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(54) Improvements relating to material containers.

(57) Containers in the form of bags for carrying one tonne or more of powdered or other material are disclosed, the bags being parallel-sided and comprising a base (1), four side walls (2-5) extending upwardly in full width from the base to the top of the bag and four corner seams (7-10) each defining the juncture of two adjacent walls and extending the full height of the bag. Lifting loops (12) are provided at the top of the bag, each loop having a leg (14) which extends down a major part of the height of the bag and which is secured to the bag fabric solely by the stitching used to form a respective one of the corner seams.

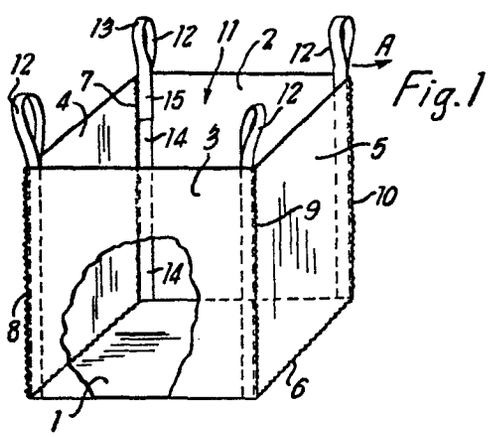

Fig. 1

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IMPROVEMENTS RELATING TO MATERIAL CONTAINERS

This invention relates to containers for bulk material.

The use of bags capable of carrying a load of one tonne or more of powered or other material is becoming increasingly widespread, and a number of forms of bag are known. The general basic requirements of such a bag are that it can be lifted by fork lift truck and by crane, that it has a good factor of safety and is inexpensive to manufacture.

Known bags are made from fabric woven from a high tenacity synthetic fibre and stitched to form a bag which has a base, and walls extending upwardly from the base to the top of the bag, which may be open or closed. In some cases it is required to have the top as large as possible and the sides are thus required to extend in full width for the full height of the bag, without any gathering in at the top of the bag. Such a bag is conventionally known in the art as a parallel-sided bag.

In order that such bags may be lifted they are provided with lifting loops spaced apart around the top of the bag. The material chosen both for the loop and the bag walls must be such that the load can be lifted with safety, and desirably with a safety factor of 5 or more. It is also necessary that the method by which the lifting loops are secured to the bag fabric gives this factor of safety.

It is already known in parallel-sided bags to weave into the bag fabric special reinforcing strips of

high tensile fibres and to stitch the lifting loops to these strips. However, the weaving of the special fabric is expensive, and labour is involved in stitching the loops onto the formed bag. It is also known to form a parallel-sided bag and then to stitch lifting loops to the bag, the loops having legs extending down the bag at respective corners thereof and being stitched to the bag fabric by a multiplicity of runs of conventional lockstitch. Such a bag does not have a very high factor of safety and the amount of lockstitching required to obtain a secure connection is high and involves substantial labour. Many other methods of attachment for the loops have been tried, but none has succeeded in giving the required strength at a low price.

According to the present invention a parallel-sided bag for transporting and storing bulk material comprises a base, four side walls extending upwardly in full width from the base to the top of the bag, four corner seams each defining the juncture of two adjacent side walls and each corner seam extending the full height of the bag, and lifting loops at the top of the bag, each loop having a leg which extends down a major part of the height of the bag and which is secured to the fabric of the bag solely by the stitching used to form a respective one of the corner seams.

The only connection effected between each leg and the bag fabric is thus by the stitching used for the corner seams. Most surprisingly, it has been found that this form of attachment can give a high factor of safety, well in excess of that previously obtained with other forms of parallel-sided bag. Furthermore, the formation of a corner seam and the attachment of a lifting loop leg can be effected by a single pass through a sewing machine, thus considerably saving work and so reducing

the cost of the bag.

In many cases a corner seam stitched by a single pass will suffice, and in all cases the major part of the corner seam length is preferably effected in a single pass. In order to increase tear-out strength of the leg transverse to the corner seam, however, it may be preferable in some cases to oversew the top part of the corner seam by reversing the materials in the sewing machine and using the same thread and stitch type used for the full length of the corner seam.

