Dec. 26, 1967 O. C. H. HUGHES 3,360,015

CONTAINERS OF TEXTILE COMPOSITION

Filed July 28, 1965

FIG.1.

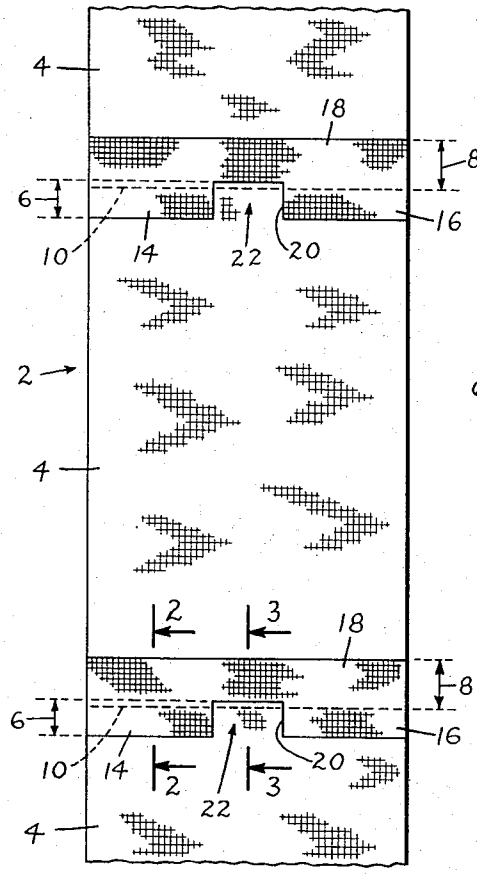


FIG.2.

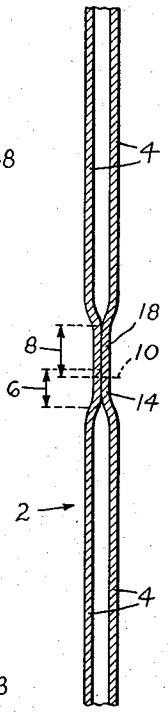
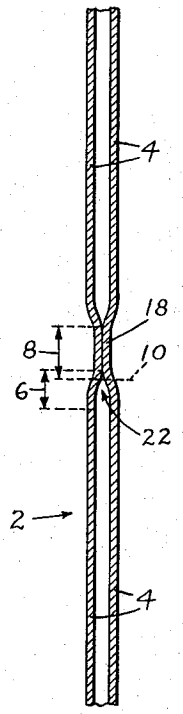


FIG.3.



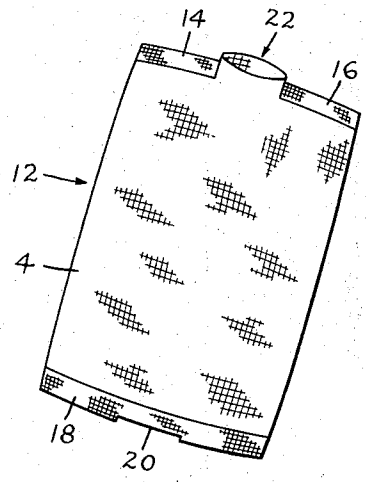


FIG.4.

INVENTOR
OSBERT C. H. HUGHES
BY
James F. Hoods
ATTORNEY

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CONTAINERS OF TEXTILE COMPOSITION

Osbert C. H. Hughes, Hopewell, Va., assignor to Allied Chemical Corporation, New York, N.Y., a corporation of New York

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This invention relates to woven segmentable textile articles and more particularly to textile containers which are produced from segmentable textile articles. Such segmentable textile articles are useful in producing the textile containers which in turn are used as sacks or bags.

In the production of strong fabric bags or sacks useful as sand bags or for the packaging of other particulate solid material, e.g. granular fertilizer material, it is generally found that any seams necessary in the construction of the sack represent potential points of weakness in the bag's structure and contribute significantly to its cost. The necessity for forming a seam on even one complete side is disadvantageous. This disadvantage is particularly true in the case of sacks for bags to be filled with sand and used in jetties, bulkheads or the like. It is generally preferable that no seam be required except for the minimum opening required for the filling of the bags; said minimum opening generally being less than 50% of the shortest side of the bag.

