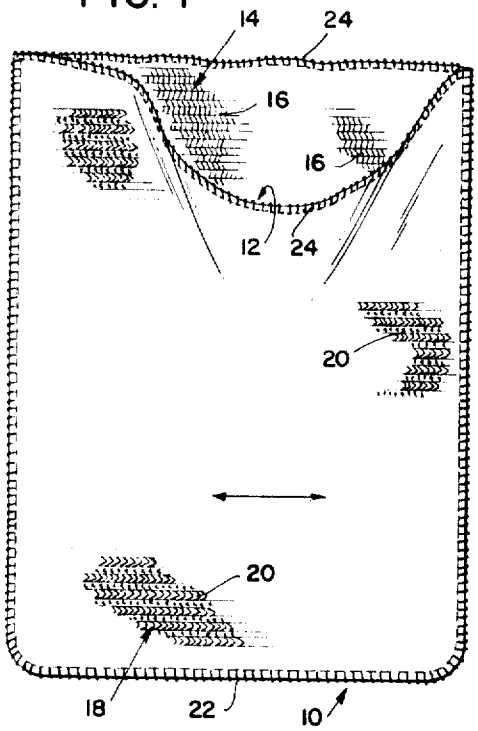
July 18, 1967 W. L. LAWSON, JR 3,331,221

