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(54) Improvements in flexible intermediate bulk containers

(57) A flexible intermediate bulk container (FIBC) (1) comprising primarily one type of non-woven, un-lined, plastics material (9) and lifting means (4,5), characterised in that the lifting means comprises carrying straps (4,5) of the said plastics material that are welded or otherwise fitted to the FIBC (1), the straps (4,5) being so sized, shaped and located around the body of the FIBC (1) as to provide the body (9) of the FIBC (1) with additional structural integrity.

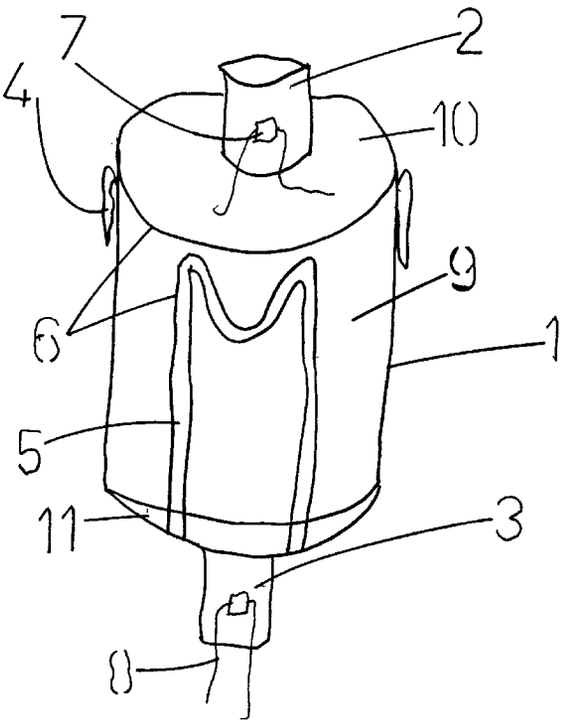

Fig 2

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Description

Field of the Invention

[0001] The present invention relates to improvements in flexible intermediate bulk containers, in particular to improvements in polypropylene and/or polyethylene based FIBC's.

Background Art Known to the Applicant

[0002] The advent of commercially available quantities of plastics materials from the 1950's onwards, provided a new means of storing bulk quantities of various types of commodity. These "new means" became known as "flexible-intermediate-bulk-containers" or F.I.B.C.'s and are essentially huge "plastic-bags" (known colloquially in the trade as "Big Bags") adapted to contain, usually, between 500 kilograms and two tonnes of material. As a major manufacturer of such "Big Bags" or F.I.B.C.'s, with a number of patents in this field, we are able to show a typical modern day F.I.B.C. and this is illustrated in Figure 1.

[0003] Various types of F.I.B.C. exist and one of the first commercially successful F.I.B.C.'s was formed from woven and stitched polypropylene panels. The woven nature of the polypropylene although expensive to produce in comparison to extruded polypropylene being primarily responsible for the overall structural integrity of the finished bag. This type of F.I.B.C. is still used today for certain types of commodity, however, despite the generally high cost of woven polypropylene *per se,* these are low in comparison to the production costs associated with this type of F.I.B.C., as the woven panels of material are literally stitched together to form the "Big Bag" and this stitching process is extremely labour intensive. Polypropylene as a material is also permeable to water and this problem is exacerbated to the extreme as a result of the puncture holes caused by the stitching process. Nevertheless, with bulk solid/powdered materials, this type of F.I.B.C. is still effective as solid powdered material is less likely to leak out from the bag especially if the edge seams of the sewn polypropylene panels are provided with sealing strips of the type discussed in either UK patent application number 2 301 087 A or French patent number FR-A-2 634 468.

[0004] To overcome one of the problems associated with this woven and stitched polypropylene F.I.B.C., (that of its inherent water permeability especially after stitching), a two-part F.I.B.C. formed from a woven polypropylene outer bag and an extruded polyethylene inner bag (or liner bag) was developed. As extruded polyethylene is waterproof, and cheap, its purpose is to line the woven polypropylene outer bag to provide the finished F.I.B.C. with an inner waterproof layer. Although polyethylene *per se* is not structurally very strong and is usually quite thin when it is used as a liner, the structural integrity of the outer bag provides the inner liner with all of the "strength" it requires.