The invention as set forth above can be practised for any construction of parallel-sided bag. For example, such bags may have their walls formed from a single length of tubular woven fabric into which a base is stitched, the base usually being square, although circular or other shapes are possible. In this case the fabric is longitudinally folded or pleated along four spaced corner lines, and each corner seam is effected by stitching along the fold or pleat; the resulting bag thus has four side walls. Alternatively, the walls may be formed from a single piece of fabric folded to form a tube and having its free edges stitched together along a seam extending the full height of the bag, a base being stitched into the tube. This seam may be a corner seam, or may be a seam extending up a side wall of the bag. When it is a corner seam, the other three corner seams can then be formed by folding or pleating and stitching as described above.

When it is not a corner seam the four corner seams are formed by folding or pleating and stitching as described above. This is one preferred construction of the bag, and in this construction preferably the warp threads of the fabric extend around the girth of the bag. The usual orientation of fabric in bags for bulk

material is to have the warp threads extending from top to bottom of the walls as this was thought necessary for proper load transmission to the lifting loops and to the base of the bag. Surprisingly it has been found that by carrying the warp threads around the girth of the bag the strength of the bag is actually increased; furthermore the lifting loops have increased resistance to tear-out due to tensile loads transverse to the corner seam direction, and the oversewing of the top part of the corner seams may, in some cases, be omitted.

A tube of material forming the side walls could alternatively be formed by two pieces of fabric stitched together along two corner or other seams, the other two corner seams, or the four corner seams as appropriate, then being formed by folding or pleating and stitching. Another alternative is to form a tube from four pieces of fabric stitched together along four corner seams, again with a base stitched into the tube. In another preferred construction the bag is formed by folding a length of fabric to a U-shape to define the base and two opposed side walls and the other two side walls are each formed by a further length of fabric stitched to the base, and stitched to each of the adjacent side walls along a corner seam extending the full height of the bag.

The bag may have four separate lifting loops, each associated with a respective one of the four corner seams, and in this case each loop has a hight extending above the top of the bag, and two legs, one leg extending down a major part of the height of the bag and being secured to the fabric of the bag only by the stitching used to form the corner seam as aforesaid, and the other leg also being secured to the fabric of the bag solely by the stitching used to form the respective corner seam. Such other leg, however, need not extend

for the major part of the height of the bag.

Alternatively, the bag may have two separate lifting loops, each extending over the top of the bag and having two legs, the two legs being secured to different corner seams of the bag solely by the stitching forming those corner seams, and both legs extending for the major part of the height of the bag. The legs of each loop may be secured todiagonally opposite corner seams or to adjacent corner seams.

In any of these embodiments of the invention, and the preferred one is the bag with four corner seams and four lifting loops each secured to one of the corner seams, time during manufacture is saved by securing a leg of a lifting loop to the bag in the same operation as a corner seam of the bag is formed.

As already stated, each corner seam may be a seam joining together two or more sections of a single folded or pleated piece of a material forming the bag, or may join together the free edges of two separate pieces of material. In the latter case the edges joined are desirably woven selvedges of the material. The or each leg of a lifting loop being stitched to the corner seam is desirably positioned between two of the sections of fabric being joined by the corner seam, and lies on the inner surface of the formed bag.

Clearly, the connection must be such that it gives the bag the required safety factor and each corner seam is preferably stitched using a yarn of large diameter and high tensile strength.

Preferably the yarn used for forming the corner seams and for securing the leg to the bag fabric in any embodiment of the invention has a diameter of at least 1.25 mm and an ultimate tensile strength of not less than 20 kg. Particularly convenient is a yarn of

1.5875 mm diameter with an ultimate tensile strength of 25 kg, and such yarn may conveniently be a 6000 denier twisted yarn of split fibre polypropylene.

The stitching techniques used must present sufficient points of contact between the yarn, the leg fabric and the bag fabric and it is preferred to use two parallel lines of stitching, with from 0.78 to 1.18 stitches per cm. It is particularly advantageous to form the two parallel lines of stitching simultaneously using a twin needle sewing machine as in this way only a single pass through the machine will suffice to form the corner seam and secure the lifting loop to the bag. Excellent results are obtained using parallel lines respectively of Heracles and Antaeus chain stitching, each at 1 stitch per cm.