It has been disclosed in U.S. Patent 2,208,256 to Goldsmith issued July 16, 1940 entitled, "Method of Making Pockets," that flat woven pocket structures can be made in a manner whereby two adjacent fabrics are interwoven and spaced by vertical and horizontal portions as integral single thickness fabrics so that, by selective severing manipulations, pockets may be obtained which are closed on three sides by margins of continuously interwoven fabric. The fourth side is either completely open or partially closed by regions of interwoven fabrics which define a mouth or opening extending only partially across that side of the pocket. However, in order to make a pocket which is only partially closed on one side, it has been found necessary to provide a tubular article enclosed on all four sides by interwoven layers of material and then remove a portion of the margin on one side by cutting into the body of the pocket. This destroys the rectilinear boundary configuration subjecting the sides of the thus formed pocket to unnecessary fraying and necessitating an additional process step for producing the pocket. The pocket, moreover, cannot be utilized readily in sack construction since the mouth is either concave and extends about 50% of the length of the pocket or coextensive with a side of the pocket and, hence, cannot be sealed readily in a seaming operation after the pocket is filled. Such a pocket, therefore, cannot be suitably used as a sand bag for bulkheads, jetties or the like, as it has these disadvantages and hence when filled and seamed will be completely unsuitable for normal use in these fields. The pocket structure having a side with a mouth of 50% of the length thereof is unsuitable for use as a sack moreover since the contents of the sack cannot be readily poured therefrom with desired pour control as is necessary in the case where the sack is to contain free-flowing contents later to be emptied, e.g. grain, fertilizer and the like.

In any mass production textile cutting and/or seaming operation, it is preferable to operate in longitudinal or lateral rectilinear directions on the fabric. For example, cutting and sealing mechanisms are generally mounted on means for transversing the fabric in the filling, i.e. the weft direction or mounted in stationary position for continuous action on the fabric in the warp direction.

To expedite the handling of textile sacks in the filling operation and to make such operation amenable to automated methods, it is desirable that the sacks, after shipment from the textile mill to the place where they are to be filled, be pre-disposed to a definite orientation or pattern with respect to one another.

Accordingly, it is the subject of the present invention to provide a seamless flat rectilinear textile container having at one side thereof a mouth opening of less than 50% of the length of said side and sealable by the linear seam.

It is another object of the present invention to provide a segmentable woven article from which by suitable linear severance a multiple of oriented flat seamless tubular textile containers can be obtained, which containers can be readily sealed after filling.

It is still another object of the present invention to provide a segmentable woven article which when segmented provides all of the sacks with their respective mouths or openings in the same direction and therefore permits filling of the bags with sand or granular substances such as fertilizers in an easy manner without the necessity of rearranging the containers so provided so that they all are positioned with respect to the filling means in the same manner.

It is still another object of the present invention to provide strong woven sack structures suitable for use as sand bags.

This invention contemplates a textile article comprising tubular fabric portions separated by:

(a) Strips parallel to the weft direction, said strips consisting of single-layer fabric formed by bringing together and combining in pairs every front warp end with a matching back warp end of the tubular fabric portion and weaving the resultant pair of ends as one; and

(b) Composite strips parallel to the weft direction, each of said composite strips comprising at least one single-layer fabric portion and one double-layer fabric portion.

Each of the tubular fabric portions of the textile article of this invention has at one end thereof a strip consisting of single-layer fabric in abutment with a composite strip and at the opposite end thereof a composite strip in abutment with a strip consisting of single-layer fabric.

Reference is made to the accompanying drawings from which other objects and advantages of the instant invention are apparent. In the drawings:

FIGURE 1 is a plan view of a segmentable woven article of this invention which can provide a plurality of textile sacks, bags or containers of equal or variable size wherein all of the bottoms or strips consisting of single-layer fabric lie, when in the segmentable woven article, in the same position relative to the tubular portion of the fabric. All of the mouths or openings provided when the woven article is segmented are positioned in the same manner and direction relative to the tubular portion of the textile article.

FIGURE 2 is a sectional elevation taken along the lines 2—2 of FIGURE 1.

FIGURE 3 is a sectional elevation taken along the lines 3—3 of FIGURE 1.

FIGURE 4 is a perspective view of an individual sack provided by selective severing of the fabric of the instant invention.

Referring to the drawings, woven textile article **2** has main body portions **4**, each of which is bounded on the top by a composite strip **6** providing a mouth **22** bounded by single-layer fabric portions **14** and **16** on either side thereof and demarcated by side **20**. Opposite mouth **22** and single-layer fabric portions **14** and **16** there is a bottom portion **8** provided when severing the fabric at **10**, which portion comprises a strip consisting of single-

layer fabric **18** above composite strip **6**, across the entire weft direction. Bottom portion **8**, it will be observed, has some double-layer fabric area at the top of mouth **22**. When the textile article is severed at **10** there is provided mouth **22** together with top single-layer fabric portions **14** and **16** on either side thereof and bottom portion **8** having a slight double-layer fabric portion provided by the severing. The severing is done a small distance from the top of mouth **22** to insure a textile container which has a mouth derived from the double-layer fabric portion of composite strip **6**. Severing can be accomplished by cutting with a knife or scissors along line **10**. To prevent ravelling, severence can be accomplished with pinking shears or with heated wires in the case of fabrics of synthetic thermoplastic fiber, e.g. poly-e-caproamide (nylon 6). When using heated wire severing means, however, care must be taken to avoid sealing the mouth **22** of the bag.