[0005] Nevertheless, the problems associated with this "solution" to stitched F.I.B.C.'s causes its own problems. These are generally associated with the method of production. Firstly, two bags need to be formed and secondly, one bag needs to be inserted into the other. A way of getting around this particular problem is to coat the inner surface of the sewn polypropylene panels with a waterproof resin and although this has met with some success in certain applications, over 50% of polypropylene based F.I.B.C.'s (31,000,000 "Big Bags" sold in Europe per year) remains the outer woven and sewn panels with the inner liner type.

[0006] The advent of poly-vinyl-chloride (PVC), although expensive, provided a further patented (EP 0 072 168) development to the construction of F.I.B.C.'s in so far as for example, a PVC coated polyester, F.I.B.C. enabled the carrying straps to be welded (using high frequency welding techniques) to the exterior surface of the F.I.B.C. as opposed to being stitched. This was a tremendous leap forward in the development of F.I.B.C. technology as PVC itself is waterproof, has high structural integrity when in combination with the polyester and negates the need for stitching or in all cases, an inner liner.

[0007] The major disadvantage of PVC based F.I.B.C.'s is that PVC is itself expensive and "Big Bags" manufactured employing this technology are themselves labour intensive to produce which adds greatly to their cost and as a result order quantities relatively speaking tend to be small. They are also non-recyclable and environmentally and therefore, politically, unfriendly.

[0008] It is an object of the present invention to therefore produce an F.I.B.C. that is non-woven, un-lined, cheap, 100% recyclable and environmentally friendly.

Summary of the Invention

[0009] According to the present invention in its broadest aspect, there is provided a Flexible Intermediate Bulk Container (F.I.B.C) comprising primarily one type of non-woven, unlined, plastics material wherein the lifting means comprising carrying straps of the said F.I.B.C. are welded or otherwise fitted to the F.I.B.C. and are so sized, shaped and located around the body of the F.I.B.C. as to provide the body of the F.I.B.C. with additional structural integrity.

[0010] Preferably, each respective pair of lifting means wrap around the underside of the F.I.B.C. in use. Such an arrangement will provide the requisite structural integrity of the F.I.B.C. that would otherwise be lacking in a non-woven F.I.B.C. formed from primarily polyethylene or polypropylene.

[0011] More preferably still, the F.I.B.C. is manufactured from extruded polyethylene. This is particularly advantageous, as extruded polyethylene is cheap to produce and methods of forming such an F.I.B.C. through conventional welding technology is particularly cost ef-

fective, as it is not labour intensive.

[0012] Preferably, the F.I.B.C. is manufactured from extruded polypropylene. This particular polymer complements the use of polyethylene as it is structurally stronger and could be used for, for example, a multi-trip F.I.B.C., whereas, polyethylene would probably be used as a single trip F.I.B.C.

[0013] More preferably still, each respective pair of carrying straps forms a carrying handle. This is particularly illustrated in Figures 2 and 3 of the specific embodiments as such a carrying handle enables a far greater purchase to be exerted on to the F.I.B.C. than mere loose, strips of polymer.

[0014] Preferably, the thickness of the F.I.B.C. is in the range of 1mm - 10mm as this provides the ordinarily weak polyethylene and polypropylene (in terms of structural integrity) with increased structural integrity as a result of the mere fact that the material is thicker than conventional polyethylene or polypropylene used in this field of activity. The thickness of the F.I.B.C. could also be thinner than the range quoted above and could conceivably be as thin as 50 microns.

[0015] Preferably, the F.I.B.C. is non-transparent. This has particular advantages in the transportation of goods that are either light sensitive or commercially sensitive.

[0016] The invention includes within its scope an F.I.B.C. substantially as herein before described with reference to and as illustrated in Figures 2 - 3 of the accompanying diagrams.

Brief Description of the Drawings

[0017] Preferred embodiments of the invention will now be more particularly described, by way of example only, with reference to the accompanying sheets of drawings wherein:

[0018] Figure 1 represents a perspective view of one of the commercially available F.I.B.C.'s sat on a pallet.

[0019] Figure 2 illustrates a perspective view of one embodiment of the present invention.

[0020] Figure 3 illustrates a perspective view of a further embodiment of the present invention.

Description of the Preferred Embodiments

[0021] Throughout this specification, the use of the word "integral" is intended to cover not only something which is formed from the outset as one single-entity component, but also anything which, whilst being assembled from a plurality of initially disparately-produced integers, ends up as one overall and normally non-dismantleable structure.