The height of the bag along which the leg of the lifting loop needs to be stitched to the bag fabric depends to some degree on the strengths of both the loop fabric and the bag fabric and also on the safety factor required. Preferred material for the lifting loops is woven polyethylene terephthalate (e.g. "Terylene", Registered Trade Mark) of the type used for vehicle seat belts. For a bag designed to carry one tonne this is desirably used in 5.08 cm widths and has an ultimate tensile strength of 1810 kg. The preferred material for the bag fabric is 38 x 38 per sq. cm woven polypropylene of 2000 denier, which is relatively cheap and possesses the required strength. Using such materials and the preferred yarn and stitching techniques referred to above, it is preferred that for a bag designed to carry a one tonne load, the leg be stitched to the bag fabric for a length of about 89 cm to 102 cm to achieve a safety factor of 5. The usual height of such a bag is about 122 cm.

In any embodiment of the invention the top of the bag may be open, or it may be closed by a skirt or a panel of material stitched to the side walls, the skirt or panel having an opening therein or tube stitched thereto through which the bag may be filled. The bag may have any suitable discharge arrangement in the base thereof.

Particular embodiments of bag according to the invention will now be described in greater detail, by of example only, with reference to the accompanying drawings in which:-

Figure 1 is a schematic view of a first embodiment of bag according to the invention;

Figure 2 is an enlarged view of part of the bag of figure 1;

Figures 3 and 4 are, respectively, cross-sections on the lines III - III and IV - IV of Figure 2;

Figures 5 to 7 correspond to Figure 3 but show possible modifications of the bag.

Figures 8 and 9 are similar to Figure 1 but show two further embodiments of bag;

Figure 10 shows part of another embodiment of bag, similar in most respects to that of Figure 1; and

Figure 11 shows yet another embodiment of the bag.

Referring now to Figure 1 this shows a bag for the transport and storage of bulk material, comprising a base 1, a first pair of opposed side walls 2, 3 and a second pair of opposed side walls 4, 5. The base 1 and side walls 2 and 3 are formed from a single length of woven fabric folded to U-shape, and each side wall 4, 5 is secured to the base by stitching 6, and is secured to the adjacent side walls 2, 3 by corner seams 7 to 10. The edges of the walls 2 to 5 that are joined by the corner seams are suitably woven selvedges. The bag has an

open top 11 to which may optionally be stitched a skirt (not shown) capable of being folded over the top of the bag to protect the contents.

The bag is provided with four lifting loops 12 which are identical in their method of construction and attachment to the bag, so that only one loop will be described in detail. Thus, each loop 12 has a bight 13 which is upstanding from the top of the bag and two legs 14 and 15. The leg 14 extends the full height of the bag and is secured to the bag fabric by placing the leg between the edges of the fabric forming the walls 2 and 4 and stitching through the two walls and the leg the full height of the bag simultaneously to form the corner seam 7 and secure the leg 14 to the bag fabric. The leg 15 extends only part way down from the top of the bag and, as shown in Figures 2 and 4, lies overlapped with the leg 14 between the walls 2 and 4 and is secured to the bag fabric solely by the stitching forming the edge seam 7. Clearly, the leg 15 could extend further down the bag, and could extend the full height if required.

The stitching forming the corner seams and securing the lifting loops to the bag is effected using a twin needle sewing machine producing two parallel runs of stitching, an outer run 16 of Heracles chain stitch and an inner run 17 of Antaeus chain stitch. The yarn used for the stitching is 6000 denier twisted yarn of split fibre polypropylene, having a diameter of 1.5875 mm and an ultimate tensile strength of 25 kg. The stitching is carried out at 1 stitch per cm.

The free edges 18, 19 of the legs 14 and 15 may be stitched together as indicated at 20 to improve the finish to the bag.

