Aug. 22, 1967 C. DEVAUD 3,336,923

STERILE ABSORBENT PADS

Filed Nov. 29, 1963

FIG. 1.

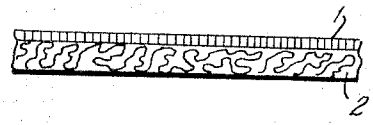


FIG. 2.

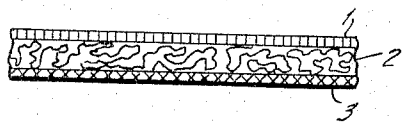


FIG. 3.

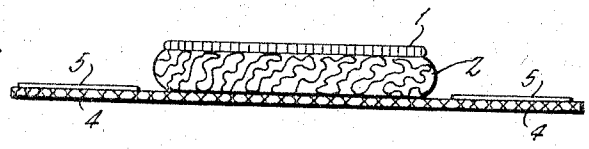


FIG. 4.

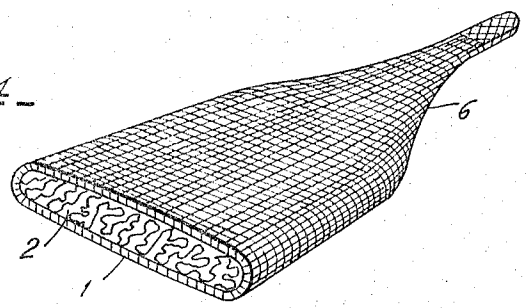


FIG. 5.

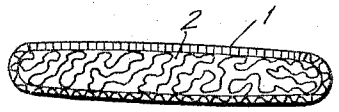


FIG. 6.

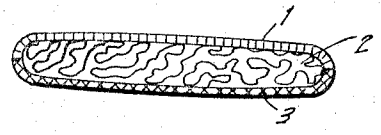
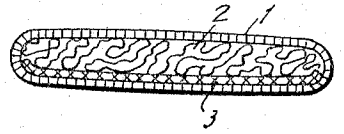


FIG. 7.



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STERILE ABSORBENT PADS

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The present invention relates to sterile articles for medical and hygienic use and more particularly to such articles useful, for example, as wound dressings or catamenial pads.

Wound dressings are designed to protect the wound against the action of external pathogenic agents, to maintain the position of existing living tissues thereby assisting subsequent sutures, and to absorb blood, serum, pus or other body fluids secreted by the wound.

In order to facilitate absorption from the wound, medical dressings are generally constituted of hydrophilic textile fibers, e.g., of cotton or other cellulosic materials. The use of such fibers, however, is not entirely satisfactory since the liquid secreted by the wound is not set by the textile dressing, but remains imprisoned in the pores of the fabric forming the dressing or in the textile fibers themselves. A portion of such liquid, frequently contaminated by bacteria or the like, thus remains in contact with the wound and both facilitates self-infection and softens the living tissues, preventing drying of the wound and slowing the healing process.

Moreover if, while such a dressing is in place, the liquid flow from the wound slows or stops, evaporation dries the dressing, which sticks to the wound, making its removal painful.

It is known that absorption of aqueous liquids by textile fabrics is due to both capillary phenomena and to swelling of the fibers of the absorptive fabric. The capillarity enables liquids to adhere to the fiber surfaces within which they are enclosed by surface tension forces. The degree of such phenomenon depends upon the nature of the particular liquid and fibrous material in question, some liquids in fact being repelled from given fibers. When capillary forces act to adhere a liquid to a fibrous material, it may be said that the liquid has a positive capillarity with respect to the fibrous material, whereas when the capillary forces tend to repel the liquid from the fiber it may be said that the liquid displays negative capillarity, with respect thereto.

A positive capillarity enables a liquid to readily penetrate into a porous fibrous material by filtering into the small passages constituted by the pores, whereas when a liquid has a negative capillarity with respect to a porous fibrous material it will penetrate the fibrous pores with difficulty.

In order to effect the penetration of a liquid having negative capillarity with respect to a given fibrous material it is necessary to apply a predetermined pressure to the material, which pressure is greater than that corresponding to the negative capillarity of the liquid. The application of such a pressure immediately fills the pores of the fabric or other fibrous material, the negative capillarity tending to empty them. If, therefore, a non-absorbent, porous fabric is placed in contact with an absorbent fibrous material, and a liquid displaying a positive capillarity with respect to the absorbent material, on the one hand, and a negative capillarity relative to the non-absorbent porous fabric, on the other hand, is impinged upon such assembly, the liquid will tend to pass through the non-absorbent fabric into the absorbent material.