[0022] Figure 2 illustrates one of the preferred embodiments of an F.I.B.C. generally designated 1 made completely from extruded polyethylene of sufficient uniform thickness to withstand the rigours of day to day use. The F.I.B.C. 1 comprises a body portion 9 that is generally circular about a radial cross-section of its longitudinal axis, the body 9 being formed from a single sheet of flexible extruded polyethylene fabric welded together along its length to form an integral tube.

[0023] The tube 9 then has a base portion 11 and top portion 10 welded to the lower and upper circumferential peripheral edges of the tube 9. The top portion 10 and the base portion 11 respectively have an inlet spout 2 and an outlet spout 3 welded to them, the inlet spout 2 and outlet spout 3 being generally circular and concentric with the longitudinal axis of the tube 9.

[0024] Fitted to the inlet spout 2 and outlet spout 3, are a pair of "tie-off" cords 8 that are integral with both the inlet spout 2 and outlet spout 3 respectively via a welded patch 7. The function of the "tie-off' cords 8 being to seal both ends of the F.I.B.C. 1 during the transportation of a filled F.I.B.C. 1 and to provide a means of accessing the contents of the "Big Bag" when required once the tie-off cords 8 are untied.

[0025] The lifting means 4, 5 comprise a pair of loops 4, 5. As can be seen from Figure 2, the first loop 4, 5 is welded to opposing side walls of the tube 9 and to the base portion 11, each respective strap 5 of the loop 4, 5 passing either side of the outlet spout 3. The tube 9 is then rotated through 90° about its longitudinal axis and the second loop 4, 5 is then welded to the F.I.B.C. 1 in a similar manner as before, each respective strap 5 of the second loop 4, 5 crossing each respective strap 5 of the first loop 4, 5 at substantially right angles across the base portion 11 of the F.I.B.C. 1 thus forming the completed F.I.B.C. 1 that is shown in Figure 2. For the avoidance of doubt, and as shown in Figure 2, the plurality of lifting means 4, 5 are symmetrically disposed around the periphery of the tubular body 9, the four handles 4 and their associated straps 5 in this particular embodiment, being located at consecutive 90° angles about the longitudinal axis of the F.I.B.C. 1.

[0026] All of the welds are plastics welds formed by a technique common in the trade known as "pulse welding" or "hot jaw". The four handles 4 of the loops 4, 5 are the only portions of the lifting means 4, 5 that are not physically or chemically bonded (through welding) to the tube 9 enabling either individuals or cranes to grip the handles, 4 to lift and relocate the position of the F.I.B.C. 1.

[0027] Where each end of the respective handles 4 meet each respective strap 5, a reinforcing piece of welded plastics material (not illustrated) is used to reinforce this "weak" area of the lifting means 4, 5. This piece of welded plastics material is a so-called "anti-peel" device which reduces the risk of accidental or deliberate abuse of the F.I.B.C. 1 brought about by attempts to peel the welded handle 4 and straps 5 from the main tubular body 9 of the F.I.B.C. 1 during its manhandling. Various types of so-called "anti-peel" device are known and the skilled reader is positively directed to European patent number 0 072 168 for more information in this regard.

[0028] Turning now to Figure 3, this shows an alternative embodiment of the present invention. In this particular embodiment, the F.I.B.C. 1 comprises a tube 9 whose radial cross-section along its longitudinal axis is generally square and the tube 9 is formed from four sheets of flexible extruded polypropylene fabric welded together along the longitudinal edges 6 of each respective sheet to form the integral tubular body 9. A base portion and top portion is then welded to the tubular body 9, the base portion in this particular instance being devoid of an outlet spout 3. In Figure 3, the integral inlet spout 2 is shown "tied-off' and sealed via the tie cords 7. In this particular embodiment only one loop 4, 5 can be seen and it is welded to the tubular body 9 and base portion of the bag 1 in a similar fashion to that described for the previous embodiment.

[0029] In both embodiments of the present invention, the lifting means 4, 5 form an integral part of the F.I.B.C. 1 structure and provide the requisite structural integrity to the F.I.B.C. 1 that would otherwise be lacking in a non-woven or for example a plastics coated polyester F.I.B.C. Furthermore, the embodiment illustrated in Figure 2 is opaque to prevent any contents of the F.I.B.C. from being viewed by the public, although light sensitive materials could also be safely carried in this type of F.I.B.C. The embodiment illustrated in Figure 3 however is not opaque.

