

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN AND RELATING TO CONTAINERS

(71) We, MILLER WEBLIFT LIMITED, a British Company of St. Alphage House, Fore Street, London, EC2Y 5DH, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to containers for the transport of materials and more particularly to flexible bags for the transportation of particulate material in bulk such as powders, pellets, granules, flakes, etc.

In recent years, there has been an increasing use of bulk containers made of fabric material which is sewn to a suitable shape and provided with lifting loops which can be engaged over the hook of a crane or the forks of a fork lift truck or similar vehicle. The containers are intended to contain a substantial quantity of material, for example in the range of one half of a ton to two tons. A problem that arises in the construction of these containers, known in the art as Intermediate Bulk Containers (IBC) is that of providing adequate strength because the containers may be roughly handled and/or mishandled and subjected to impulsive forces by the crane or fork lift truck during lifting and transportation. A common cause of failure is at the point of attachment of the lifting loops to the main area of the fabric of the container.

It is an object of the present invention therefore to overcome or substantially reduce some or all of these disadvantages.

According to one aspect of the invention, there is provided a method of making a flexible bag for the transportation of material, comprising the steps of forming the bag from one or more lengths of textile material, the, some or each of which has at least one area thereon which has been reinforced with interwoven additional reinforcing threads, and attaching lifting means to the bag at one or more areas of reinforcement.

According to another aspect of the invention, there is provided a flexible bag for the transportation of material comprising a tubular body of textile material, the, some or each side wall of which has at least one area with additional reinforcing threads interwoven with the threads of the body material to provide a reinforcement area, lifting means being attached to said rein-

forcement area or areas.

It has been proposed to reinforce a cylindrical woven fabric container bag by increasing the number of warps of body thread per unit length of the portion to which the handles are attached to at least 1.4 times the number of warps per unit length in the other portions. This technique is known as 'cramming' of warp threads. By contrast the reinforcing threads of the present invention are threads which are preferably introduced from a separate beam during weaving, and are preferably of polyester, polyamide or other synthetic or semisynthetic threads of the like mechanical properties, whereas the body fabric is generally woven from flat polyolefin tapes. In general, the term 'additional reinforcing threads' is used herein in the sense of being different from the threads of the body fabric in respect of count and/or textile material and/or tensile strength.

Conveniently the bag is formed by connecting together the free ends of a single length of material at a side seam but a seamless sleeve may be used or separate lengths of material depending on the required shape of the bag. For instance, the bag may be formed by folding a first length of material to provide two sides and a bottom, two separate additional sides being secured to the first length of the material for instance by stitching, to provide the remaining two walls of a four sided bag.

The areas of reinforcement are preferably woven into the bag material as lines of reinforcement extending uninterrupted between the top and bottom of the bag, and in some cases across the bottom of the bag. They may, however, be formed as individual areas in the side wall or walls of the bag to which the lifting means such as loops of webbing may be secured.

Conveniently, the bags are made from a length of material cut from a continuous piece having a plurality of spaced parallel linear reinforcement areas therein, the cut length of material being folded about lines extending generally parallel to the reinforcement areas to form the bag. In one preferred method, the reinforcement lines extend along the whole of the continuous length of material but are spaced from each other across the width thereof. In another method, however, the lines of reinforcement extend across the full width of

the material and are spaced from each other along the length thereof.

The reinforcement areas are formed by interweaving extra reinforcing threads with the existing threads of a length of textile fabric.

Conveniently, in a four sided bag, each side wall thereof is provided with two lines of reinforcement extending between the top and bottom edges and positioned adjacent the corners of the bag, each corner of the bag having the free ends of a lifting loop attached to the lines of reinforcement on each side of the bag corner. However, more than two reinforcement lines can be provided in each side wall if desired, although lifting loops may not necessarily be attached to all of these. Additionally, both free ends of each lifting loop may be attached to a single line of reinforcement if desired. Alternatively, only some, for instance, two facing sides of a four sided bag, can be provided with the lines of reinforcement to which the lifting loops are attached.

Features and advantages of the invention will appear from the following description of embodiments thereof, given by way of example only, with reference to the accompanying diagrammatic drawings, in which:—

Figure 1 is a perspective view of an intermediate bulk container;

Figure 2 is a perspective exploded view of an alternative container;

Figure 3 shows various other alternative containers;

Figure 4 is a plan view showing a preferred continuous length of material from which the containers of Figures 1 to 3 may be made;

Figure 5 is a plan view showing an alternative continuous length of material from which the containers of Figures 1 to 3 may be made;

Figure 6 is a fragmentary view of the material of a fabric weave;

Figure 7 is a fragmentary view of an alternative fabric weave; and

Figures 8–10 are perspective views of one form of top for a bulk container.