It is known, employing the preceding principles, to provide bandages for the protection of wounds which, while absorbing the liquids secreted by the wounds, neither adhere to the wounds nor permit the secreted liquids to adhere thereto. Such a bandage is described, for example, in my British Patent 782,504 of Sept. 11, 1957. The bandage described in said patent includes a layer of a non-absorbent polyvinyl chloride textile and a layer of absorbent material, e.g., cotton, the former layer interposed between the wound and the absorbent material, having a negative capillarity with respect to the liquid secreted by the wound, and having a sufficiently coarse pore structure that the negative capillary pressure facilitates emptying the pores of the polyvinyl chloride textile into the absorbent part of the bandage.

It is among the objects of the present invention to provide an improved bandage of the character described above, which provides the desirable properties indicated and yet which may be sterilized at elevated temperatures without impairment of the bandage characteristics.

The nature and objects of the invention will be more fully apparent from a consideration of the following detailed description thereof, taken in connection with the accompanying drawing wherein:

FIGURES 1 to 3 show, in cross-section, three forms of sterile articles embodying the invention;

FIGURE 4 is a view in cross-section and perspective of a catamenial pad incorporating the construction hereof; and

FIGURES 5 to 7 are cross-sectional views illustrating other embodiments of the invention.

In accordance with the invention, a sterile article particularly useful for hygienic or medical dressings or bandages is provided, constituting a layer of absorbent, cellulosic material and, adhered thereto, a porous, non-absorbent layer constituted of a fabric of polypropylene yarn, the polypropylene fabric forming a plurality of interstices, the average cross-sectional area of each of which is between about 750 and 1100 millionths of a square inch and which area is between about 2.4 and 2.75 millionths of a square inch per denier of the polypropylene yarn defining the fabric.

It has been found that the polypropylene fabric, which is preferably knitted rather than woven, e.g., in the conventional 1:1 ribbed fashion, should comply with a number of conditions to provide optimum porosity and negative capillarity in accordance with the present invention.

Initially, the average cross-sectional area of each loop interstice should be not less than 750 millionths of a square inch to insure proper passage of the liquid, but not more than 1100 millionths of a square inch to provide the desired negative capillarity with respect to the liquid within the fabric interstices. Moreover, since the water repellent properties of the polypropylene fabric are related to the thickness of the polypropylene yarn of which it is composed, as well as to the interstitial area between the individual held loops of the fabric, the area of each such interstice is regulated to between about 2.4 and 2.75 millionths of a square inch per denier of the prolypropylene yarn.

The polypropylene yarn should have a total denier of not less than about 285 denier but not more than about 450 denier. A preferred polypropylene yarn useful for preparing the sterile articles of the present invention is one twisted from two strands of polypropylene fibers, each of which weighs 188 denier, the composite yarn having approximately a 375 denier and having an ultimate apparent diameter of about 0.012 inch. When such a yarn is incorporated in the knitted polypropylene fabric hereof, the area per interstice amounts to between about 2.4 x 375 and 2.75 x 375, that is to say between 900 and 1060 millionths of a square inch.

Furthermore, the number of fabric wales per inch is preferably regulated at between 0.5 and 0.7 the number of courses per inch in the knitted polypropylene fabric. In the preferred example indicated above, the polypro-

pylene fabric may comprise 30 courses per inch, measured in the vertical or wale-wise direction, and 18 wales per inch, measured in the horizontal of course-wise direction.

By thus providing the polypropylene fiber yarn of the indicated denier and the polypropylene fabric in a knit such as to provide the indicated interstitial areas, a porous, non-absorbent material is produced which provides optimum porosity and negative capillarity with respect to aqueous body fluids.

The sterile bandages or catamenial pads incorporating such polypropylene fabric are markedly superior to such articles including polyvinyl chloride non-absorbent layers, the latter material being markedly heavier than the polypropylene fibers employed herein (the specific gravity of polyvinyl chloride is 1.38, as compared with a specific gravity of from 0.90 to 0.91 for polypropylene). The sterile articles constituted of polypropylene can thus be manufactured from finer fabrics and yarns than is the case employing articles constituted of polyvinyl chloride materials. Moreover, dressings prepared in accordance with the applicant's invention may be sterilized to combat infection, whereas articles prepared including non-absorbent polyvinyl chloride layers cannot be subjected to elevated temperatures such as required to effect sterilization.

