Dec. 27, 1966 B. KIMBALL 3,293,724

METHOD OF FINISHING A KNITTED PAPER FABRIC

Filed April 17, 1964

FIG. 1.

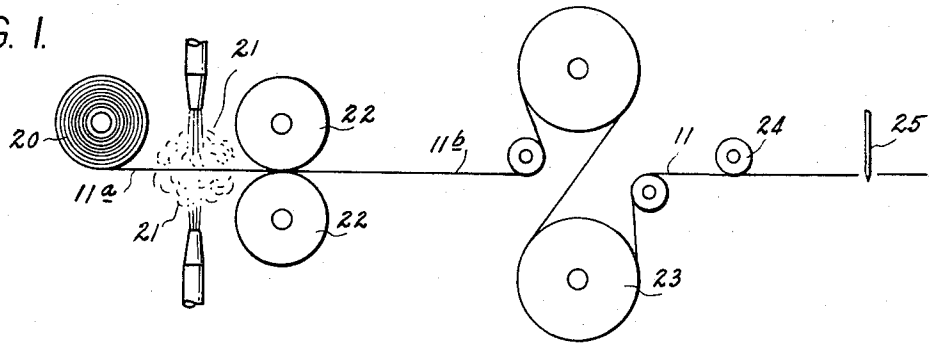


FIG. 3.

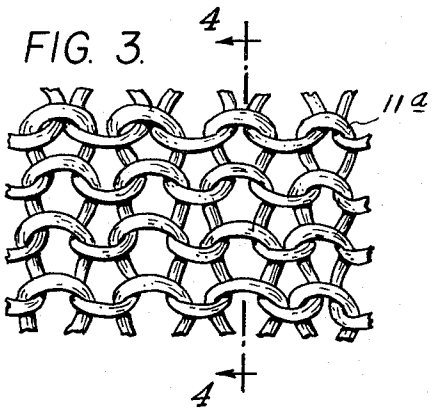


FIG. 4.



FIG. 2.

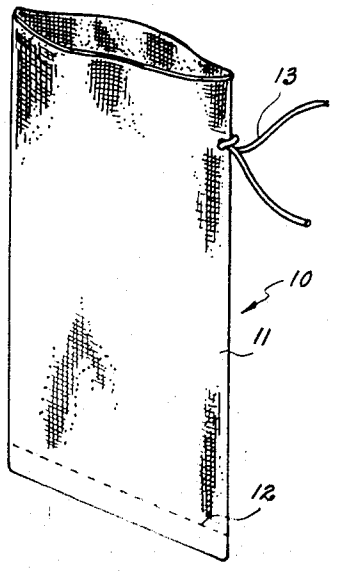


FIG. 5.

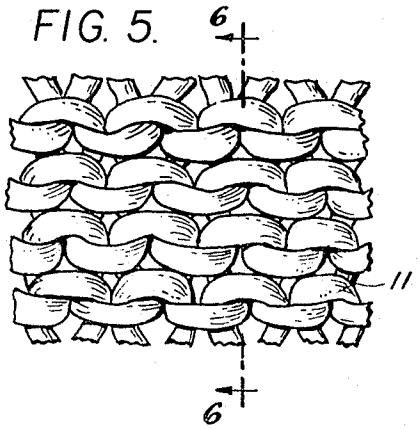


FIG. 6.



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3,293,724

Patented Dec. 27, 1966

3,293,724

METHOD OF FINISHING A KNITTED PAPER FABRIC

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Filed Apr. 17, 1964, Ser. No. 360,656
1 Claim. (Cl. 28—76)

This invention relates generally to textiles, and is especially concerned with a unique textile construction and method of manufacture.

While the textile and method of manufacture of the present invention have been primarily developed and employed for use in bags for containing granular material, such as sandbags and the like, and will be illustrated and described hereinafter with particular reference thereto, it is appreciated that the advantageous features of the invention are capable of many varied applications, all of which are intended to be comprehended herein.

It is an important object of the present invention to provide a fabric and method of fabric manufacture for use in sandbags and the like, which effectively reduces sifting and greatly increases strength.

It is a further object of the present invention to provide a bag construction and method of the type described, which is extremely economical in manufacture, durable and reliable in use, and wherein the fabric surface may be printed as desired, to provide a neat and attractive appearance.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claim.

In the drawings:

FIGURE 1 is a diagrammatic representation of the method of the present invention.

FIGURE 2 is a perspective view illustrating a bag constructed in accordance with the teachings of the present invention.

FIGURE 3 is a fragmentary view, greatly enlarged, showing an area of knit fabric of the prior art.