[0030] Of course, the embodiments that have just been described, have been described by way of example only and a number of modifications can be made without departing from the scope of the invention. For instance, the lifting means 4, 5, need not necessarily solely comprise a number of straps 5 and handles 4 that run substantially parallel to the longitudinal axis of the F.I.B.C. 1. For added structural integrity, a number of equally (or non equally) spaced apart concentric straps (or rings) 5 could run around and be welded wholly or impart to the outer circumferential peripheral edge of the tubular body 9 and the existing vertical lifting means 4, 5. For example, in between the welds linking the top portion 10 and base portion 11 to the tubular body 9, there could be three such "rings" or straps 5 that are welded to and surround the outer surface of the tubular body 9 that are equidistant and essentially transverse to the vertical straps 5 of the lifting means 4, 5 illustrated in Figures 2 and 3 of the embodiment shown in their normal attitude of operation.

[0031] Furthermore, the thickness of the tubular body 9 of the F.I.B.C. 1 need not necessarily be uniform throughout its length. It is well known, for example, that such an F.I.B.C. 1 in its normal attitude of operation will experience greater pressure and stress from its contents towards the lower 1/3 of the F.I.B.C. 1 in its normal attitude of operation than in any other part. Therefore, to again, increase the structural integrity of such an F.I.B.C. 1, the entire lower 1/3 of the F.I.B.C. 1 could be formed from thicker polyethylene or polypropylene than the other 2/3 of the F.I.B.C. Alternatively, the thickness could be tapered throughout the length of the tubular body 9, the thicker portion tending towards the lower end of the F.I.B.C. in its normal attitude of operation.

[0032] Similarly, the lifting means 4, 5 need not necessarily be loops of uniform cross-section and could be tapered in the longitudinal and/or the transverse (the thickness of the strap) lateral direction.

[0033] As it is generally conventional for a "Big Bag" to comprise a closable inlet spout 2 and outlet spout 3, the pre-determined shape of the inlet spout 2 and outlet spout 3 may be circular (as illustrated in Figure 2) or indeed it could be polygonal or square, for example, but in all cases, all the welds of the inlet spout 2 and outlet spout 3 (and all other associated welds 6 involved in the fabrication of the F.I.B.C. 1) ensure that the FIBC 1 remains impervious to liquid. For the transportation of liquids, or particulate matter capable of fluid flow, however, the outlet spout 3 (as shown in Figure 3) will normally be omitted or permanently sealed and a plug or spigot (not illustrated) sealed in position, either in the bottom portion of the F.I.B.C. 1 or at the bottom of the tubular wall 9 thereof, to enable liquid to be poured off.

[0034] Furthermore, instead of the handle 4 forming a loop between two respective welded straps 5, one could imagine the handle 4 simply being a non-welded continuation of each respective strap 5 providing, if we take Figure 2 as an illustrative example, an F.I.B.C. 1 with 8 handles 4. For the avoidance of doubt, the handles 4 in this alternative embodiment would be similar to those illustrated in Figure 2 if each respective handle 4 in Figure 2 was cut in two at its mid-point transverse to the length of the handle 4.

[0035] For the purpose of welding such materials together, hot arc welding, hot air welding, ultrasonic welding as well as the specified pulse welding may be employed instead of the conventional high frequency welding techniques which are usually preferred and the choice of welding technique or a combination of those mentioned above could be selected without further inventive thought by the intended skilled addressee of this specification.

[0036] In addition, the means of fitting the straps 5 to the tubular body 9 of the F.I.B.C. 1 need not be through the use of welds. For example, a strap 5 comprising an adhesive layer on one face, that face being fitted with a removable face-to-face mating strip of material can be envisaged. With such an arrangement, the removable strip would first be peeled off the strap 5 to reveal the adhesive layer and the adhesive layer would then be placed onto the tubular body 9 effectively "gluing" the strap 5 into place.

[0037] Of course, a peelable or otherwise removable strip may not be necessary as surfaces that become "adhesive-like" in nature through the application of, for example, pressure or heat are well known and such technology would be available to the skilled addressee of this specification. The only problem that would need to be overcome is that of ensuring which face of the strap

5 was placed onto the tubular body 9 of the F.I.B.C. 1. This could simply be through the use of either a matt finish on one face of the strap 5 and a gloss finish on the other face of the strap 5 or alternatively, one face could be colour-coded.