A bag designed to carry a one tonne load has been made in accordance with Figure 1 using the yarn described

above, using 5.08 cm "Terylene" seat belt webbing having an ultimate tensile strength of 1810 kg and using 38 x 38 per sq. cm woven polypropylene of 2000 denier, the bag having a base measuring 89 cm x 89 cm and a height of 122 cm. The bag was lifted on a single hook positioned over the centre of the bag, with all four loops engaged on the hook. The test load applied to the bag was increased to 6.5 tonnes before failure occurred and this was due to the webbing of one of the loops tearing. The bag thus had a safety factor of 6.5, which was completely unexpected and is a remarkably high value.

Figure 5 shows a slightly modified corner seam construction wherein the leg 14 is placed on the outside of the bag. Furthermore one of the legs may be inside and one outside the bag.

Figure 6 shows a corner seam construction wherein the leg 14 is folded to lie between the walls 2 and 4 and the seam stitching thus passes through two thicknesses of leg fabric. The leg 15 may then be similarly folded, or may be left unfolded, and may lie between or outside the folds of bag fabric. Figure 7 is similar to Figure 6 but shows a folded leg 14 lying outside the walls 2 and 4. Again, leg 15 may be similarly folded, or may be left unfolded, and may lie between or outside the folds of bag fabric. It is preferred that a bag have an identical construction for each of the four corner seams and loop connections but obviously mixtures of the constructions shown could be used.

Figures 8 and 9 show alternative forms of bags with only two lifting loops but otherwise of similar construction to the bag of Figure 1. In Figure 8 the bag has two loops and 22, each extending over the top of the bag. The loop 21 has two legs 23, 24, each of

which extends the full height of the bag and is stitched into the respective corner seam in the manner as shown for leg 14 in any one of Figures 3, 5, 6 and 7. The corner seams to which the legs are stitched are adjacent and the loop 22 similarly has legs 25, 26 which are secured to the adjacent corner seams at the other side of the bag.

The bag shown in Figure 9 is generally similar to that shown in Figure 8 save that the loops 27, 28 extend diagonally over the bag and their legs are secured to diagonally opposite corner seams, in any one of the ways shown in Figures 3, 5, 6 and 7.

In each embodiment one or both legs of each lifting loop is shown as extending the full height of the bag; this is not essential, although it is generally the simplest manufacturing method. The legs could terminate short of the bottom of the bag, but one must extend for a major part of the bag height, and desirably for a minimum distance of about 89 cm.

In all the embodiments shown the corner seam is formed by a single pass of the fabric through the sewing machine and, as described, stitching the leg to the bag fabric by the seam stitching gives the required lifting strength. In some cases, however, a loop of the bag may be submitted to a tensile load transverse to the corner seam direction, for example by a pull on one loop in the direction of the arrow A in Figure 1. It may be preferable to increase the tear-out resistance of the loops to such loads and this can be done in two ways either separately or, preferably, in combination.

As shown in Figure 10 the first method by which increased strength can be obtained is by folding over the top part of the fabric of each wall before stitching the corner seams, so that for the top 5 cms to 15 cms

of each wall there is a double thickness 30 of bag fabric. The second method is by oversewing the top part of the corner seam, for a distance of 5 to 8 cms, by reversing the materials in the sewing machine and stitching back along the seam using the same thread and stitch type used for the full length of the seam. This results in a denser section 31 of the stitching used to form the seam, for example a stitch density of 2 stitches per cm for the top section rather than the 1 stitch per cm used on the major part of the seam.

The bag shown in Figure 11 comprises four walls 29 to 32 formed by a single length of material folded to form a tube and having its free edges stitched together along a seam 33 extending the full height of the wall 29. A base 34 is secured to the walls by stitching 35 and a top 36 is secured to the walls by stitching 37. Both the base and the top have a spout 38, 39 respectively stitched thereto, through which the bag may be emptied and filled respectively, each spout being closable by means not shown in the Figure.

The fabric at the upper edge of each wall is folded over to form a hem 40, the free edge of the folded section being stitched to the respective wall.

