United States Patent

Webber et al.

[15] **3,699,590**

[45] **Oct. 24, 1972**

[54] **ANTISTATIC GARMENT**

[72] Inventors: **Harold H. Webber,** Groton; **Pauline F. Riordan,** Lowell, both of Mass.

[73] Assignee: **Brunswick Corporation**

[22] Filed: **Jan. 24, 1972**

[21] Appl. No.: **220,326**

Related U.S. Application Data

[63] Continuation of Ser. No. 4,306, Jan. 20, 1970, abandoned.

[52] **U.S. Cl.**.....**2/73,** 57/157 AS, 139/425 R, 317/2 B, 317/2 C

[51] **Int. Cl.**.....**A41b 9/00,** H05f 3/00

[58] **Field of Search**.....2/73; 139/425 R, 425 A; 57/157 AS; 317/2 B, 2 C

[56] **References Cited**

UNITED STATES PATENTS

2,302,003	11/1942	Cadwell et al.	57/157 AS X
3,277,564	10/1966	Webber et al.	57/157 AS
3,288,175	11/1966	Valko	139/425 R
3,472,298	10/1969	Webber	57/157 AS

OTHER PUBLICATIONS

" Metal Filaments, Their Processing and End Use;" H. Webber; Modern Textile Magazine; May 1966.

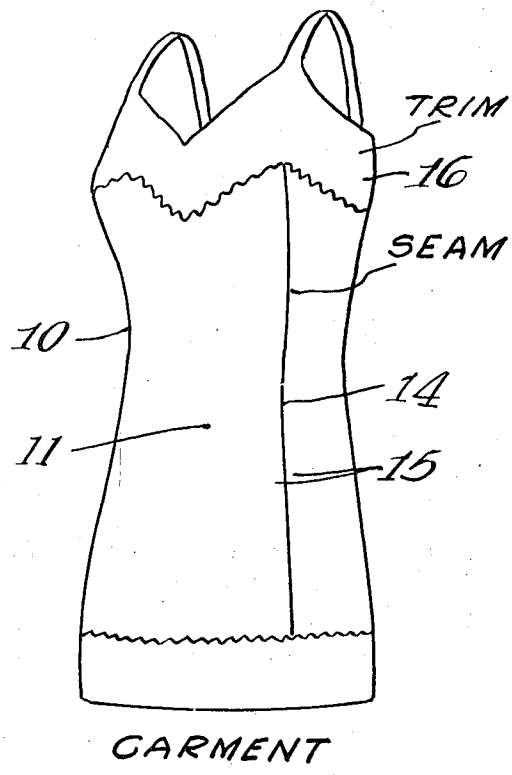
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[57] **ABSTRACT**

An anti-static garment such as an undergarment intended to be worn by a person having means for precluding the accumulation of static electricity. The garment fabric has a hand substantially similar to the hand of conventional garment fabrics while providing the desirable static elimination by incorporation therein of distributed textile-like conductive fiber. The fiber may be substantially uniformly distributed in the fabric or may be localized, such as in the stitching and/or trim portions of the garment.

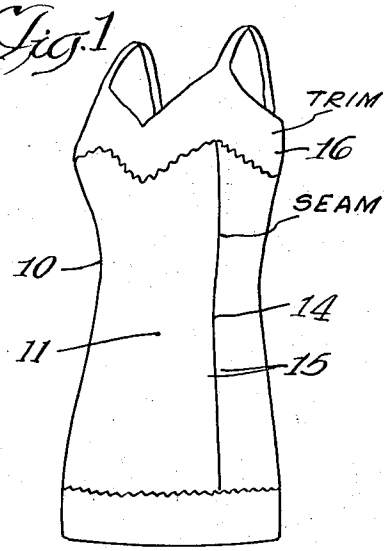
18 Claims, 10 Drawing Figures



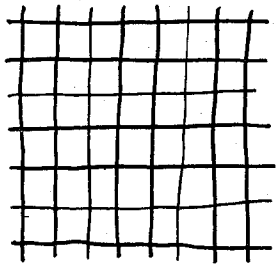
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Fig. 1