[0038] An alternative method of forming the tubular body 9 other than that described herein above could be through the direct extrusion of an open ended tube which after extrusion, is cut at substantially right angles to the longitudinal axis of the tube to form the tubular body 9. The base portion 11 and top portion 10 then being welded to the tubular body 9 before the lifting means 4, 5 are fitted to the tubular body 9.

[0039] One could envisage a method of forming such an F.I.B.C. 1 by production line employing the steps just described. Of course, additional steps to fit the inlet spout 2 and outlet spout 3 hand "tie-off' cords 8 and welded patch 7 if one were manufacturing the embodiment illustrated in Figure 2 would also need to be included.

Claims

1. A flexible intermediate bulk container (FIBC) comprising primarily one type of non-woven, un-lined, plastics material and lifting means, characterised in that the lifting means comprises carrying straps of the said plastics material that are welded or otherwise fitted to the FIBC, the straps being so sized, shaped and located around the body of the FIBC as to provide the body of the FIBC with additional structural integrity

2. A flexible intermediate bulk container as claimed in claim 1, characterised in that each respective pair of lifting means wrap around the underside of the FIBC in use.

3. A flexible intermediate bulk container as claimed in either claim 1 or claim 2, characterised in that the FIBC is manufactured from extruded polyethylene

4. A flexible intermediate bulk container as claimed in either claim 1 or claim 2, characterised in that the FIBC is manufactured from extruded polypropylene.

5. A flexible intermediate bulk container as claimed in any of the preceding claims characterised in that each respective pair of carrying straps forms a carrying handle.

6. A flexible intermediate bulk container as claimed in any of the proceeding claims, characterised in that the thickness of the FIBC is in the range of 1 mm - 10 mm.

7. A flexible intermediate bulk container as claimed in any of the preceding claims, characterised in that the FIBC is non-transparent.

8. A flexible intermediate bulk container substantially as hereinbefore described with reference to and as illustrated in Figures 2 and 3 of the accompanying diagrams.

