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POLYPROPYLENE FABRIC WITH MODIFIED SELVAGE

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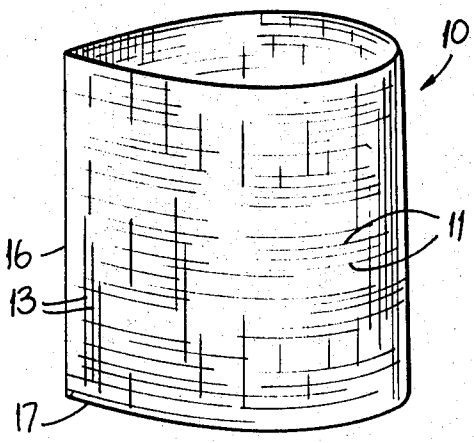

Fig. 1.

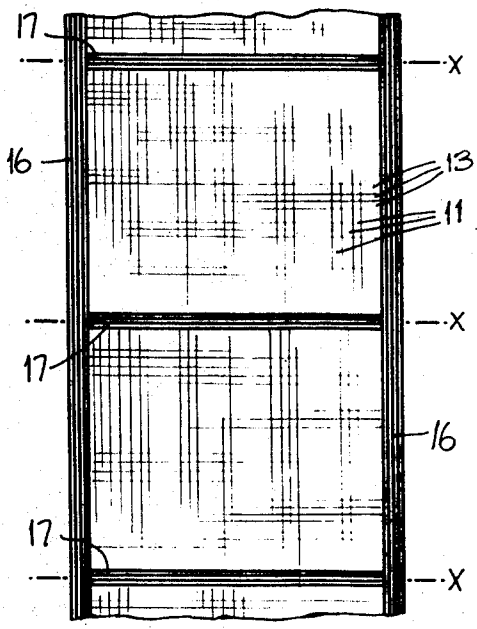

Fig. 5.

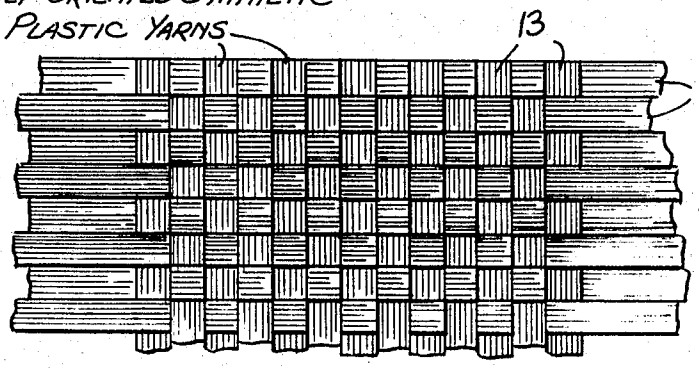

Fig. 2.

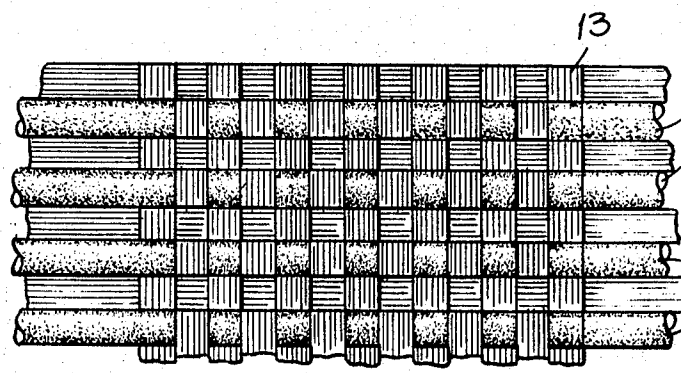

Fig. 3.

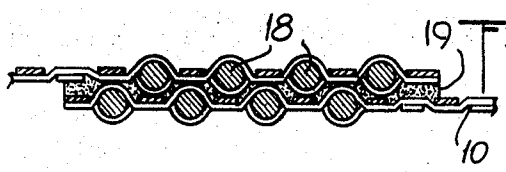

Fig. 4.

