle-type garment. It should fit in intimate, conforming, wrinkle-free relationship with the body, without being uncomfortably tight. It should also hold the napkin securely in position in intimate contact with the body of the wearer in order for the napkin to exercise its function of absorbing menstrual fluid. The panty particularly the crotch portion thereof, should not sag away from the body, nor roll, or otherwise become displaced from its desired position. It should have sufficient stretchability to provide a comfortable, conforming fit, coupled with sufficient contractability to maintain it and the napkin it holds in the desired position with respect to the body. The relationship of stretchability and contractability should be such as to resist displacement due to movement of the body, while still permitting free body movement. An undergarment of the sanitary panty type should also desirably be soft and have a light, lingerie-type weight.

In the interests of economy, it is also desirable to provide a sanitary panty which can fit a wide range of body sizes. The hip sizes of women range from about 29 to about 49 inches, and the waist sizes from about 20 to about 47 inches. In order for a sanitary panty to properly fit at least a large proportion of such hip and waist sizes, the panty must not fit too loosely in the lower sizes, nor be too restrictive and binding in the upper sizes. To fit properly most women in these size ranges, it has been determined that a longitudinal stretch, i.e., in the direction across the hips, of up to about 280% is required in a panty which has an initial circumference of about 16 inches.

Further, the dimensions of women from the front waist to the back waist (crotch length) varies from about 19 to about 34 inches. Therefore, the panty should also be stretchable in this direction to accommodate such a range of sizes.

Sufficient stretchability may be provided in a sanitary panty to fit such ranges in body sizes without great difficulty. However, in addition to stretchability, contractability is an important feature in an article of this type in order to obtain a snug but comfortable fit. Rubber threads have sufficient extensibility to provide the desired stretchability, but such threads become unduly restrictive and tight in the upper ranges of stretch and hence are not completely satisfactory. Also, it is difficult to obtain rubber threads in a gauge fine enough to provide a light weight, lingerie-type panty.

Other features desired in a sanitary panty-type garment include a crotch portion which is relatively waterproof, which does not cause excessive warmth, and which may be easily laundered. The panty should also include support features which hold the napkin against the body to prevent the napkin from becoming displaced from its desired position.

We have discovered that an undergarment of the

sanitary panty type which achieves the foregoing objectives may be obtained by providing a panty which has a body portion made from a rib-knit fabric, preferably tubular knit, which is formed from a combination of highly extensible, synthetic thermoplastic resin yarns of low contracting capabilities, such as those prepared in accordance with the "Helanca" process and commonly referred to as stretch yarns, and highly extensible elastic yarns having a higher contractability, such as spandex yarns. A further important feature of the panty of our invention is the use of a rib-knit fabric which contains from about 87% to about 95% by weight of stretch yarns and from about 13% to about 5% by weight of spandex yarns. In its preferred form, the fabric from which the panty is made contains about 91% by weight stretch yarn and 9% spandex yarn.

Another important feature in the panty of our invention is the provision of a waistband which extends downwardly in a V-shaped configuration at the rear of the panty to provide a firmer fit and better support from the hips when the panty is worn. Another feature of the panty is the provision of an inelastic fabric strap which is secured at its ends and which extends from the V-shaped portion of the waistband downwardly to the crotch portion of the panty to hold the napkin in position in close relationship to the body, and to provide effective garment fit across the lower portion of the body in the area of the buttocks.

Yarn formed in accordance with the process designated under the trademark "Helanca," so-called stretch yarn, is well known and has exceptional properties of extensibility which permits it to be easily elongated to more than twice its unstretched length without becoming deformed or damaged. The high degree of extensibility in the yarn is due to its form rather than its inherent elasticity, as in the case of rubber. The yarn is usually formed from a plurality of continuous, extensible, synthetic thermoplastic resin filaments which have a regular or irregular curled, sinuous form. The curled, sinuous form in the filaments is provided by twisting, heat setting, and then untwisting the filaments. The yarns are easily stretchable over a wide range and the resistance to stretching does not increase in direct proportion to the increase in elongation caused by stretching. They are customarily made from polyamides, such as nylon, polyesters, such as those known commercially as "Dacron," and other fiber-forming synthetic linear condensation polymers. When used herein, the term stretch yarn is limited to such yarns.