The textile structure of FIGURES 1, 2 and 3 prior to the severance of individual bags or containers therefrom constitutes a valuable article of commerce since it can be shipped by a manufacturer in roll form or packages otherwise found suitable for fabrics and it can be utilized in this convenient form by the purchaser by the removal of bags or containers in oriented manner simply by severing the fabric at line **10**.

As seen from the accompanying drawings, the textile article of this invention can be a strip of fabric from which two or more bags can be formed with tubular body portions separated by a composite strip on one side thereof in the warp direction and an strip consisting of single-layer fabric in the warp direction on the other side thereof, the composite strip being adjacent to a strip consisting of single-layer fabric of an adjoining bag and the strip consisting of single-layer fabric being adjacent a composite strip of an adjoining bag. It is desired that the double-layer fabric portion between tubular portions be half the total distance of the single-layer fabric portions between adjacent tubular portions.

The textile containers provided by severing the article of this invention are preferably woven using a weave pattern which restrains ripping such a rip-stop weave. A suitable rip-stop weave for the tubular portion is one having two doubles (under two and over two) in the warp direction every 22 ends, plus 22 single yarns and two doubles in the weft direction (over two and under two) every 26 picks (plus 22 single yarns) per pattern repeat. The weave pattern used in the tubular portion is essentially a plain weave with the exception of the two doubles periodically in the warp and weft direction. The term doubles as employed herein means that two ends or picks are woven as a single end or pick. Single-layer fabric portions can be formed by combining in pairs every front end with the matching back end of the tubular fabric and weaving the resultant pair of ends as one. In the double thick closed single-layer sections, a plain (under and over) weave is used throughout the warp; and in the weft the weave is the same as in the body, i.e. plain weave with two doubles (under two and over two) inserted periodically. The weaving of the textile article of this invention can be accomplished by use of a loom having eight front harnesses and eight back harnesses cooperating to weave tubular fabric in the body and in the mouth portion **22**.

When the article is severed into bags, the top is flat with top single-layer fabric portions **14** and **16**, defining opening or mouth **22** leading into the bag in the middle thereof. The final closing of the bag when filled is considerably facilitated since the opening is quickly and easily pulled closed and flat by a pull on the two top corners even when the bag is full and it can then be easily heat sealed or sewn shut. The construction can readily be made in continuous fabric on conventional weaving equipment.

The fabrics of this invention can be produced on

Jacquard looms, dobby looms, or shuttleless looms employing upper and lower fabric sheds. The term shed as employed herein denotes a separated group of warp elements. Weaves such as plain, satin, twill, herringbone twill, or crepe can be employed. The preferred weave is a plain weave which, at regularly spaced intervals has two warp ends working as one end and two weft picks per shed. This preferred weave affords protection against long rips or tears in the sack. The regions at which the structure exists as a single fabric thickness are achieved by bringing together into a different shed the warp ends and weft picks employed in weaving the body region of the sack and interweaving the total of the warp and weft yarns (normally separated) to form an integral fabric. At the regions of consolidation or single fabric thickness, the numbers of warp ends and weft picks per inch are double the warp ends and weft picks of the tubular fabric of body regions **4**. The regions of consolidation can contain colored threads, dyes or other visible indicia to guide the severing operation.

The yarns employed in the manufacture of the textile structures of this invention can be of synthetic or natural origins. Continuous filament synthetic yarns, e.g. poly-e-caproamide (nyon 6) are found preferable in view of their strength, resistance to insecticidal and microbial damage, and amenability to heat sealing. For use as sandbags, the tubular fabric body portion should preferably have a trapezoidal tearing strength (across the warp) of at least 190 pounds, and a 1" grab strength (warp direction) of at least 450 pounds.

When used as sand bags, the sacks of the present invention should have a mouth portion less than 50% of the width of the sack to enable ready emptying of the sack when filled with free flowing material, e.g. sand. The ratio of the length to the width of the body portion of the sack should be between 1.4 and 2.2 to facilitate good handling and adaptability to stacking. The sacks are preferably filled only to 80% capacity with sand in order to impart plasticity to the filled bag. Using the afore said dimensions and filling conditions the filled sand bag constitutes essentially a plastic boulder useful as a constructional component in permanent engineering installations such as dams, dykes, levees, bulkheads, jetties, groins, piers, docks, breakwaters, etc. Preferred sand bags will have dimensions such that the ratio of fabric surface to bag volume (when 100% filled) is between 2.3 and 2.6. A sack which will contain about 80 pounds of moist sand, which is the maximum weight generally agreed upon as feasible for handling by manpower alone, will preferably have a width of about 14.2 inches and a length of about 28.2 inches. Larger bags, weighing thousands of pounds when properly filled, when constructed in accordance with these preferred dimensions, have sufficient strength and plasticity to be properly handled by heavy equipment.