A lifting loop 41 to 44 is provided at each top corner of the bag and the legs of the lifting loops are stitched to the respective corner seams of the bag only by the stitching used for those seams, by any of the methods hereinbefore described. Each corner seam joins together two adjacent walls separated by a fold in the single length of the material from which the walls are formed. It is preferred that the warp threads of the bag fabric extend around the girth of the bag rather than up the walls, i.e. extend in the direction of the arrow 45. A stronger bag is formed in this manner, and the

individual loops have greater resistance to tear-out due to tensile loads transverse to the corner seam direction; the need for oversewing the top parts of the corner seams may thus be obviated.

CLAIMS:

1. A parallel-sided bag for transporting and storing bulk material, the bag comprising a base, four side walls extending upwardly in full width from the base to the top of the bag, four corner seams each defining the juncture of two adjacent side walls and each corner seam extending the full height of the bag, and lifting loops at the top of the bag, each loop having a leg which extends down a major part of the height of the bag and which is secured to the fabric of the bag solely by the stitching used to form a respective one of the corner seams.

2. A parallel-sided bag according to claim 1 in which the stitching used to form each corner seam is effected for at least a major part of the length of the corner seam by a single pass of fabric through a sewing machine.

3. A parallel-sided bag according to claim 1 in which the top part of the or each corner seam is oversewn using the same thread and stitch type used for the full length of the corner seam.

4. A parallel-sided bag according to any one of the preceding claims in which one or more of the corner seams is constituted by joining together two or more sections of a single folded or pleated piece of fabric forming adjacent side walls of the bag.

5. A parallel-sided bag according to claim 5 in which all four side walls of the bag are formed by a single length of fabric arranged so that the warp threads extend around the girth of the bag, the free ends of the length of fabric being joined by a seam extending the full height of the bag.

6. A parallel-sided bag according to any one of claims 1 to 4 in which one or more of the corner seams is constituted by joining together the free woven

selvedges of two separate pieces of material.

7. A parallel-sided bag according to claim 5 or claim 6 in which the bag is formed by folding a length of fabric to a U-shape to define the base and two opposed side walls and the other two side walls are each formed by a further length of fabric stitched to the base, and stitched to each of the adjacent side walls along a corner seam extending the full height of the bag.

8. A parallel-sided bag according to any one of the preceding claims in which the bag has four separate lifting loops, each associated with a respective one of the four corner seams, and each loop has a bight extending above the top of the bag, a first leg extending down a major part of the height of the bag and secured to the fabric of the bag solely by the stitching used to form the respective corner seam, and a second leg also secured to the fabric of the bag solely by the stitching used to form the respective corner seam.

9. A parallel-sided bag according to any one of claims 1 to 8 in which the bag has two separate lifting loops, each extending over the top of the bag and having two legs, the two legs being secured to different corner seams of the bag solely by the stitching forming those corner seams, and both legs extending for the major part of the height of the bag.

10. A parallel-sided bag according to any one of the preceding claims in which the twine used for forming the corner seams and for securing each leg to the bag fabric has a diameter of at least 1.25 mm and an ultimate tensile strength of not less than 20 kg, the stitching used to form each corner seam comprises [illegible] of Heracles and Antaeus chain stitching formed simultaneously using a twin needle sewing [illegible] and each loop has a leg that is secured to the respective corner seam for a minimum distance of 89 cms.