FIGURE 4 is a sectional view taken generally along the line 4—4 of FIG. 3.

FIGURE 5 is a fragmentary area, greatly enlarged, showing knit fabric of the instant invention.

FIGURE 6 is a sectional view taken generally along the line 6—6 of FIGURE 5.

Referring now more particularly to the drawings, and specifically to FIGURE 2 thereof, a bag is there generally designated **10** and may be formed of knit fabric **11**. The fabric **11** may be tubular, as produced by conventional tubular knitting machines and is knit of cellulose yarn, preferably paper yarn having a twist of from one to ten turns per inch. Prior to knitting, the cellulose or paper yarn may advantageously be treated with a wet-strength resin of suitable composition, and if desired, also with a fungus preventative.

The tubular knit fabric **11** may have one end closed, as by stitching **12**, the other end being illustrated as open and provided with a tie string **13** for securement or closure after filling.

In FIGURE 5 is shown an enlarged fragmentary area of the fabric **11**, wherein it will be observed that the needle holes or interstitial openings are relatively small, the individual yarns having been spread or widened and

squeezed toward each other to produce this desired result, as will appear more fully hereinafter.

It is also shown in FIGURE 6 that the fabric **11** is relatively thin and dense, the surfaces thereof being relatively smooth.

The above characteristics of the fabric **11** are best noted by comparison to the prior-art fabric **11***a* of FIGURES 3 and 4. It is there seen that the interstitial spaces or needle holes are relatively large, the individual yarns being relatively thin, and the fabric surfaces being relatively rough.

The method of the instant invention may be considered as employing the prior-art fabric **11***a* as a starting material, with the resultant product of the instant invention being fabric **11** having the increased interlocking action of yarns and above-mentioned additional advantageous characteristics.

In the diagrammatic representation of FIGURE 1, a supply roll is designated **20** and may supply a web of fabric **11***a*, such as that of the prior art illustrated in FIGURES 3 and 4. Thus, the fabric **11***a* is conventionally knit of cellulose or paper yarn and may be of single or double thickness, the latter as produced by tubular knitting. Of course, the supply roll **20** may be replaced by a tubular knitting machine for direct feeding therefrom of the knit fabric **11***a*.

From the supply roll **20**, the knit fabric **11***a* may be subjected to softening, as by the application of steam at **21**. The softening station **21** may apply steam from both sides of the web for more thorough softening of the yarns, if desired.

After softening, the fabric **11***a* passes between the nip of pressure or calendering rolls **22**. The calendering rolls **22** may be of any suitable character, such as of steel, granite, hard rubber or the like, and serve to squeeze therebetween the fabric under a pressure of approximately 25 tons. This calendering action produces the above-described novel and advantageous characteristics of the resultant product, effectively smoothing the surfaces of the fabric to the extent that it can be printed, increasing the interlock of yarns, substantially closing the needle holes, and effectively reducing the caliper or thickness of the fabric, say on the order of 50%, decreasing the stretch of the fabric, resulting in the bag retaining its original shape.

The fabric passing from the calendering rolls **22** is designated **11***b* and passes thence to a drying station or drier **23**, which may consist of heated rolls or other suitable drying means to insure removal of moisture and effectively set the fabric in its calendered condition.

The finished fabric **11** exits from the drier station **23** where it is conveyed by a conveyor **24** to a cutter or knife **25** for severance into lengths suitable for bag formation.

In practice, a resultant bag **10** of the present invention is competitive with a jute bag and reduces sifting by approximately 50% over that of the jute bag. Further, the calendering of the knit cellulose fabric greatly reduces stretch of the fabric to considerably enhance bag strength to far beyond that of the jute bag.

From the foregoing, it is seen that the present invention provides a highly advantageous textile product and method of manufacture which fully accomplish their intended objects and are well adapted to meet practical conditions of manufacture and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and scope of the appended claim.

What is claimed is:

In the art of textile manufacturing, the method of making knitted paper bags which comprises:

(a) knitting twisted wet-strength paper yarn into a tubular fabric on a tubular knitting machine,

(b) removing said knitted tube from said machine and flattening said tube,

(c) applying steam to both sides of the flattened tube,

(d) passing the steamed flattened tube between calendering rolls under a pressure of approximately 25 tons, thus increasing the interlock of yarns, substantially closing the needle holes to reduce the sand sift loss, effectively decreasing the stretch of the fabric, and substantially increasing the strength thereof,

(e) drying the flattened tube to insure the removal of moisture and effectively set the fabric in its calendered condition, and

(f) then cutting the flattened tube into suitable lengths for sandbag formation.

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