INVENTOR.
HAROLD A. SCHWARTZ
BY Michael Ebert
ATTORNEY

United States Patent Office

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POLYPROPYLENE FABRIC WITH MODIFIED SELVAGE

Harold A. Schwartz, Litchfield, Conn., assignor, by mesne assignments, to Avisun Corporation, Philadelphia, Pa., a corporation of Delaware

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U.S. Cl. 150—1 13 Claims

ABSTRACT OF THE DISCLOSURE

A polypropylene fabric having a modified selvage which lends itself to binding or bonding, using conventional adhesives, the body of the fabric being woven of polypropylene yarns which are oriented to increase the strength thereof, the selvage of the fabric including a marginal series of warp or filling yarns which are composed of a natural or synthetic material having a high affinity for standard adhesive systems, whereby the selvage may be readily glued with an adhesive to which the polypropylene yarns are resistant.

This invention relates generally to fabrics formed of polyolefin yarns, and more particularly to a polypropylene fabric having a modified selvage which makes it possible to bind or bond the fabric by means of commercially available adhesives.

Polypropylene yarns, such as those disclosed in "Petrothene Polyolefins—A Processing Guide," published in 1965 by U.S.I. Chemicals, possess exceptional properties, for they have a high strength-to-weight ratio and remarkable resistance to many solvents and chemicals. In weaving fabrics or polypropylene, it is the practice to first orient the yarns mono-axially, which may be of rectangular or circular cross-section. This is usually accomplished by hot-drawing, so as to irreversibly stretch the yarns and thereby orient their molecular structure. Fabrics of this construction are exceptionally strong and stable, as well as being light-weight.

In making bags or sacks of such polypropylene fabrics, it is only necessary to cut a rectangle of suitable size from the woven material and to fold it, the long sides of the folded rectangle being seamed to create a tube, one end of which is then seamed to close the tube and thereby complete the bag or sack. In making large tarpaulins of polypropylene fabric, the selvage of one piece is seamed to the selvage of another, thereby producing a larger fabric area.

The seams to form the fabric into bags or tarpaulins may be produced by sewing the selvages with high-strength sewing thread. But this is a relatively expensive and time-consuming operation which is not feasible in making low-cost products such as sandbags. While it is also possible with a thermoplastic material, such as polypropylene to form seams by thermal welding or heat-sealing using heat and pressure, the application of heat or pressure adversely affects the orientation of polypropylene. As a consequence, there is a significant loss of fabric strength at the seams. Since a loaded bag is subjected to heavy stresses at the seams, particularly at the bottom, the effect of conventional thermal welding is deleterious and may cause bag failure.

The simplest and least expensive technique for seaming a synthetic fabric is by the use of liquid or hot-melt

adhesives. A great variety of adhesives is commercially available for binding and bonding plastic materials, such as those adhesives identified in the Adhesives Chart appearing on page 604 in the "Modern Plastics Encyclopedia" for 1961, and also disclosed in subsequent annual editions of the same encyclopedia. However, such known adhesives have a poor affinity for polypropylene, for the very characteristics of this material which make it highly resistant to most chemicals and solvents, impart to it a resistance to conventional adhesive systems.

In view of the foregoing, it is the primary object of this invention to provide a polypropylene fabric having a selvage which is modified to lend itself to effective binding and bonding with conventional adhesive systems.

By the term "binding" is meant gluing a fabric to a dissimilar material, such as securing the edge of a polypropylene fabric to a vinyl fabric, and by the term "bonding" is meant gluing the fabric to itself. The invention is applicable to both binding and bonding, for in either case, with a conventional polypropylene fabric, one can neither bind nor bond this material using ordinary adhesives.

More particularly, it is an object of this invention to provide a polypropylene fabric whose selvage includes a series of warp yarns having a high affinity for standard adhesive systems, these warp yarns being made of natural or synthetic fibers such as cotton, spun nylon or any other yarn material of good strength which has a strong affinity toward the adhesive to be used to effect binding or bonding.

Thus the invention does away with the need for sewing or heat-welding in connection with polypropylene fabrics and makes possible a strong bond at the selvage which in no way weakens the yarns forming the joint.