FABRIC BAG FOR PROTECTING ARTICLES IN LIQUID TREATING BATHS

Filed April 19, 1965

FIG. 1



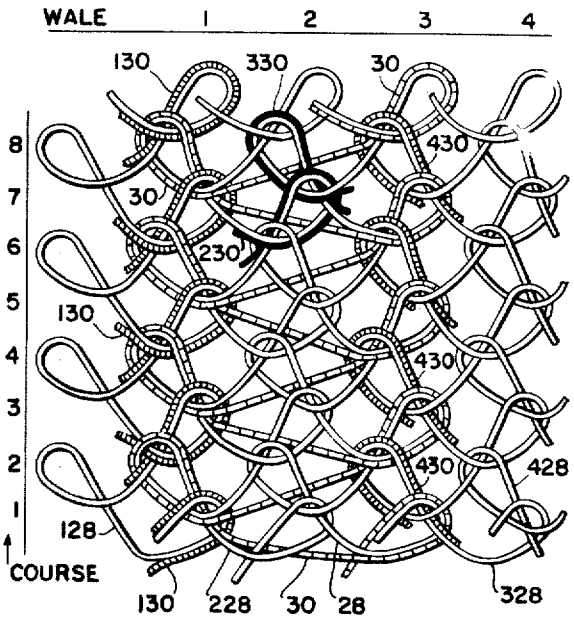


FIG. 3

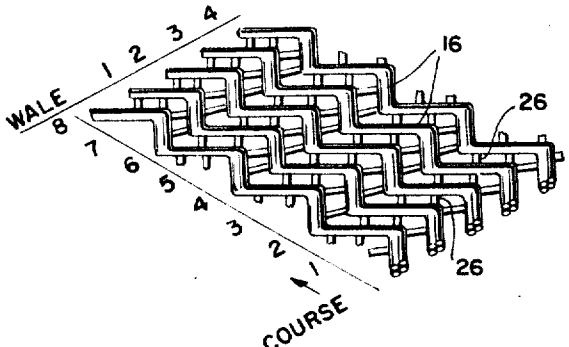


FIG. 2

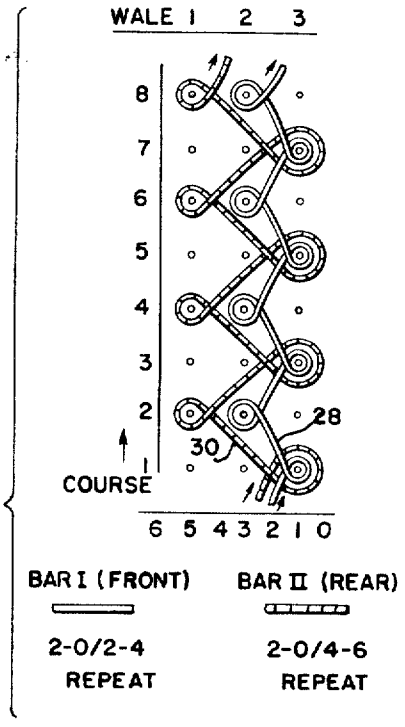


FIG. 4

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FABRIC BAG FOR PROTECTING ARTICLES IN LIQUID TREATING BATHS

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The present invention relates to a textile bag for containing a plurality of delicate textile products, such as nylon hosiery, during dyeing and related operations. Such operations ordinarily are carried out in relatively large vats in which the articles are subjected to agitation in various liquids. It has been customary, particularly with ladies' hosiery, to place a rather small number of articles in each of a plurality of small textile bags which are sufficiently porous to permit the liquids to flow through the bags into contact with the articles therein. Relatively large groups of such bags with the articles therein are then placed in proper sequence in the various vats. The procedure is intended to reduce the abrasion and tangling of the articles which would be encountered if large numbers of articles were to be placed unconfined in such vats or would be encountered in varying degree if relatively large numbers of articles were to be placed in large bags.

The dye bags heretofore widely used for ladies' hosiery have been made from a woven cotton material and typically have been simple flattened tubular bags about 12 inches by 15 inches in flattened dimensions. Also, typically, the open mouths of such bags have been closed, after filling, by a tie string, elastic band, elastic clip or the like. The cotton yarns from which the material for such bags is woven are absorbent by nature and the bags accordingly will absorb and retain considerable quantities of the dye, resin or other treating liquids from the vats. Since the bags are used repeatedly such absorbtion is progressive and this results not only in the waste of such absorbed materials but the bags soon become stiffened with the resinous materials which set therein and they will contain mixtures of dyes of various colors which may or may not become set on the cotton. The fibers of the cotton yarns which are stiffened with resin cause snagging of the stockings or other delicate articles and this is particularly encountered when the articles are inserted into or removed from the dry bags. To the extent that dye or other treating materials absorbed by the cotton yarns remain in soluble form they contaminate subsequent dye or other treating baths leading to erratic color and/or resin-treating results.

There are many other difficulties which have been encountered with the use of woven cotton dye bags including the relatively limited porosity of a woven cotton fabric which has sufficient strength and durability for the purpose which porosity becomes progressively lessened as the bags absorb treating materials in use. Also woven cotton fabrics have very little stretch in either direction whereby the stockings or other articles enclosed therein are not firmly confined and thus are free to move relative to one another with resultant damage from abrasion. Also there is a tendency for certain areas of the enclosed stockings to stick in face-to-face contact with an area of the interior bag surface which frequently leads to non-uniform color and/or resin treatment as between such an area and another area of the same stocking which may not be in contact with the bag surface.

It is an object of the present invention to provide a dye bag which minimizes or completely eliminates all of the difficulties encountered with woven cotton dye bags and which afford additional specific advantages thereover. To this end the present invention provides a dye bag made from an open mesh fabric knitted in accordance

with certain specific principles from synthetic yarns or threads selected for specific characteristics which contribute to the success of the dye bags thus provided. More specifically, for use in the dyeing and treating of nylon stockings, dye bags embodying the present invention are fabricated from an open mesh fabric made of polypropylene yarns or threads. The fabric is knitted in such a fashion as to provide a relative smooth but definitely discontinuous inner surface for contact with the enclosed stockings and to provide a relatively closely textured rough outer surface making filled bags easy to handle and capable of secure closure by the use of string or clips of the type already in use in the art. In the manufacture of dye bags from fabric as just described the fabric is so knitted as to stretch quite readily in one direction and to have very little stretch in the other direction and the bags are so cut from the fabric that the direction of stretch is circumferential of the tubular body of the finished bag. The surface of the knitted fabric having the wales becomes the interior surface of the bag with the length of the wales extending vertically from the mouth of the bag. The knitting pattern is so selected that the wales will supply, in effect, smooth tracks leading vertically into the interior of the bag thus facilitating insertion and removal of stockings from the mouth of the bag. The courses of the knitted fabric will extend circumferentially of the bag and the stretchability of the fabric along the courses is such that when an appropriate number of stockings is inserted into the bag the fabric will have been stretched somewhat and thus will continuously exert a gentle confining pressure upon the stockings during the time that they remain in the bag. Under such pressure the stockings are not free to move a great deal relative to one another with consequent reduction in abrasion.