Referring now to the drawings, FIGURE 1 shows a sterile dressing constituted of a layer 1 of the non-absorbent polypropylene fabric secured to a layer 2 of an absorbent material, such as absorbent cotton or a similar cellulosic material.

FIGURE 2 illustrates another form of construction in which layers 1 and 2 are the same as indicated above, but which construction additionally comprises a support layer 3 which may be constituted of paper or a fabric, layer 3 being secured to the face of the absorbent cellulosic stratum 2 opposite that bearing the polypropylene layer 1.

In FIGURE 3 the layer 3 is formed by a fabric which may be elastic, and which is coated on portions 4 thereof displaced from the assembly of layers 1 and 2, with a suitable pressure sensitive adhesive, thereby facilitating adhesion of the dressing to the healthy skin surrounding a wound.

FIGURE 4 illustrates a catamenial pad formed by an absorbent layer 2 surrounded by layer 1 constituted of the non-absorbent polypropylene fabric. The ends 6 of the polypropylene fabric, which is formed in a tubular shape, pass beyond the absorbent layer 2 and constitute attaching parts for securing the catamenial pad.

It will be understood that it is also possible to provide a non-absorbent layer 1, which extends only under one of the faces of the layer 2 of the construction illustrated in FIGURE 4, the remainder 2*a* of the envelope of such construction comprising an absorbent material, as shown in FIGURE 5.

It is also possible to provide on one of the faces of layer 2 a layer 3 of a water impermeable material which may be located, as illustrated in FIGURE 7, within the tubular envelope of the non-absorbent polypropylene fabric.

In each of the embodiments described above, whether in the form of a wound dressing, or a catamenial pad, the non-absorbent polypropylene fabric layer is adapted to be placed adjacent the body portion at which unwanted fluids are present, such liquids diffusing through the porous polypropylene layer and being absorped by the absorbent cellulosic material layer adhered thereto. Such sterile articles thereby facilitate flow of body liquids from wounds or the like, preventing self-infection and eliminating drying and sticking of the article to the body.

Since various changes can be made in the embodiments of the sterile articles described hereinabove without departing from the scope of the invention, it will be understood that the preceding description should be interpreted as illustrative and not in a limiting sense.

I claim:

1. A catamenial pad, which comprises a first layer constituted of an absorbent, cellulosic material; and, secured to and enveloping said layer, a second tubular-shaped layer constituted of a porous, polypropylene knitted fabric forming a plurality of interstices, the average cross-sectional area of each of which interstices is between 750 and 1100 millionths of a square inch and is between 2.4 and 2.75 millionths of a square inch per denier of the polypropylene yarn of which it is composed, said fabric being comprised of a polypropylene yarn having a count of between 285 and 450 denier; said tubular-shaped layer including an end portion extending beyond said first layer and defining attaching means for securing the catamenial pad.

2. The catamenial pad as defined in claim 4, in which the average cross-sectional area of each of the interstices of said polypropylene fabric is between 900 and 1060 millionths of a square inch and in which said fabric comprises 30 courses per inch and 18 wales per inch of a 375 denier polypropylene yarn.

3. A sterile article for use as a wound dressing, comprising: a first non-absorbent layer constituted of a porous, polypropylene fabric forming a plurality of interstices, the average cross-sectional area of each of which interstices is between 750 and 1100 millionths of a square inch, and which area is between 2.4 and 2.75 millionths of a square inch per denier of the polypropylene yarn defining said fabric; a second absorbent layer constituted of a cellulosic material; and a third supporting layer secured to said second layer, and bearing on portions of its face secured to said second layer but displaced therefrom, a pressure sensitive adhesive facilitating adhesion of the dressing to the healthy skin surrounding a wound.

4. The sterile article as defined in claim 3 in which said polypropylene fabric is constituted of a polypropylene yarn having a count of between 285 and 450 denier.

5. The sterile article as defined in claim 3, in which said polypropylene fabric is constituted of a plurality of held loops knitted in 1:1 ribbed fashion with the number of wales per inch, measured in the course-wise direction, of between 0.5 and 0.7 the number of courses per inch, measured in the wale-wise direction.

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