After the sack is filled, the mouth portion can be sealed by conventional means such as sewing, heat sealing, pinning, clamping, stapling, adhesives, etc.

The following specific example is offered merely for the purpose of illustration and is not to be considered as limiting the scope of the invention.

Example 1

A textile structure having the pattern shown in FIGURE 1 was woven on a Crompton and Knowles loom, employing eight harness shafts to provide two separate fabrics for the body regions **4** which exist as a tubular fabric and have a double plain weave, a warp count of 34 ends per inch and a weft count of 30 picks per inch. The yarn employed for the warp and weft was continuous filament Caprolan nylon 6 of 840 denier, 136 filaments. Strips **18** consisting of single-layer fabric were 1 and ½ inches long as were the composite strips **6**. In the center of each composite strip **16** was a 6⅔ inch zone or mouth **22** wherein the structure existed as a strip consisting of single-layer fabric abutting a composite strip such that

the double-layer fabric portion of the composite strip formed the mouth **22**. The mouth **22** communicated with the body region **4**. In all regions wherein the tubular structure or body region was closed off, yarns from opposite sides of the body region were paired and woven as a double yarn. In these double yarn regions the warp count was 68 ends per inch and the weft count was 66 picks per inch.

The partitioned tubular fabric thus produced, woven as a continuous roll of fabric, was converted into sacks by cutting in a straight line with pinking shears midway within top and bottom regions of single fabric thickness. The resultant sacks were rectangular, the outer edges of all four sides being essentially straight lines. The width and length of body section **4** were 59 inches and 88½ inches respectively, providing a ratio of length to width of 1.5. The ratio of fabric surface to bag volume (100%) was 2.35. When filled 80% with moist sand, the bag weighed 3,700 pounds, and was strong enough to be lifted by a crane and dropped into place. After filling, the mouth of the bag was seamed by sewing between the regions of single-layer fabric which constitute the incomplete upper margin of the sack.

The container construction of this invention permits the fabrication of sand bag containers of relatively great size. These achieve cost savings in view of the low container cost per unit weight of sand, reduced labor costs, and reduced time required in utilizing the bags in a given construction. Although the containers of this invention have been exemplified primarily in terms of their use as sand bags for which they are eminently suited, the containers are also useful in the packaging of other granular solid material such as coffee, food grains mineral products, chemical products, seeds and the like. The containers provided by the container construction when segmented can be readily seamed in a seaming operation and the container is not subject to as many weak spots in its construction as conventional textile containers.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. A textile article comprising tubular fabric portions separated by:

(a) strips parallel to the weft direction, said strips consisting of single-layer fabric formed by bringing together and combining in pairs every front warp end with a matching back warp end of the tubular fabric portion and weaving the resultant pair of ends as one; and in alternating and abutting relative therewith,

(b) composite strips parallel to the weft direction, each of said composite strips comprising at least two

single-layer fabric portions and one double-layer fabric portion, the ratio of the length along the warp of each of the tubular fabric portions of said textile article to the width along the weft of such tubular fabric portion being between 1.4 and 2.2 and the ratio of fabric surface to bag volume, when said tubular portion is filled, being between 2.3 and 2.6 in units of feet; such bag when filled having a capacity of at least 80 pounds of moist sand; and wherein each said strip (a) and (b) spans the weft of each tubular fabric portion, each composite strip consisting of at least one composite segment which spans the weft of one said tubular fabric portion, each such segment of a composite strip consisting of one single-layer fabric portion at each end thereof and one double-layer fabric portion centrally thereof forming upon severance along such composite segment a sack with a mouth at the center of a narrower edge or top of the sack; said fabric being woven from continuous filament synthetic yarn and having a trapezoidal tear strength across the warp direction of at least 190 pounds and a one-inch grab strength in the warp direction of at least 450 pounds.

2. A textile article according to claim **1** wherein the double-layer fabric portion of each of said composite strips is less than 50% of the width of said composite strip.

3. A textile article according to claim **1** wherein the warp and weft count of the single-layer fabric constituting the strips separating the tubular fabric portions are at least double the warp and weft count of said tubular fabric portions.

4. A textile article according to claim **1** wherein said tubular portions are woven in a rip-stop weave.

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MERVIN STEIN, *Primary Examiner.*

J. KEE CHI, *Assistant Examiner.*