The knitting pattern for the fabric is also so designed as to insure that the general plane of the upper surfaces of the wales will lie substantially above the general plane of the trughs between the wales. The wales thus define paths or tracks which not only facilitate insertion and removal of the stockings but which also serve to minimize the tendency of certain areas of the enclosed stockings to adhere in face-to-face contact with the inner surface of the bag.

The material for the yarns or threads from which the textile fabric is knitted is chosen with regard to the particular dye and other treating baths to which the stockings are to be subjected. For example when nylon stockings are to be treated the dyes and resins are selected for their effect upon the nylon and the yarn selected for the dye bags should be one which reacts very little, if at all, with the dyes and resins involved. A preferred material for the yarns in dye bags for nylon articles is polypropylene. To impart desirable softness to the bags it is preferred to use multifilament yarns. The dyes and resins customarily used for nylon stockings will not be absorbed by or react with the individual filaments of polypropylene yarns and any liquids which may have penetrated the yarns are readily washed out. The continuous multifilament yarns or threads preferred herein do not have fiber ends which are characteristic of yarns made from natural or from synthetic staple yarns. Even after extended use with incident breaking of some of the continuous filaments the ends thus formed cannot become stiffened by the resins customarily used for nylon articles.

As has been indicated above the pattern for knitting of the fabric to be used in the manufacture of bags in accordance with the present invention is of particular importance. The provision of straight smooth wales would meet only a portion of the requirements of the present invention. Among other things, the troughs between straight wales are likely to receive a pleat or fold,

of considerable length, of a particular stocking and to confine or pinch it possibly somewhat reducing the effectiveness of the dying or other treatment of such area in comparison with the remaining areas of the stocking. Also any such portion of the stocking may be pinched with such tenacity as to lead to damage to the stocking when it is attempted to remove the stocking from the bag at the end of treatment. It is therefore preferred to provide wales which have a zig-zag conformation preferably changing direction at every course. Also it is preferred that the zig-zags of adjacent wales be parallel or in mesh whereby the width of the troughs between the wales will remain uniform but tortuous thereby affording maximum resistance to the entry of any substantial area of the stocking into the troughs.

It will be apparent that the various features of the present invention may be achieved by the employment of differing specific knitting patterns, yarn constructions and fiber materials. A preferred but not necessarily the only form of invention will be described in full detail herein in order to enable those skilled in the art to produce such preferred form as well as such modifications and variations thereof as fall within the scope of the claims.

In the drawings:

FIG. 1 is an elevational view of a dye bag embodying the present invention;

FIG. 2 is an enlarged diagrammatic view of a small portion of the inner surface of the knitted fabric of the bag shown in FIG. 1 showing, in exaggerated manner, the texture of a preferred form of such knitted fabric;

FIG. 3 is an enlarged diagrammatic view showing the relationship of the threads in the preferred knitted fabric, with certain threads omitted and others shown in fragmentary form; and

FIG. 4 is a point paper illustration of the knitting pattern for the preferred fabric.

Referring now to the drawings a dye bag **10**, which may be of any desired or customary size, is shown with a portion of the edge of the mouth **12** turned downwardly and forwardly to reveal a portion of the inner surface **14** of the bag. The texture of the inner surface **14** as shown in greater detail in FIG. 2 is established by a plurality of closely spaced zig-zag wales **16** the lengths of which extend vertically of the bag, that is, at right angles with the edge of the bag mouth **12**. The outer surface **18** of the fabric of the bag has a texture which is established by the interlocking threads in the courses which give the appearance of rows **20** extending circumferentially of the bag.

The bag **10** may be made from flat, warp-knitted fabric in any desired manner. Thus the front and rear walls of the bag **10** shown in FIG. 1 may be separate pieces joined in face-to-face relation by stitching **22**, of over-edge or other type suitable for use with knitted fabrics, to close three sides. Additional over-edge or other suitable stitching **24** preferably is used to bind the edges of the mouth **12**. Obviously the bag may be formed from one flat piece of fabric folded along one longitudinal edge or along the bottom edge, as desired, with the open edges closed by stitching as required. Also, the bag may be formed from a tubular-knitted fabric requiring only a seam along the bottom edge and binding along the edges of the mouth provided a circular knitting machine is used which is capable of forming a fabric having textures on the opposite surfaces which meet the requirements herein described.