Briefly stated, these objects are accomplished in a fabric whose body is composed of interwoven warp and filling yarns formed of polypropylene which is monoaxially-oriented, the yarns having a rectangular cross-section whereby the fabric has a sheet-like construction, the selvage of the fabric including a marginal series of warp or filling threads of a relatively bulky natural or synthetic material having a high affinity for a given adhesive for which the polypropylene has a poor affinity, whereby the selvage may be readily glued.

For a better understanding of the invention, as well as further objects and features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a rectangular piece of polypropylene fabric which has been folded preparatory to forming a bag thereof;

FIG. 2 is a plan view of the body of the woven fabric used in forming the bag;

FIG. 3 is a plan view of the modified selvage of the same fabric, the selvage being in accordance with the invention;

FIG. 4 shows in sectional view, two selvages being bonded; and

FIG. 5 is a sketch of a fabric web in accordance with the invention.

Referring now to FIGS. 1 and 2, the bag or sack, generally designated by numeral **10**, is formed by a fabric composed of horizontally-extending flat warp yarns **11** and transversely-extending flat weft or filling yarns **13**. These yarns are interwoven in any know manner on a textile loom to form a sheet-like material relatively free of interstices. The tightness of the weave depends on the

end use for the bag, and if the bag is to contain organic material such as tobacco which requires some degree of porosity, then a fairly open weave may be used. In other instances, such as bags for sand or powder, the weave is made very tight.

The yarns preferably used for this purpose are ribbon-like synthetic plastic, monofilament or multifilament yarns having a rectangular cross-section. Such yarns are formed of polyolefin material, such as polypropylene, or they may be formed of any other synthetic plastic material having suitable characteristics, the material being used having a poor affinity for standard adhesive systems.

In practice, yarns of one-half to two mils thickness and 50 to 200 mils in width, are suitable. It will be appreciated that by reason of the flat yarns, maximum coverage is obtained with the least amount of weaving, for as compared to round yarns, it requires relatively few yarns per inch to cover a given surface.

It is important that the ribbon-like yarns be highly oriented mono-axially in the longitudinal direction. This is accomplished by so drawing the flat yarn or the web from which flat yarn ribbons are slit, so as to irreversibly stretch the yarn or web, thereby orienting the molecular structure of the material. In bi-axially oriented yarns or sheeting, the material is hot or cold-stretched both in the transverse and longitudinal directions, but for purposes of the present invention, it is desirable that the orientation be carried out mainly in the longitudinal direction.

When mono-axially oriented polypropylene or other high-strength synthetic plastic yarns are interwoven, they cross over in the warp and weft directions, and because of their high tear and tensile strength, as well as their hydrophilic properties, the resultant fabric is highly stable. Thus the bag, if properly seamed, is capable of supporting unusually heavy loads without sagging or stretching of the walls of the bag.

In shaping this fabric into a sack, it is only necessary to cut a siutable rectangle of the material and to fold it, after which the side selvages **16** are seamed to produce a sleeve or tube, and the end selvages **17** are seamed to close the bottom, thereby completing the bag. While the adhesive seaming technique is disclosed herein in connection with a polypropylene bag, it will be appreciated that it is also usable to seam together pieces of polypropylene fabric to produce a tarpaulin or any other product in which one polypropylene fabric is joined to another or to material of different composition.

As shown in FIG. 3, the selvage **16**, as distinguished from the body of the fabric shown in FIG. 2, replaces a series of polypropylene warp yarns in the margin of the fabric with relatively bulky warp yarns **18** of a natural or synthetic material having a good affinity for the adhesive to be used. In practice, this series may be composed of six or more of such yarns spaced one next to the other, or they may be alternated with flat polypropylene yarns.

Because of the relative bulkiness of the series of warp yarns, the selvage area is effectively roughened or pocketed, thereby providing a good anchoring surface for the adhesive. Moreover, the salvage warp yarns are preferably formed of a fuzzy material such as a spun yarn, so that the adhesive tends to permeate the selvage yarns to provide a better gripping action. If it is desirable to have a fabric that is made entirely of synthetic material in order to eliminate the problem of rot and other drawbacks of natural material, the series of selvage warp yarns may be formed of spun nylon or any other synthetic yarn material having a strong affinity toward the gluing system contemplated.