Referring to the drawings, there is shown in Figure 1 an intermediate bulk container having four sides 10, 11, 12 and 13 and a base (not shown). Each side is provided with a pair of linear areas, strips or lines of reinforcement 21–28 (the purpose of which will be described in more detail hereafter). The upper edge of the container is folded over to provide a double thickness of material 51 for extra strength but this is not essential as a single thickness of material would suffice. Lifting means in the form of loops 15–18 are attached, preferably by stitching 60, to the reinforcement lines to provide loops extending from the open upper edge of the container, the loops being stitched to the reinforcement strips and the folded-over portion 51 or single later of material. Any suitable sewing technique can be used such as the box and cross pattern illustrated in the drawings.

The container can be made up in a variety of

ways either from a single seamless cylinder of knitted or woven fabric to which a separate bottom or bottom and top may be attached or it can be made up from a single length of material formed into a cylinder, the free ends of said length of material being attached together, preferably by stitching, to provide a single side seam. As before, a bottom or bottom and top can then be attached to the tubular body portion. Alternatively, the container can be made up as shown in Figure 2 with a first single length of fabric 71 providing two of the side walls and the bottom of a four sided container, the remaining two side walls 72, 73 being separate lengths of material secured to the longest side edges of the first length of fabric (as indicated by the dotted lines 76) to complete the container. A top can be added if required. In the illustrated embodiment, all the lengths of fabric 71, 72, 73 have lines of reinforcement 79 but these can be omitted from the side panels 72, 73 if desired. Each area of reinforcement 79 of the length 71 extends uninterrupted across the bottom of the bag.

Each side wall, the bottom and top of the container can also be formed individually, the various individual pieces being secured together to form the container.

Although it is preferable to provide each side wall of the container with two spaced reinforcement lines 21–28, each side wall could be provided with only one or more than two reinforcement lines. See for instance the alternative embodiments illustrated in Figure 3.

As illustrated, the reinforcing lines extend uninterrupted between the top and bottom of the container. This is the preferred arrangement as it more effectively transfers the load during lifting over the whole height of each side wall. However, shorter lines could be provided which do not necessarily extend over the whole height of each side wall.

The lifting loops 15–18 are preferably open-ended loops as illustrated, the free ends of each loop being attached to a different reinforcement line 40. However, both free ends could be attached to the same reinforcement line if desired as shown in Figure 3.

The bottom of the container can be either a separate length of fabric (with or without reinforcement lines) which is secured to the side walls of the container, or the bottom portion of side walls at the corners of the container may be axially cut to provide separate flaps which may be folded inwardly and secured together. If desired, an outlet spout (not shown) may be provided in the base of the container which can be closed by any suitable means such as tie strings.

Alternatively, the bottom of the container can be formed into a conical configuration by providing a tapered flap at the bottom of each side wall and stitching together adjacent flaps to form a conical base with an outlet opening therein which can be closed with tie strings. If

desired an additional covering flap can be stitched to two or more of the bottom edges of the side walls to provide extra security for the bottom of the container, this flap being cut open when the container has to be emptied thereby exposing the folded conical base which is allowed to unfold out of the container body under the weight of the material therein. The tie strings around the outlet in the conical base can then be released to open the outlet and permit the contents of the container to be emptied therefrom.

The top of the container can be left open or it can be closed by a separate panel provided with a filling opening or spout. A preferred top closure is shown in Figures 8-10. The containers shown in Figures 8 and 9 each consist of a generally tubular body portion 80 provided with reinforcement lines 82. The container is closed at its lower end by a suitable closure 81 and has a side seam 86. The container can have a generally cylindrical or oval cross-section, as in Figures 8 or 10, or it can be rectangular or square, as shown in Figure 9.

The top portion 80a of the body portion is turned inwardly and handles or handling loops 90 are then sewn, as at 83, to the doubled edge of the folded-in body portion but it is arranged that the handle stitching does not extend below the level indicated by the broken line 84. When the handles have been secured in this way it is possible to pull up the lower edge of the turned-in portion 80a of the body portion and, when desired, the container can be filled with the material to be transported, up to approximately the level indicated by line 84. The edge 80b of the turned-in portion of the body portion can then be secured together, somewhat in the manner indicated in Figure 10. To close this edge of the filled container, the portion of the container near edge 80b can be provided with a hem or loops to receive a draw-string 85. In this way, the container is made integral with the closure, simplifying manufacture.