However, while easily extensible, such yarns have virtually no contrasting power and a panty made from such extensible stretch yarns does not provide the support-without-restriction property desired in a sanitary panty-type garment; the desired contractability is lacking. We have found that by incorporating into the fabric containing such stretch yarns from which the panty is made spandex yarns, also well known in the art, which are yarns formed of polyurethane, the balance of extensibility and contractability desired can be obtained. In distinction to the stretch yarns, spandex yarns have an inherent capacity to contract from an elongated condition, with a degree of power in contraction. The spandex yarns are elastic polymers of the type disclosed in U.S. Patent No. 2,623,031.

The spandex yarn, in addition to imparting to the panty a conformability and contractability not attainable when all stretch yarn is used, can also be obtained in extremely small deniers (gauge), thus making feasible light weight, lingerie-type panties. Such yarns are currently available under the name "Vyrene" sold by the United States Rubber Company and "Lycra" sold by Du Pont.

Reference is made to the accompanying drawings wherein a preferred embodiment of the invention is illustrated by way of example. In the drawings:

FIG. 1 is a front elevational view of the panty, partly in perspective.

FIG. 2 is a vertical sectional view of FIG. 1 taken along lines 2—2;

FIG. 3 is a view of the construction of the fabric from which the body portion of the panty is made; and

FIG. 4 is a view of the panty turned inside out to illustrate the provision of napkin-retaining straps on the inside of the crotch portion.

The panty **10** comprises a stretchable fabric body portion **12** of conventional form which is adapted to fit around the waist and hips of the wearer and a relatively nonstretchable crotch portion **14** which is adapted to extend between the legs to hold a sanitary napkin against the body. The crotch is sewn at its ends to the body portion to form a front seam **16** and a rear seam **18**. It is curved inwardly on both side edges to define leg openings in conjunction with the bottom edge portions of the body portion. The fabric from which the body portion is made, is, as illustrated in FIG. 3, a rib-knit fabric **20** and is preferably knit in tubular form to eliminate the necessity for side seams. The waist-encircling portion **22** of the panty may, by way of example, have a circumference of about 16 inches.

A fabric knit in a knit-purl pattern is preferred to an all knit pattern so that the fabric will have additional extensibility, as will be brought out below. The fabric is arranged with respect to the body portion of the panty so that the courses extend horizontally of the panty to provide additional stretch in a horizontal direction, e.g., around the hips, so that the panty can fit a wide range of hip sizes.

The fabric is made from thermoplastic resin stretch yarns **24**, such as those known commercially as "Magiloft" nylon sold by Du Pont, preferably covered with cotton or nylon, and spandex yarns **26**, such as those sold commercially as "Vyrene" by the United States Rubber Company under the designation KV 5461, with every fourth course, in the preferred form, being spandex yarn. When used herein, the term "knit" in an alternating pattern" refers to such arrangement of knit courses, and others, such as the spandex yarn occurring in every other, or every third course. By way of example, the fabric may have 52 ribs per inch and have, per inch, in a coursewise direction, 45 courses of 70 denier stretch yarn in a 1 x 1 rib and 15 courses of 150 core spandex yarn knit in a regular jersey stitch. Other rib-knit patterns may be used, such as a 2 x 1, or 2 x 2 rib, and the type of jersey stitch may also be varied.

In the preferred form, the spandex yarn is looped in every other wale and floats across intermediate wales. However, the spandex yarn may float across two wales. The spandex yarn is floated across one or two wales in order to maintain the desired relationship of extensibility and contractability in the fabric. If the spandex yarn is looped in every wale, the extensibility of the fabric will be adequate; however, the contractability of the fabric will be lower than that desired. If the spandex yarn is floated across more than two wales, the contractability of the fabric will be higher than desired and the panty will be too restrictive. The relationship of stretchability to contractability desired in the fabric, is therefore, that which is obtained when spandex yarn is floated across no more than two wales, and preferably one wale. The fabric may be knit on a circular knitting machine with six feeds running one end each of the stretch yarn and two feeds of the spandex yarn which is knit with a jersey stitch.