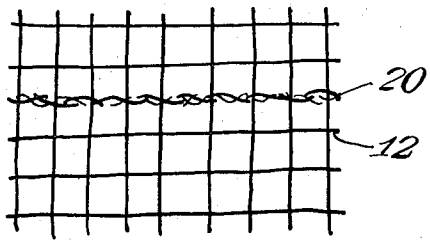


GARMENT



SPACED YARNS FABRIC

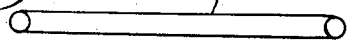
Fig. 2



FABRIC WITH BLENDED YARN

Fig. 3

Fig. 4

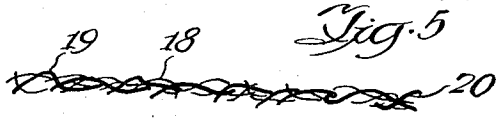


CONTINUOUS FILAMENT



STAPLE ALL METAL YARN

Fig. 5



BLENDED YARN

Fig. 6

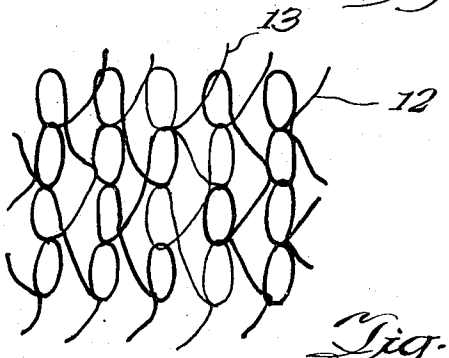


Fig. 7

WARP KNIT FABRIC

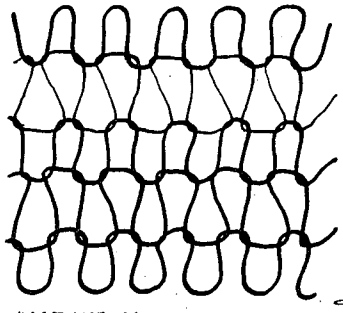
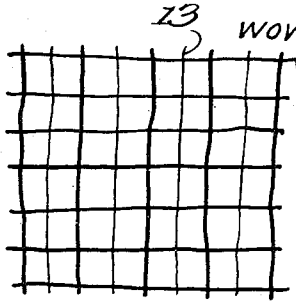


Fig. 8

WEFT KNIT FABRIC



WOVEN FABRIC

Fig. 9

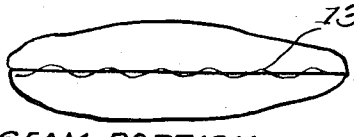


Fig. 10

SEAM PORTION

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ANTISTATIC GARMENT

This is a continuation of application Ser. No. 4,306 filed Jan. 20, 1970, and now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to garments such as undergarments and in particular to garments having anti-static characteristics.

2. Description of the Prior Art

In conventional garments, such as women's slips and similar undergarments, a problem arises in particular in connection with the forming of such garments by a number of different man-made fiber fabrics. Thus, such garments have been found to tend to cling undesirably to the wearer's body and to other articles of clothing being worn. Not only does this cause an undesirable effect on the appearance of the clothes worn by the person but also, as a result of the discharge of the static electricity causing such clinging, an undesirable annoying experience occurs often in the removal of the garments as a result of the arcing or sparking of the static electricity against the wearer's body.

Another problem arising in conjunction with such static accumulating in conventional fabric material is the tendency for such material to retain dirt and foreign material as s result of the static charge. It has been found that there is substantial increase in the rate of soiling of such fabric over the rate non-static-charging fabrics soil. The effect appears to be self-perpetuating in that once a nucleus of attracted material forms, it tends to build up thereby causing the conventional pilling, common in certain synthetic fiber fabrics.

Recently Harold Webber, co-inventor of the invention of this application, developed in conjunction with another a new process for forming metal fibers permitting such fibers for the first time to be adapted for use as conventional textile materials. While prior to this development, as disclosed in Webber et al. U.S. Pat. No. 3,277,564, anti-static materials were known, such materials incorporated relatively heavy wires, carbon materials, etc. rendering them substantially useless for applications such as garments. The making of metal textile-type fibers available, however, has opened a whole new field of technology providing solutions to the long standing vexatious problems related to static formation in garments as discussed above.

The usefulness of the new metal textile fibers was disseminated to the public at large by said Harold H. Webber and others associated with him such as in his article in the May, 1966 issue of Modern Textiles magazine at pages 72–75 entitled "Metal Fibers — Their Processing and End Uses." The development of the improved method of forming such metal textile fibers was made prior to 1964, as indicated by the Mar. 14, 1963 filing date of the indicated Webber et al. patent. Information as to the availability of the improved textile fiber material was disseminated, as discussed above, and others began to use such fibers in connection with their products. Illustratively, a textile material utilizing small diameter metal fibers is disclosed in the Valko U.S. Pat. No. 3,288,175 and in the more recent J. F. Burke et al U.S. Pat. No. 3,422,460. In the Valko patent a relatively large percentage of metal fibers in the textile material was required to provide the necessary electrically conductive metallic fiber

system. In the Burke et al patent a lower range of percentages is indicated as capable of providing the anti-static characteristics in a garment.

SUMMARY OF THE INVENTION

The present invention comprehends the forming of garments from textile fabrics with electrically conductive fiber distributed therein to render the garment substantially static free when worn on a person's body. Thus, the present invention relates to an anti-static garment such as disclosed in said Burke et al patent.