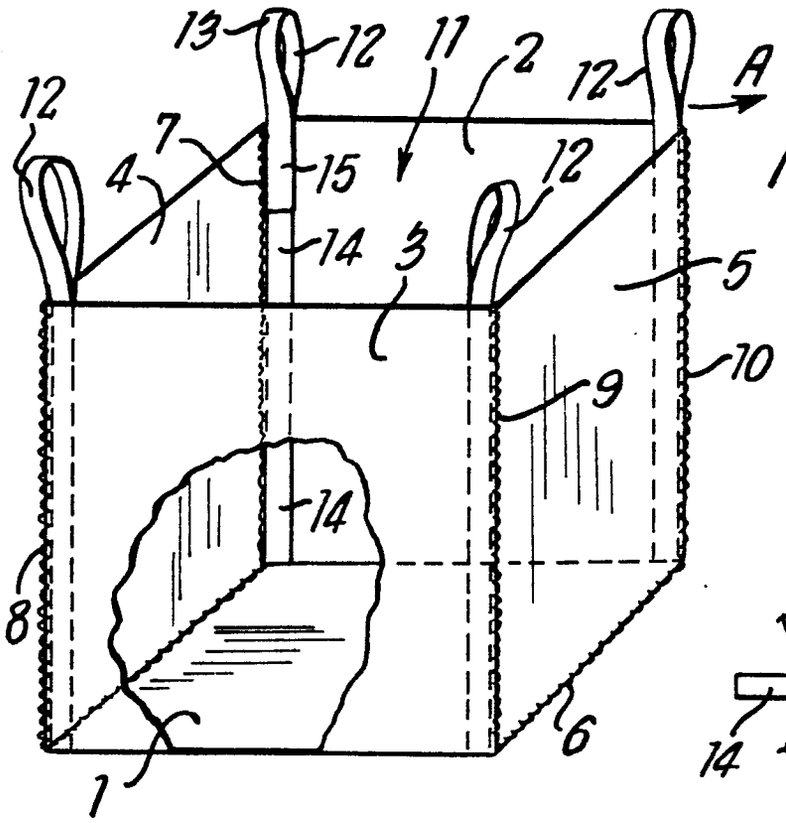

Fig.1

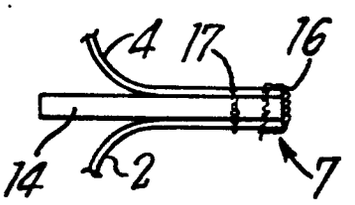

Fig.3

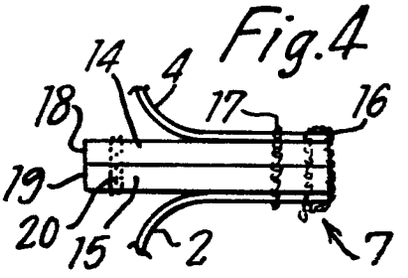

Fig.4

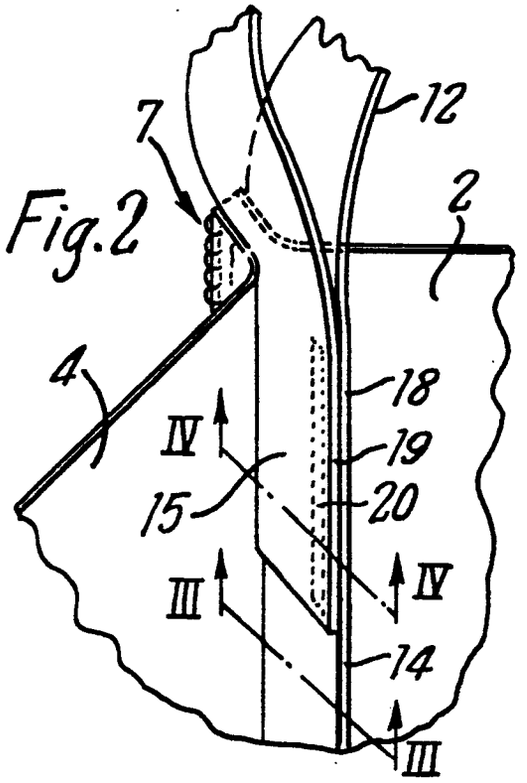

Fig.2

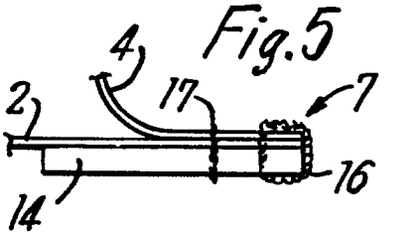

Fig.5

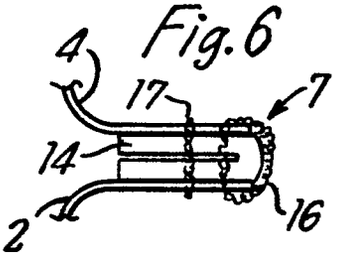

Fig.6

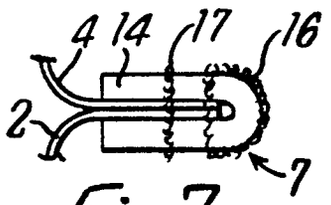

Fig.7

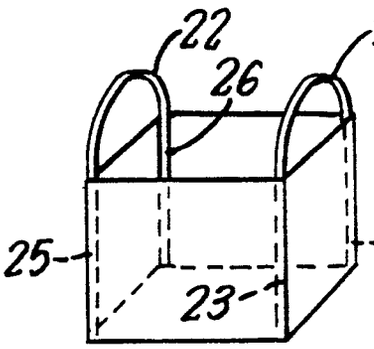

Fig.8

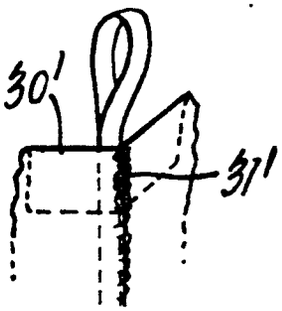

Fig.10

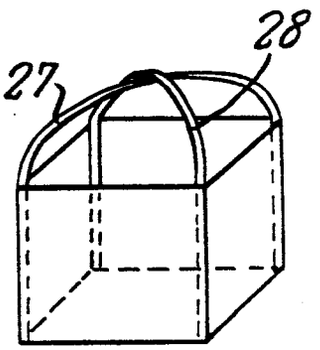

Fig.9

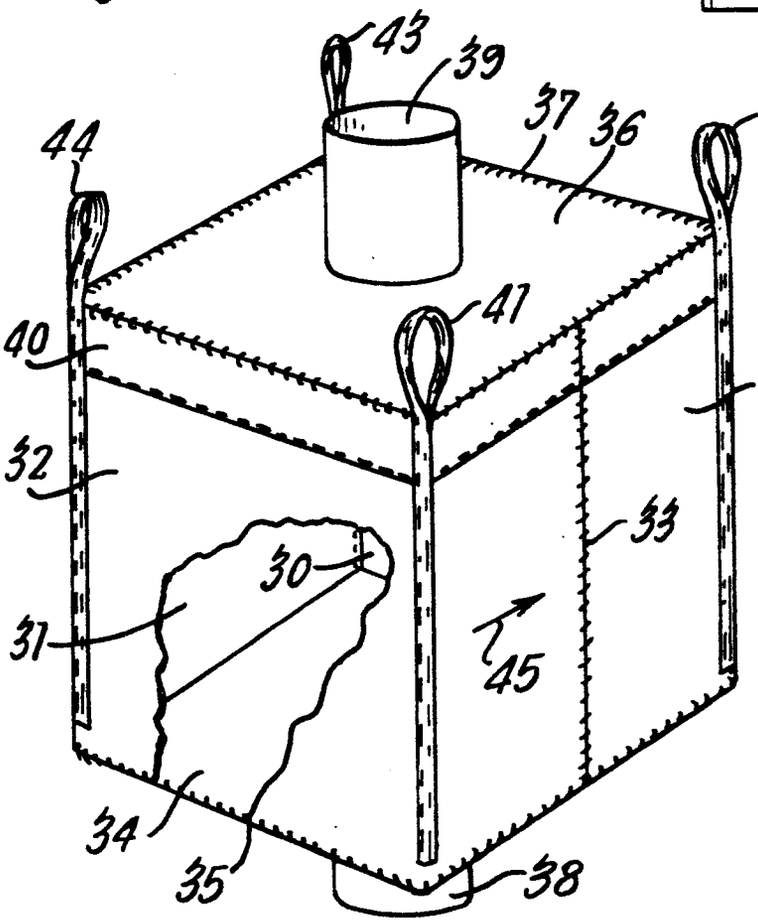

Fig.11

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 78 30 0470

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	GB - A - 1 340 693 (I.C.I.) * Entirety * --	1
A	FR - A - 2 224 357 (NATTRASS) * Entirety * ----	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.²)

B 65 D 89/02
B 65 D 89/12
B 65 D 29/00

TECHNICAL FIELDS SEARCHED (Int.Cl.²)

B 65 D 89/00
B 65 D 29/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20-11-1978	BAETENS

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