A primary requirement for the texture of the inner surface **14** of the bag **10** is that the wales **16** each have upper (or inwardly facing) surface which is as close to being level and smooth as is practicable. Also, the wales should stand well above the level of the bottoms of the troughs between wales, the bottoms of said troughs being defined by the threads indicated generally at **26** in FIG. 2. In a preferred form of fabric for the present invention the wales **16**, as illustrated diagrammatically in FIG. 2

are made up of interlocking loops each of which includes two threads which lie substantially parallel with one another. Thus each wale **16**, as shown in FIG. 2, is the approximate equivalent of four parallel threads lying on top of a pattern of threads **26** some of which float beneath one wale and are interlocked with the wales adjacent both sides of said one wale.

The wales **16** thus provide quite smooth, essentially level tracks which facilitate insertion into and removal from the bag **10** of delicate fabric objects such as ladies' stockings. The texture of the inner surface of the bag is such that a person's finger tip will slide smoothly along the fabric in a direction parallel with the length of the wales **16** but will encounter considerable resistance to sliding transverse the wales. Also, from FIG. 2 it will be apparent that the troughs between the wales **16** are substantially uniform in width but are zig-zag in lengthwise direction. The bottom of each trough has a substantial portion of its level which is below the tops of adjacent wales by a distance of at least two diameters of the thread. These relatively deep, zig-zag troughs present considerable resistance to the entry therein of areas of the stockings in the bag whereby there is little tendency for the stockings to become "plastered" against the surface of the interior of the bag. The relative non-slipperiness of the inner surface of the bag in the direction transverse the wales **16** reduces any tendency for the stockings to move circumferentially of the interior of the bags and thus reduces tangling of the stockings. Also, as previously noted herein the knitted fabric is stretchable circumferentially of the bag and by filling the bag to such an extent as to slightly stretch the same the stockings therein will be further restrained against movement.

The texture of the outer surface **18** of the bag **10** is preferably rather rough in all directions for the purposes stated above. Preferred knitting patterns to afford such a texture have interlocking loops and crossing threads which extend in a pattern which is rather wild and is quite uniform in level whereby slipping movement of a person's finger tip in any direction is resisted by a large number of transversely disposed threads. As pointed out above such a texture is desirable, among other reasons, because it tends to retain the closure devices which, typically, are wrapped or clipped around the gathered closed mouth of the filled bag.

One specific knitted fabric which provides all of the features described above for use in manufacture of dye bags in accordance with the present invention will now be described. This fabric is knitted from polypropylene continuous multifilament threads of 165 denier, 70 filaments, of relatively low twist. The fabric is knitted on a Kidde two bar warp knitting machine having 24 guides per inch on each bar and having 24 needles per inch. The machine is fully threaded, that is all guides on both the front and rear bars are threaded. The fabric is stabilized under moderate tension transverse the lengths of the wales whereby the relaxed fabric in a typical finished bag will have about 17 wales per inch and about 22 courses per inch.

The pattern for the front bar is 2–0/2–4 (the spaces between needles being assigned even numbers and zero) and the pattern for the back bar is 2–0/4–6. These patterns are shown superimposed as if on point paper in FIG. 4 wherein the white thread **28** is the front bar thread and the cross-hatched thread **30** is the back bar thread. It will be noted that the laps of both of these threads are in the same direction in each course, as a result of which the loops will be distorted in alternating directions thus forming the zig-zag wales **16** which are illustrated diagrammatically in FIG. 2.

In FIG. 4 it will be noted that the needles have been assigned the odd numbers **1**, **3** and **5** which lie between the zero and even numbers **2**, **4** and **6** which are assigned to the spaces between needles. According to another system (not illustrated herein) of expressing the pattern

of lapping movements of the guide bars, only the spaces between needles are numbered and consecutive numbers from zero up are used. According to that system the patterns for producing the preferred knitted fabric herein disclosed would be 1–0/1–2 for the front bar and 1–0/2–3 for the back bar.

FIG. 3 is a conventional diagrammatic showing of the knitted fabric made in accordance with the specific pattern disclosed above. It will be noted that the thread **28** and the other front bar threads **128**, **228**, **328** and **428** are shown in white. The back bar thread **30** is hatched in the same manner as in FIG. 4, the back bar threads **130** and **430**, which are only partially shown in FIG. 3 are more heavily cross-hatched and the back bar threads **230** and **330**, of which only single loops are shown, are in black.