In a conventional bulk container, the points of greatest stress and therefore the points at which failure is most likely to occur, are at the points of attachment of the lifting loops to the container body due to the problem of the transfer of load from one part of the stitched construction to another.

In order to increase the strength off the containers described and to substantially reduce this problem, the container body is provided with the reinforcement strips or lines 21-28, 40 and 82 to which the lifting loops are attached.

The reinforcement areas are made by strengthening local areas of the container body fabric by interweaving therewith reinforcement threads.

Referring now to Figures 4 and 5, Figure 4 shows a continuous length of woven fabric along the length of which reinforcement lines 21-28 are inter-woven, there being eight such

lines spaced across the width of the fabric. In order to make a container for instance as shown in Figure 1, the width X of the fabric would be woven so as to correspond to substantially the perimeter size of the container, i.e. the sum total of the width of the 4 sides. Lengths Y of fabric would be cut from the continuous length, the length Y being equal to or greater than the height of the container depending on whether or not the bottom portion of the container body is to be inwardly folded to provide a bottom therefor or whether the top edge is to be folded over.

The cut length of fabric is then made up into a tubular container by shaping it about an axis parallel to the lines of reinforcement i.e. in the direction of arrow A.

It will be appreciated that as the reinforcement lines run along the whole length of the fabric, they are inter-woven with the warp threads thereof. In Figure 5 however, the reinforcing threads are inter-woven with the weft threads of the fabric to provide a series of spaced reinforcement lines extending across the width of the fabric but spaced from each other along the length thereof. The fabric of Figure 5 is woven so that its width Y corresponds substantially to the height of the container depending on whether or not the bottom portion is to be inwardly folded to provide the container bottom or whether the top edge is to be folded over. Lengths of material X are then cut from the continuous length of fabric, the length X corresponding substantially to the perimeter size of the finished container. The cut length is then made up into the container by shaping it about an axis parallel to the lines of reinforcement in the direction of arrow B.

As already explained, the reinforcement lines are woven into the fabric from which the container is made, additional warp or weft threads being added depending on the orientation of the fabric in the finished container.

In general, the reinforcement areas can be provided at any part of the fabric, up to and including the selvage; the major stress areas arise at the connections between the loops and the body of the container and it is at these regions that maximum advantage is obtained by use of the reinforcement of the material.

The additional threads 37 can be inter-woven with the warp 36 or weft 35 threads of the fabric in any suitable pattern. The fabric itself is usually woven as a plain weave but other weaves such as twill, basket or ribbed are possible. Figure 6 shows how the reinforcement threads 37 can be inter-woven as a plain weave with a body fabric which is also plain woven. Figure 7 on the other hand shows the reinforcement threads 37 inter-woven as a ribbed weave with a plain woven body fabric. This has been found to be an acceptable arrangement as it allows the reinforcement threads to spread the load during lifting more evenly along the length of the reinforcement lines on the container due

to the said threads being able to extend in the lifting direction more readily than is possible with a plain weave.

Preferably, the reinforcing threads 37 are regularly interwoven with the fabric threads 35, 36 so that they are evenly spaced apart across the width of the reinforcement strips. However, the reinforcement threads can be inter-woven so that they are closest together in the middle of the strip and become less close towards the edges thereof.

The warp and weft threads of the container body fabric and the reinforcement threads can be of any suitable natural fibre or yarn of a semi-synthetic or synthetic polymer such as polyester, polyamide, polyolefin or polyacrylic. The fabric may or may not be coated or impregnated after weaving to provide improved insulation, for instance waterproofing.

The lifting loops can be of any suitable material but preferably woven webbing is used.

The completed container can, if desired, incorporate a tubular liner or a liner specifically shaped to fit the contours of the container.

Reference is directed to our co-pending Application No. 38838/78 (Serial No. 1590942) which is divided herefrom.

WHAT WE CLAIM IS:-

1. A method of making a flexible bag for the transportation of material comprising the steps of forming the bag from one or more lengths of textile material, the, some or each of which has at least one area thereon which has been reinforced with inter-woven additional reinforcing threads, and attaching lifting means to the bag at one or more areas of reinforcement.

2. A method as claimed in claim 1 wherein the or each reinforcement area extends between opposite edges of the or each length of material, the or each length of material being formed into the bag so that the areas of reinforcement extend between the top and bottom thereof.