Stretch yarn which is currently available may have an extensibility of up to about 120%. This degree of extensibility, however, is not adequate in providing a sanitary panty which can be stretched about 280% from

an initial circumferece of about 16 inches so that the panty will fit a large range of body sizes. Therefore, the additional extensibility desired is obtained by using a rib-knit pattern in the body fabric. 150 core spandex yarn has an extensibility of about 200%. This extensibility, supplemented by the extensibility of the rib-knit pattern of the body fabric, will also permit the panty to be extended up to the desired 280%.

150 core spandex yarn has been found especially suitable because it inherently has a stretch of about 200%, because it has the desired contractability and also because it will provide a light weight panty. Satisfactory results may, however, be obtained by using spandex yarns which range from about 70 core to about 200 core. If a spandex yarn significantly above 200 core is used, the weight of the panty becomes higher, the extensibility becomes lower and the contractability higher. On the other hand, if spandex yarn appreciably below 70 core is used in the fabric, a lighter weight panty having a high extensibility may be obtained, but its contractability is low. These various factors should, therefore, be taken into consideration in providing a panty incorporating the invention.

A panty of the invention will have a stretch of about 280%, e.g., to a circumference of about 45 inches in the horizontal direction from an initial circumference of about 16 inches, due both to the rib-knit pattern and to the stretchability of the thermoplastic resin stretch yarn and the spandex yarn. The fabric will also have a stretchability of up to about 60% in a vertical direction to fit the range of crotch sizes noted above, due primarily to the knit pattern used in the fabric and to the extensibility of the stretch yarn.

Since the spandex yarn extends horizontally, its contracting effect will be exercised in that direction, e.g., across the hips and waist of the wearer, and it will provide a snug fit without being restrictive. In order to obtain the desired balance of extensibility to contractability, it has been determined that best results are obtained when the fabric contains about 91% by weight of thermoplastic resin stretch yarn and about 9% by weight of spandex yarn. As the amount of spandex yarn in the fabric is decreased, snugness decreases and conversely, as the amount of spandex yarn increases, restriction increases. Further, as the amount of spandex yarn is increased, the type of fit obtained in a panty containing such a fabric more nearly approaches the highly restrictive fit obtained in a girdle-type garment.

By forming the body portion of the fabric in the form of tubular knit which in its unstretched state is about 16 inches in circumference, the panty will fit a majority of women. The panty will have the stretch properties required and also have the desired restrictive properties, without being unduly so, over a large range of body sizes.

To provide a better fit and more support for the napkin from the hips of the wearer, the top rear of the waist-encircling portion **22** of the panty is tapered downwardly into a V-shaped configuration **28**. An elastic strap **30** which is sewn to the upper edge of the waist-encircling portion follows its contours and forms the waistband. In addition, more positive support for a napkin may be obtained by securing a nonextensible strap **32**, such as a cloth fabric strap ⅞ of an inch wide, to the inside of the panty at the rear thereof. The strap extends from the V-shaped portion **28** downwardly to the seam **18** at which the rear end of the crotch portion of the panty and the bottom of the body portion of the panty are secured together. The strap may be stitched or otherwise secured at its side margins **34, 34** to the body fabric. It is secured at its top end **36** to the elastic waistband **30** at the V-shaped portion **28** and at its bottom end **38** to the crotch portion at the rear seam **18**. The nonextensible strap aids in holding up the rear of the crotch and, consequently, the rear portion of the napkin held within the crotch, so that the napkin is maintained up against the

body of the wearer. In conjunction with the V-shaped configuration at the rear of the waist-encircling portion of the panty, it also distributes the stresses imposed upon the panty, particularly when the wearer of the panty moves, to around the waistband portion of the panty, thereby reducing the tendency of the panty to slide down in the rear.

The crotch portion of the panty is preferably made from a single ply of a relatively nonextensible closely knit, fabric such as that sold under the trademark "Banlon." The crotch portion of the fabric may be made in a jersey stitch pattern from 70/3 denier, medium bulk, nylon yarn which has been treated in accordance with the "Banlon" process. The crotch fabric has only little stretch in both a lengthwise and transverse direction and therefore does not tend to sag to cause the napkin held therein to become displaced or move out of the desired intimate contact with the body. The edges of the crotch portion and the edges of the body portion which define the leg openings are provided with elastic fabric straps **40** to provide a snug fit around the legs of the wearer.