Thus, as shown in FIG. 4, in which one selvage **16** is placed over another, the adhesive layer **19** not only forms an interfacial bond between the exposed faces of the series of warp yarns **18**, but it sinks into the roughened selvage to join the side surfaces of these yarns, thereby forming an exceptionally tight joint. In this manner, a very strong bag or other product is formed without the need for sewing or thermally welding the fabric, and without impairing the inherent strength of the oriented polypropylene yarns.

In weaving a web of polypropylene yarns on a conventional loom it is only possible to form selvages **16** in accordance with the invention along the longitudinal margins. But in making a bag in the manner disclosed in FIG. 1, it is necessary to also have a selvage **17** extending across the web along the transverse line x where the web is to be cut, as shown in FIG. 5. In selvage **17**, the series of yarns having a good affinity for the adhesive lie in the filling direction, not the warp.

In order therefore to make a fabric web of polypropylene or other material having a poor affinity for adhesive but otherwise having the desired properties, the web is woven on a so-called Dobby loom which is capable of selectively making two or more filling insertions. Thus on the Dobby loom, the long selvages **16** are made in the conventional manner while the short selvages **17** are made by switching over from the polypropylene filling to the filling yarns of good adhesive affinity at a series of filling courses preceding cutting line x. When therefore the web is later cut into rectangular pieces to be formed into bags, the pieces have two modified selvages **16** at the long sides and a modified selvage **17** at one end.

While a bulky yarn is ordinarily desirable for the special selvages, it is also possible to use flat yarns for this purpose, as long as these yarns have a good adhesive affinity. For example, if a polypropylene piece is to be joined to a vinyl piece formed of flat vinyl yarns the special selvage yarns in the polypropylene piece may be of vinyl so that the selected adhesive which is intended for the vinyl piece will also be suitable for the polypropylene selvage.

While there has been shown and described a preferred embodiment of the invention, it will be appreciated that many changes and modifications may be made therein without, however, departing from the essential spirit of the invention.

What I claim is:

1. A synthetic fabric whose body is formed of interwoven warp and weft yarns of a synthetic plastic material of high strength which has a poor affinity for a given adhesive, said fabric including a selvage having a marginal series of yarns therealong which is composed of different material having a high affinity for said adhesive, whereby said fabric may be seamed by said adhesive.

2. A fabric as set forth in claim **1**, wherein said series of selvage yarns have a fuzzy structure whereby said adhesive tends to permeate same.

3. A fabric as set forth in claim **1** wherein said series of selvage yarns are relatively bulky.

4. A fabric as set forth in claim **1**, wherein said body yarns are formed of polypropylene.

5. A fabric as set forth in claim **4**, wherein said polypropylene yarns have a flat cross-section, whereby said fabric has a sheet-like construction.

6. A fabric as set forth in claim **4**, wherein said body yarns are mono-axially oriented.

7. A fabric as set forth in claim **1**, wherein said series of yarns in said selvage alternate with warp yarns of the body material.

8. A fabric as set forth in claim **1**, wherein said series of selvage yarn is composed of cotton.

9. A fabric as set forth in claim **1**, wherein said series of slevage yarns is composed of spun nylon.

10. A bag formed of a rectangular piece of fabric of the type set forth in claim **1**, said piece having selvages at the long sides thereof and at one end and being folded and adhesively seamed at the long sides to define a tube whose bottom is adhesively seamed to complete the bag.

11. A tarpaulin formed of two rectangular pieces of fabric of the type set forth in claim **1**, the selvages of said pieces being joined together by adhesive.

12. A fabric, as set forth in claim **1**, wherein said body yarns are formed of polyethylene.

13. A fabric, as set forth in claim 1 adapted to be seamed by adhesive to a fabric formed of flat vinyl yarns, the series of yarns in the selvage being also composed of flat vinyl yarns.

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DONALD F. NORTON, Primary Examiner

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