3. A method as claimed in claim 1 or claim 2 comprising the step of connecting together the free ends of a single length of material at a side seam to form the bag.

4. A method as claimed in any one of the preceding claims comprising the step of forming a bottom for the bag by inwardly folding the end portion thereof.

5. A method as claimed in claim 4 comprising the steps of making axially extending cuts in said one end portion of the bag to provide separate segments for inward folding to produce the bottom of the bag.

6. A method as claimed in claim 1 or claim 2 comprising the steps of forming a length of material to provide two sides and the bottom of the bag and attaching two separate additional sides thereto to provide the remaining two walls of a four sided bag.

7. A method as claimed in either of claims 1 or 2 comprising the step of attaching together

individual side and bottom lengths of material to form the bag.

8. A method as claimed in any preceding claim wherein the length or lengths of material are attached together by stitching.

9. A method as claimed in any preceding claim wherein the lifting means are attached to the bag by stitching.

10. A method as claimed in any of the preceding claims wherein the lifting means is a pair of open ended loops the method comprising the step of attaching both ends of each open ended loop to a respective one of said reinforcement areas.

11. A method as claimed in any of claims 1 to 9 wherein the lifting means comprises at least one open ended loop the method further including the step of attaching one of the or each of said open ended loops to an area of reinforcement on one side of the bag and the other end to another area of reinforcement on the other side of the bag.

12. A method as claimed in any of claims 1 to 9 wherein the lifting means comprises four open ended loops, the free ends of each loop being attached to respective adjacent pairs of reinforcement areas located at the corners of the bag.

13. A method as claimed in claim 1 comprising the steps of weaving a continuous length of material with a plurality of spaced parallel reinforcement areas therein, cutting a length of material from said continuous length substantially equal to the perimeter size or the height of the bag to be formed and folding said cut length about lines generally parallel to said reinforcement areas to form the bag.

14. A method as claimed in claim 13 wherein each reinforcement area extends along the whole of the continuous length of the material, the reinforcement areas being spaced across the width thereof.

15. A method as claimed in claim 13 wherein each reinforcement area extends across the width of the material, the reinforcement areas being spaced along the length thereof.

16. A method of making a flexible bag according to claim 1 substantially as herein described with reference to the accompanying drawings.

17. A flexible bag for the transportation of material comprising a tubular body of textile material, the, some or each side wall of which has at least one area with additional reinforcing threads inter-woven with the threads of the body material to provide a reinforcement area, lifting means being attached to said reinforcement area or areas.

18. A flexible bag as claimed in claim 17 wherein the or each reinforcement area extends uninterrupted between the top and bottom of the bag.

19. A flexible bag as claimed in claim 17 or claim 18 wherein the or each area of reinforcement extends uninterrupted across the

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to the said threads being able to extend in the lifting direction more readily than is possible with a plain weave.

Preferably, the reinforcing threads 37 are regularly interwoven with the fabric threads 35, 36 so that they are evenly spaced apart across the width of the reinforcement strips. However, the reinforcement threads can be inter-woven so that they are closest together in the middle of the strip and become less close towards the edges thereof.

The warp and weft threads of the container body fabric and the reinforcement threads can be of any suitable natural fibre or yarn of a semi-synthetic or synthetic polymer such as polyester, polyamide, polyolefin or polyacrylic. The fabric may or may not be coated or impregnated after weaving to provide improved insulation, for instance waterproofing.

The lifting loops can be of any suitable material but preferably woven webbing is used.

The completed container can, if desired, incorporate a tubular liner or a liner specifically shaped to fit the contours of the container.

Reference is directed to our co-pending Application No. 38838/78 (Serial No. 1590942) which is divided herefrom.

WHAT WE CLAIM IS:—

1. A method of making a flexible bag for the transportation of material comprising the steps of forming the bag from one or more lengths of textile material, the, some or each of which has at least one area thereon which has been reinforced with inter-woven additional reinforcing threads, and attaching lifting means to the bag at one or more areas of reinforcement.

2. A method as claimed in claim 1 wherein the or each reinforcement area extends between opposite edges of the or each length of material, the or each length of material being formed into the bag so that the areas of reinforcement extend between the top and bottom thereof.

3. A method as claimed in claim 1 or claim 2 comprising the step of connecting together the free ends of a single length of material at a side seam to form the bag.

4. A method as claimed in any one of the preceding claims comprising the step of forming a bottom for the bag by inwardly folding the end portion thereof.