The present invention more specifically comprehends an improved static free garment wherein the electrically conductive fiber selectively may be provided in a uniform distribution through the fabric, may be utilized as the stitching material, may be utilized in trim components and the like, or in other configurations whereby the garment is rendered substantially static free when worn by a person.

The fiber may be provided in the form of continuous filaments, staple yarn, blended or plied yarns utilizing either continuous or staple length metal fiber, etc. As indicated above, the fiber may be present in a relatively small percentage while yet providing the desirable anti-static characteristics in the garment. Illustratively, the fiber may be present in an amount under **10**. The fiber is preferably very small in diameter to provide the desired simulation of conventional textile fiber characteristics, such as flexibility, drapeability, etc. The fabric may comprise any suitable conventional fabric for forming the garment including warp knit, such as tricot, Raschel, etc., weft knit; woven, such as taffeta, satin, crepe, etc.; etc. fabrics.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. **1** is an elevation of a static free garment embodying the invention;

FIG. **2** is an enlarged plan view of a fabric adapted for use in such a static free garment wherein the conductive fiber is distributed in spaced yarns;

FIG. **3** is an enlarged plan view illustrating another form of fabric embodying the invention wherein the fiber is blended with non-conductive fibers in the fabric yarns;

FIG. **4** is an elevation of a conductive filament suitable for use in the static free garment;

FIG. **5** is an elevation of a yarn made of staple metal fibers suitable for use in the static free garment;

FIG. **6** is an elevation of a blended yarn suitable for use in the static free garment;

FIG. **7** is an enlarged plan view illustrating the invention in connection with a warp knit fabric;

FIG. **8** is an enlarged plan view illustrating the invention in connection with a weft knit fabric;

FIG. **9** is an enlarged plan view illustrating the invention in connection with a woven fabric;

FIG. **10** is an enlarged plan view illustrating the use of the conductive fiber as stitching means for the garment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In illustrative embodiments as disclosed in the drawing, a static free garment generally designated **10** is shown to comprise an undergarment. Illustratively, the undergarment may comprise a slip of the type conventionally worn by women. The slip is formed of a fabric **11** which may include both an electrically non-conductive textile material **12** and electrically conductive fiber **13**. The electrically conductive fiber may be distributed in the non-conductive material **12**, may comprise localized elements such as stitching **14** along the seams **15** of fabric **11**, or may comprise fiber distributed in the trim portion **16** of the garment. Obviously the fiber may be distributed in any one or a combination of these different ways in the garment suitably to render the garment substantially static free when worn on a person's body. Thus, garment **10** effectively eliminates the problems caused by static formation in conventional garments as discussed above.

While the illustrative embodiment comprises a conventional woman's slip, obviously the garment may comprise any suitable garment, such as other undergarments, socks and hose, sweaters, skirts, dresses, blouses, men's shorts, shirts, etc.

The conductive fiber **13** may be distributed in different ways in the garment fabric within the scope of the invention. Thus, as shown in FIG. **2**, the conductive fiber **13** may comprise separate yarns distributed at spaced intervals in the non-conductive yarn fabric. As shown in FIG. **2**, the conductive yarns **13** may be utilized as warp and/or filling yarns, in part or in total as desired. As shown in FIG. **3**, the conductive fiber **13** may comprise a portion of a blended yarn **20** utilized in the fabric. As shown in FIG. **4**, the conductive fiber of which yarns may be formed, may comprise continuous filaments **17** which may be in the form of two or individual monofilament material as desired. As shown in FIG. **5**, the conductive yarn may comprise a yarn formed of staple metal fibers **18** formed in the conventional staple yarn manner. As illustrated in FIG. **6**, the conductive yarn may comprise a blend of metal fibers **18** and non-conductive fibers **19** (which may be similar to non-conductive fibers **12**, as desired). In all instances, it is desirable that the conductive fiber be relatively small so as to simulate the physical characteristics of the conventional non-conductive textile fiber materials whereby the fabric **11** and the garment **10** may have characteristics such as appearance, drapeability, hand, etc. similar to that of the conventional non-conductive textile material alone. We have found that by utilizing metal fibers such as stainless steel fibers in a size range of under approximately **25** micron diameter, such simulated textile characteristics may be obtained. We have further found that it is unnecessary to provide electrical contact between the respective metal fibers to effect the desired static electricity elimination. Relatively low percentages of metal fiber to non-conductive fiber may be utilized to provide the desirable anti-static characteristics in the garment. Thus, we have found that the metal fibers need be present in quantities of less than 10 percent to provide the desired anti-static characteristics. A particularly well suited ratio has been found to be approximately ½ to 5 percent.

Fabric **11** may comprise any suitable conventional yarn configuration such as the warp knit configuration of FIG. **7**, the weft knit configuration of FIG. **8**, the woven configuration of FIG. **9**, etc. The illustrated configurations are exemplary only, it being obvious to those skilled in the art that any suitable fabric configuration may be employed within the scope of the invention.