Fig 1

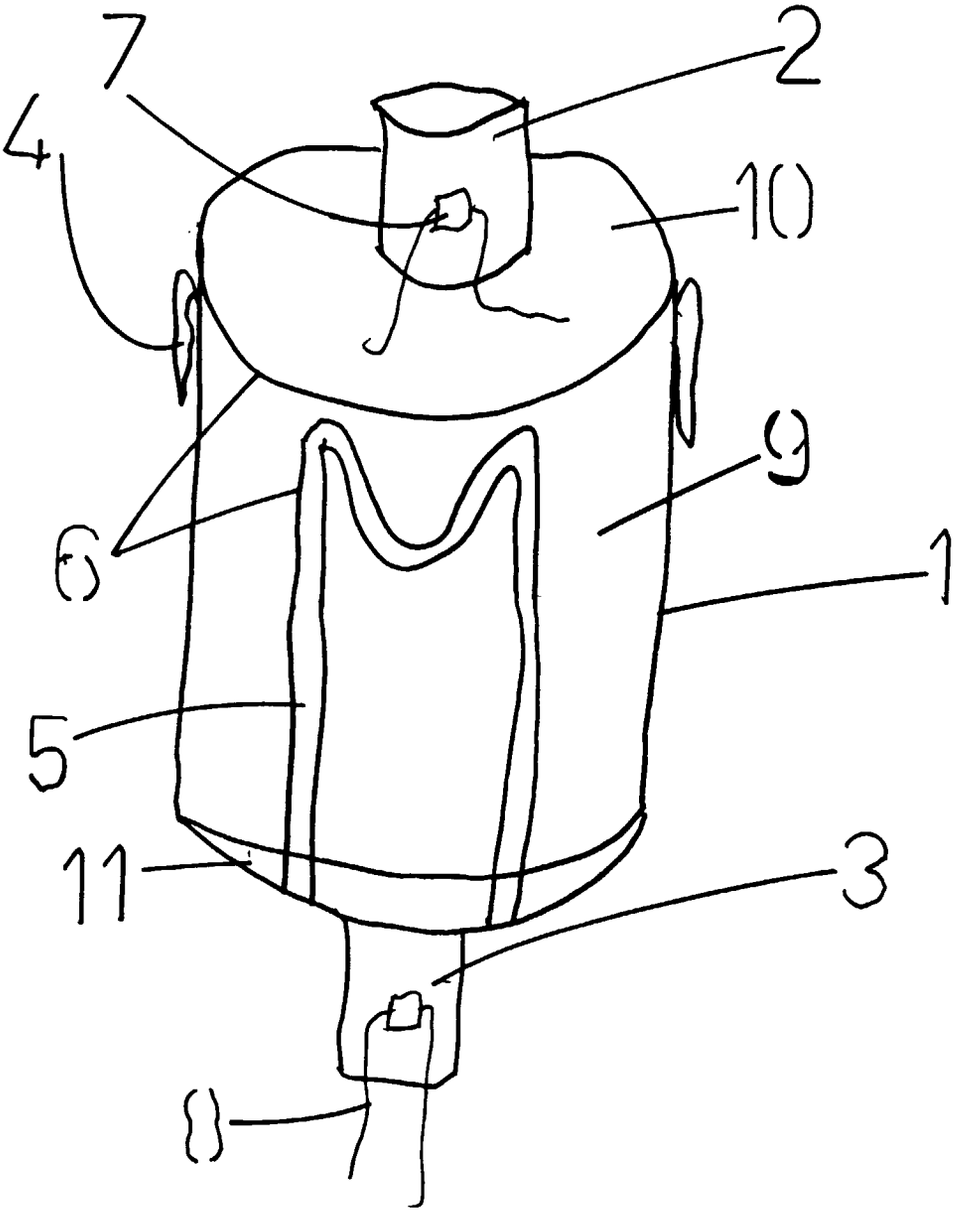

Fig 2

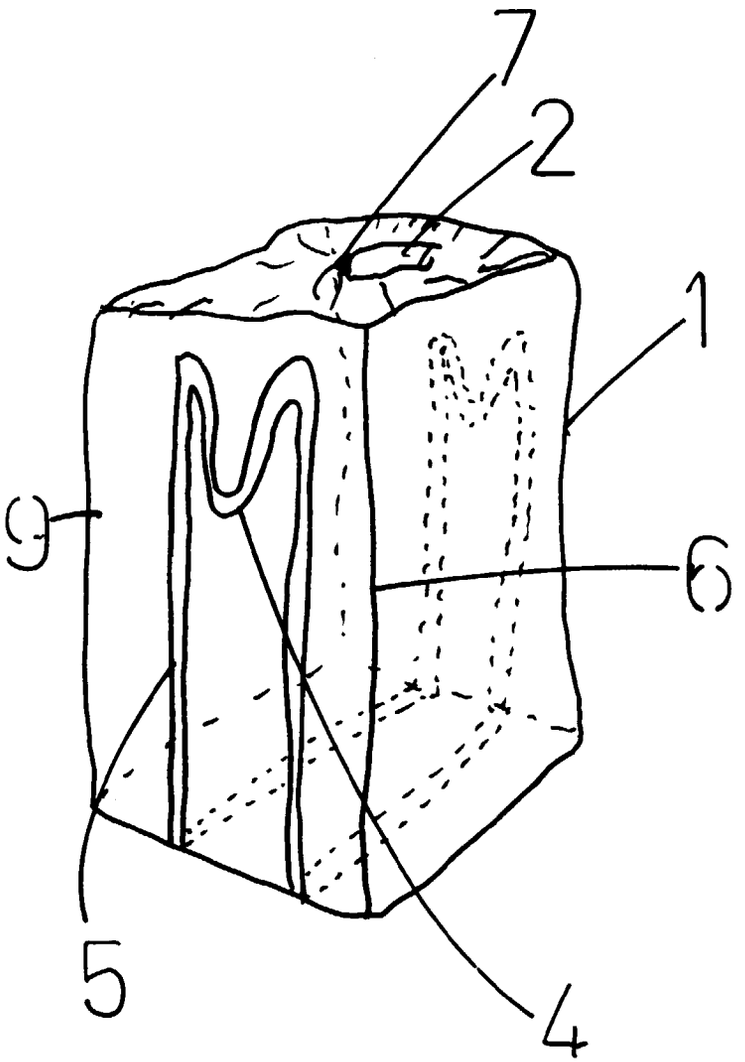

Fig 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 8644

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	EP 0 302 191 A (CUSTOM PACKAGING SYST) 8 February 1989 * column 4, line 12 - line 23 *	1,3,4,6,8	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 January 1999	Van Rolleghem, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 30 8644

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