5. A method as claimed in claim 4 comprising the steps of making axially extending cuts in said one end portion of the bag to provide separate segments for inward folding to produce the bottom of the bag.

6. A method as claimed in claim 1 or claim 2 comprising the steps of forming a length of material to provide two sides and the bottom of the bag and attaching two separate additional sides thereto to provide the remaining two walls of a four sided bag.

7. A method as claimed in either of claims 1 or 2 comprising the step of attaching together

individual side and bottom lengths of material to form the bag.

8. A method as claimed in any preceding claim wherein the length or lengths of material are attached together by stitching.

9. A method as claimed in any preceding claim wherein the lifting means are attached to the bag by stitching.

10. A method as claimed in any of the preceding claims wherein the lifting means is a pair of open ended loops the method comprising the step of attaching both ends of each open ended loop to a respective one of said reinforcement areas.

11. A method as claimed in any of claims 1 to 9 wherein the lifting means comprises at least one open ended loop the method further including the step of attaching one of the or each of said open ended loops to an area of reinforcement on one side of the bag and the other end to another area of reinforcement on the other side of the bag.

12. A method as claimed in any of claims 1 to 9 wherein the lifting means comprises four open ended loops, the free ends of each loop being attached to respective adjacent pairs of reinforcement areas located at the corners of the bag.

13. A method as claimed in claim 1 comprising the steps of weaving a continuous length of material with a plurality of spaced parallel reinforcement areas therein, cutting a length of material from said continuous length substantially equal to the perimeter size or the height of the bag to be formed and folding said cut length about lines generally parallel to said reinforcement areas to form the bag.

14. A method as claimed in claim 13 wherein each reinforcement area extends along the whole of the continuous length of the material, the reinforcement areas being spaced across the width thereof.

15. A method as claimed in claim 13 wherein each reinforcement area extends across the width of the material, the reinforcement areas being spaced along the length thereof.

16. A method of making a flexible bag according to claim 1 substantially as herein described with reference to the accompanying drawings.

17. A flexible bag for the transportation of material comprising a tubular body of textile material, the, some or each side wall of which has at least one area with additional reinforcing threads inter-woven with the threads of the body material to provide a reinforcement area, lifting means being attached to said reinforcement area or areas.

18. A flexible bag as claimed in claim 17 wherein the or each reinforcement area extends uninterrupted between the top and bottom of the bag.

19. A flexible bag as claimed in claim 17 or claim 18 wherein the or each area of reinforcement extends uninterrupted across the



- bottom of the bag.
20. A flexible bag as claimed in any one of claims 17 to 19 wherein the bag is four sided.
21. A flexible bag as claimed in any one of claims 17 to 19 wherein the bag is cylindrical.
22. A flexible bag as claimed in any one of claims 17 to 21 wherein the tubular body of the bag is formed from a single piece of material whose opposite free ends are joined together to form a side-seam.
23. A flexible bag as claimed in any of claims 17 to 20 wherein the tubular body of the bag comprises a first length of material which is folded to provide two side walls and the bottom of the bag and two separate additional side walls secured to the side edges of said first length of material.
24. A flexible bag as claimed in any one of claims 17 to 23 wherein the material of the body of the bag is woven in a plain weave, the reinforcing threads being inter-woven therewith as a ribbed weave running from the top to the bottom of the bag.
25. A flexible bag as claimed in any one of claims 17 to 23 wherein the material of the body of the bag is woven in a plain weave, the reinforcing threads being inter-woven therewith also as a plain weave.
26. A flexible bag as claimed in claim 24 or claim 25 wherein there are more reinforcing threads in the central region of a reinforcement area than at its peripheral regions.
27. A flexible bag as claimed in any one of claims 17 to 26 wherein the body of the bag is made from a synthetic polyolefin textile material.
28. A flexible bag as claimed in any of claims 17 to 27 wherein the reinforcing threads are of a synthetic polyester or polyamide textile material.
29. A flexible bag as claimed in any one of claims 17 to 28 wherein the lifting means comprise open ended loops whose free ends are secured to the reinforcement areas on the tubular body of the bag.
30. A flexible bag as claimed in claim 29 wherein both free ends of each loop are attached to the same reinforcement area.
31. A flexible bag as claimed in claim 29 wherein the free ends of each loop are attached to separate reinforcement areas.
32. A flexible bag as claimed in claim 31 wherein the free ends of each loop are attached to adjacent reinforcement areas.
33. A flexible bag substantially as herein described with reference to the accompanying drawings.
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