The fabric from which the crotch portion is made is made repellent or impervious to fluid and is preferably siliconized, whereby the fabric, although made repellent, still has sufficient porosity to minimize the uncomfortable warmth which often results when an impervious material, such as a plastic film, is used. The fabric may be siliconized after it is made, or the yarns from which the fabric is made may be treated prior to formation into a fabric. Imparting repellency by siliconizing permits repeated laundering.

The crotch portion of the panty is also provided with suitable devices for holding the napkin in position in the panty. Preferably, the devices are in the form of elastic straps **42** sewn at their ends to the crotch fabric to form loops into which the ends of a sanitary napkin may be extended. The straps may be ⅛ of an inch wide and 2½ inches long, spaced apart 5½ inches, with the strap in the front portion of the crotch placed about one inch below the front seam **16** and the strap in the rear portion of the crotch placed about 1½ inches below the back seam **18**. Napkin-securing straps of this type permit napkins to be easily attached and detached from the crotch portion of the panty. The straps are also desirably made repellent by siliconizing in the same manner as the crotch portion.

The foregoing features in a sanitary panty permit its use in a wide range of body sizes, provide a snug but comfortable fit, and securely maintains the napkin in intimate contact with the body.

It is apparent that modifications and changes may be made in the foregoing illustrative embodiment of the invention while still remaining within its spirit.

What is claimed is:

1. A light weight sanitary panty having a stretchable body portion and a relatively nonstretchable crotch portion, said body portion comprising a tubular rib-knit fabric containing, by weight, from about 87% to about 95% stretch yarn and from about 13% to about 5% spandex yarn knit in an alternating pattern ranging from every other course being spandex yarn to every fourth course being spandex yarn, said stretch yarn being extensible about 120%, said spandex yarn being extensible about 200%, said spandex yarn being floated across from one to two wales, said panty having a waist-encircling portion which extends downwardly in a V-shaped configuration at the rear of said panty, and a nonextensible tape which extends downward from said waist-encircling portion at said V to the rear of said crotch portion, said tape being secured to said waist-encircling portion and to said crotch portion.

2. A light weight sanitary panty having a stretchable body portion and a relatively nonstretchable crotch portion, said body portion comprising a rib-knit fabric containing, by weight, from about 87% to about 95% stretch yarn and from about 13% to about 5% spandex yarn with every fourth course being spandex yarn, said stretch yarn being extensible about 120%, said spandex yarn being extensible about 200%, said spandex yarn being floated across alternate wales, said panty having a waist-encircling portion which extends downwardly in a V-shaped configuration at the rear of said panty, and a nonextensible tape which extends downwardly from said waist-encircling portion at said V to the rear of said crotch portion, said tape being secured to said waist-encircling portion and to said crotch portion.

3. A light weight sanitary panty having a stretchable body portion and a relatively nonstretchable crotch portion, said body portion comprising a tubular rib-knit fabric containing, by weight, about 91% stretch yarn and about 9% spandex yarn with every fourth course being spandex yarn, said stretch yarn being extensible about 120%, said spandex yarn being extensible about 200%, said spandex yarn being floated across alternate wales, said panty having a waist-encircling portion which extends downwardly in a V-shaped configuration at the rear of said panty, and a nonextensible tape which extends downwardly from said waist-encircling portion at said V to the rear of said crotch portion, said tape being secured to said waist-encircling portion and to said crotch portion.

4. A light weight sanitary panty having a body portion stretchable at least about 280% in a hipwise direction, and a relatively nonstretchable crotch portion, said body portion comprising a tubular rib-knit fabric containing, by weight, about 91% stretch yarn and about 9% spandex yarn with every fourth course being spandex yarn, said stretch yarn being extensible about 120%, said spandex yarn being extensible about 200%, said spandex yarn being floated across alternate wales, said panty having a waist-encircling portion which extends downwardly in a V-shaped configuration at the rear of said panty, and a nonextensible tape which extends downwardly from said waist-encircling portion at said V to the rear of said crotch portion, said tape being secured to said waist-encircling portion and to said crotch portion.

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