While the optimum anti-static characteristics are obtained by providing a substantially uniform distribution of the conductive material in the fabric, as discussed above, the provision of the anti-static means may be localized in the garment, if desired. It has been found that providing the conductive fiber in localized portions such as the seam stitching material provides an improved anti-static characteristic to the garment, even in the absence of a distribution of the material throughout the fabric **11**. Optimum anti-static characteristics, however, are obtained by the further distribution of the anti-static material in the fabric. Another area which may be utilized to provide limited anti-static characteristics is the trim portion of the garment, such as trim portion **16** as shown in FIG. **1**. Here again, while some (desirable) anti-static control is provided by the localized presence of the anti-static material in the trim, optimum anti-static characteristics are obtained by further providing a distribution of the electrically conductive material in the remainder of the garment.

The non-conductive textile material may comprise conventional synthetic fiber materials such as nylon, polyester, polyolefin, acrylic, etc. fibers. The conductive metal fiber may be formed of any suitable material and illustratively herein comprises stainless steel fiber. The fiber may be provided with a thin coating of lubricant such as polyvinyl alcohol, oils, etc. where lubrication is desired. Where the yarns are spaced in the fabric, it has been found that a maximum spacing of one-third inch provides desirable anti-static control. The use of blended yarns appears to offer advantages in connection with such anti-static material, such as facilitated fiber manipulation by means of substantially conventional textile machinery eliminating the need for special setups and the like. Further, by distributing the conductive fiber substantially uniformly throughout the entire fabric, maximum anti-static characteristics are obtained.

The electrically conductive fiber preferably comprises metal fiber having a rough, non-machined, unburnished surface and a transverse cross-section under 50 microns. It is preferably formed by a multiple end constriction of metal elements in a suitable matrix which is suitably removed upon the fiber being reduced therein to the desired size.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

Thus the invention comprehends a loose-fitting lady's undergarment attended by an undesirable adhesion to the body occasioned by the generation of static electricity, constituted by a loose-fitting fabric body portion including stitching and trim components, at least the trim component containing electrically conductive filaments of extremely fine denier, ranging in diameter from 1 micron to 25 microns and constituting a small percentage of the fibers of the components in an amount ranging from 0.25 to 3.00 percent, but in

sufficient quantity and in such disposition as to inhibit the accumulation of any significant amount of static electricity.

We claim:

1. A loose-fitting lady's undergarment attended by an undesirable adhesion to the body occasioned by the generation of static electricity, constituted by a loose-fitting fabric body portion including stitching and trim components, at least said trim component containing electrically conductive filaments of extremely fine denier, ranging in diameter from 1 micron to 25 microns and constituting a small percentage of the fibers of said component in an amount ranging from 0.25 to 3.00%, but in sufficient quantity and in such disposition as to inhibit the accumulation of any significant amount of static electricity.

2. A garment being substantially static free comprising:

fabric portions having seams therebetween arranged in the shape of a garment; and,

stitching means for holding the garment together at the seams, the stitching means comprising a yarn having electrically non-conductive filaments and metal textile filaments which range in size from about 1 micron to about 25 microns, the yarn being electrically discontinuous along the length thereof whereby localized static build-up is prevented, and the weight of the metal filament comprising less than approximately 10 percent of the yarn.

3. The garment of claim 2 wherein the fabric comprises at least some yarns having electrically non-conductive filaments and metal textile filaments with the weight of the metal filaments comprising less than 10 percent of the fabric.

4. The garment of claim 3 wherein the metal filaments are staple filaments.

5. The garment of claim 3 wherein the non-conductive filaments are staple fibers.

6. The garment of claim 2 wherein the metal filaments are staple fibers.

7. The garment of claim 2 wherein the non-conductive filaments are staple fibers.

8. The garment of claim 2 further including a trim portion secured to appropriate portions of the garment.

9. The garment of claim 8 wherein the trim portion comprises yarns having electrically non-conductive filaments and metal textile filaments.

10. The garment of claim 9 wherein the weight of the metal filaments comprises less than 10 percent of the trim portion.

11. The garment of claim 2 wherein the fabric is a warp knit.

12. The garment of claim 2 wherein the fabric is tricot knit.

13. The garment of claim 2 wherein the fabric is woven.

14. The garment of claim 2 wherein the fabric is weft knit.

15. The garment of claim 3 wherein the metal textile filaments are distributed substantially uniformly in the fabric.

16. The garment of claim 3 wherein the metal filaments are distributed in a grid arrangement in the fabric.

17. The garment of claim 3 wherein the yarns with the metal filaments are distributed in a parallel spaced arrangement in the fabric in a single direction.

18. The garment of claim 3 wherein the metal filaments have a rough, unmachined, unburnished, fracture free outer surface.

* * * * *