From a consideration of FIG. 3 it will be observed that wales number **1** and number **3** are illustrated with each loop made up of two threads and it will be recognized that substantially the entire length of wales thus made up will have an effective thickness of four threads. From a consideration of wale number **2** in FIG. 3 the relationship of the floating back bar thread **30** with the wale will be apparent. As clearly shown in FIG. 3 the floating portions of the back bar thread **30**, as it laps back and forth between wales number **1** and **3**, float beneath wale number **2**. The full construction of the fabric is shown only in courses **7** and **8** in wale number **2** wherein the adjacent back bar threads **230** and **330** are illustrated in the interlocking loops which in turn lie on top of the floating portions of the back bar thread **30**. It will be understood, of course, that the entire area of the fabric will have the complete construction thus illustrated, that is, all loops include two threads and all loops interlock to form continuous, zig-zag wales each of which lie on top of floating portions of a back bar thread.

The knitting of the fabric just described is carried out, as regards warp tension and the rate at which the fabric is drawn off the needles, in such manner to produce a fabric which, after stabilization, will be quite open in mesh and highly porous in contrast with the woven cotton fabrics heretofore used. It is essential that the fabric be stabilized before bags made therefrom are put in use. Preferably the fabric is stabilized before cutting and by the use of heat appropriate for the particular fiber used. For example, the polypropylene fabric of the preferred example given herein may be stabilized in accordance with the thread manufacturer's recommendations by heating the fabric to about 265–270° F. While being stabilized the fabric is held under transverse tension to stretch the fabric width-wise and to establish for the relaxed fabric a count of about 17 wales per inch and about 22 courses per inch and cooling the fabric under the same tension. Stabilization of the fabric under these conditions leaves a substantial amount of firm and springy stretch in the direction of the courses and very little stretch in the direction of the wales. As noted above both of the characteristics are advantageous in the intended use of the dye bags made in accordance with this invention.

Useful fabrics having the same or equivalent characteristics may be knitted in different specific patterns. Also, fibers other than polypropylene may be used, particularly when the dye bags are intended for use with articles made of some fiber other than nylon. Appropriate stabilization techniques for such other fibers are known in the art and may be adapted to knitted fabrics intended for use as dye bags in accordance with the present invention.

What is claimed is:

1. An open mouth bag for containing fabric articles during treatment of said articles in at least one chemical bath which is reactive with at least some of the fiber from which said fabric articles are made, said bag being made from an open mesh knitted fabric the threads of which are continuous multifilament threads of a synthetic fiber-forming material substantially immune to the chemical bath with which said fabric articles are to be treated when contained in said bag, and the fabric of said bag being knitted in such a manner as to present as the inner surface of said bag a pattern of parallel wales alternating with parallel troughs, said wales and troughs extending lengthwise from the open mouth of said bag into the interior thereof to afford a smooth discontinuous surface facilitating the insertion into and withdrawal from said bag of said fabric articles, the fabric of said bag being also knitted in such manner as to prevent as the outer surface of said bag a closely textured rough pattern of interlocking and floating threads, and the fabric of said bag being stabilized by setting the threads thereof in conformations such that the stabilized fabric is resiliently stretchable transverse the wales and is substantially non-stretchable lengthwise the wales.

2. A bag in accordance with claim **1** in which the wales of said knitted fabric are formed essentially of four threads interlocking at each course with threads in each course extending beneath and generally transverse the length of each wale as said last-named threads float between the wales next adjacent to and on either side of each said wale.

3. A bag in accordance with claim **2** wherein all of the threads which form and float beneath each wall in each course are lapped in the same direction whereby all of said wales are zig-zag in conformation.

4. A bag in accordance with claim **1** especially designed for containing fabric articles made at least in part from nylon, the knitted fabric of said bag being formed wholly from continuous multifilament threads of polypropylene.

5. A bag in accordance with claim **2** especially designed for containing fabric articles made at least in part from nylon, the knitted fabric of said bag being formed wholly from continuous multifilament threads of polypropylene.

6. A bag in accordance with claim **3** especially designed for containing fabric articles made at least in part from nylon, the knitted fabric of said bag being formed wholly from continuous multifilament threads of polypropylene.

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