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54 **Container bag.**

57 A container bag 10 comprises a body of flexible material containing one or more side seams and lifting loops together with a woven inner liner 22. Both the bag body and the liner 22 have conductive threads 24 woven into the fabric. The liner and the body fabric are connected to one another electrically. The IBC so made has excellent resistance to the drop test and at the same time is antistatic and so may be used on hazardous loads.

EP 0 456 328 A2

This invention relates to container bags and in particular relates to container bags for carrying loads in the range of one half to two tonnes and known as intermediate bulk containers (IBC's).

Intermediate bulk containers are increasingly employed in cargo handling and transporting situations, especially for the carriage of particulate or pulverulent material. A typical IBC will be manufactured from a fabric woven from a polyolefin tape and have integral lifting loops. Examples of such containers are described in UK patent numbers 1591091 and 2063816. IBC's have to meet various national and international safety standards, for example it is normal to require a five to one safety ratio, that is an IBC rated at one tonne should not break under loads of less than 5 tonnes.

Another requirement which has been introduced, particularly where the IBC is to carry hazardous goods, is the drop test. In this a loaded IBC is dropped from various heights such as 1.2 metres and in order to pass the test the IBC should not burst to cause product spillage under such conditions. The method of manufacturing many IBC's involves one or more side seams and such constructions may not meet the drop test. Our European patent application number 0332333 discloses an IBC which comprises a body flexible material containing one or more side seams and lifting loops characterised in that the body is provided with a circular woven inner lining. The use of a liner of a circular woven material enables the IBC to withstand the most severe of the drop tests with ease since the liner absorbs most of the force involved and, being circular woven, has no side seams but has an uninterrupted circular weft which is believed to contribute to its resistance to the forces involved in the drop test.

However, in certain end uses, it is desirable that an IBC should exhibit a degree of static conductivity so as to reduce the risk of explosion as a result of build up of electro static charge.

The invention seeks to provide a form of IBC in accordance with our above European patent publication improved in respect of static performance.

According to the present invention there is provided a container bag which comprises a body of flexible material containing one or more side seams and lifting loops and, in addition, provided with a woven inner lining, characterised in that both the body and the lining have conductive threads woven into the fabric and in that the liner and the body fabric are connected to one another electrically.

The use of conductive threads in an IBC fabric has been proposed previously. However, the use of conductive threads both in the IBC body fabric and liner, with the two being electrically connected together, represents a departure from previous prac-

tice and which produces the advantageous result that a bag meeting the drop test for hazardous chemicals can now be made with static conductors properties.

As well as being electrically attached, the liner may be mechanically attached to the IBC e.g. by stitching or adhesive and preferably it is so, at least at the top edge thereof since if it is not mechanically attached there is a danger that it will slip down inside the IBC before or during filling. The liner need have no base portion since it is the sides of the bag which are subject to the greatest forces during a drop test. The use of the liner additionally strengthens the bag in other ways, and increases its resistance to spillage, seepage and the like.

The fabric from which the IBC of the invention, and the liner, are formed, may be conventional fabrics for use in this type of container bag and may be woven from polyethylene or polypropylene tape yarns. Preferably, however, at least the side walls of the container bag are made from a fabric having reinforced zones or areas of interwoven reinforcing yarns, for example as disclosed in our UK patent no. 1591091. Where such reinforcing areas are provided then they may be as described in that patent and may be formed of interwoven threads of high tensile strength reinforcing yarns such as polyamide, polyester or twisted or fibrillated polypropylene. The lifting loops are attached to such reinforced areas. Alternatively, the IBC may be "underslung" where the lifting loops extend down the side walls and under the base of the container body. In either case the lifting loops will preferably be of a woven webbing of synthetic yarns, for instance of the type used for car seat belts, for example polyamide or polyester yarns, or may be ropes or hawsers of suitable strength. In addition, the fabric of the IBC will have interwoven conductive threads, for example threads of spun metallised yarn woven into the body fabric at regular intervals. This yarn will "give" with the body fabric under the stresses of filling or handling whereas metallic wires might break. The liner is also provided with such conductive yarns at spaced intervals.

It is preferred that four lifting loops are provided spaced across the corners of the container bag. The corners will normally be defined by side seams. This construction of bag is particularly preferred since it is roughly cubic in shape when filled and therefore stacks well. The container bag of the invention may be fitted with a top and/or a filling spout, as well as a discharge spout as is conventional in the IBC art.

In addition the IBC of the invention has an electrical connection between its body fabric and inner lining. This may be achieved in various ways.

In one preferred embodiment the inner and outer are connected together by normal sewing thread but a braid of metallic material, for example copper or stainless steel, is sandwiched between the two thus providing an electrical connection along the sewn seam. Alternatively, normal sewing may be employed using a conductive sewing thread. In either event the inner and outer are connected electrically together so that static build up arising on either the inner or the outer fabric is discharged by the conductive yarns. In addition, a length of conductive wire or braid may be provided to form an earth connection, preferably from one of the bottom corners of the bag. The conductive braid is also preferably employed around the bottom seams of the bag and up at least one side seam so as to ensure that there is continuous circuit. Using this form of construction resistivities of less than 10^6 Ohms (the generally accepted standard for "anti-static") are easily attained.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic elevational view of the outer fabric of an IBC in accordance with the invention;

Figure 2 is a similar view of a liner for use with the IBC of figure 1;

Figure 3 is a similar view of the bag with the liner in place; and

Figure 4 illustrates the electrical and mechanical connections between the two.

Referring to the drawing, an IBC generally designated 10 has side walls 12 and a base 14. The side walls are attached to one another by stitched seams 16. Across each corner is a lifting loop 18 stitched to its respective side wall 12 at 20.

A liner 22 is cut from a roll of tubular woven polyethylene or polypropylene cloth so that the liner has no side seams, but is open top and bottom. The circumference of the liner 22 should be slightly less than that of the four sides of the bag 10.

The bag sides 12 are of a fabric having spaced conductive threads e.g. spun metallised yarns, 24 running up its vertical length. Similarly, the liner 22 has conductive yarns 24 spaced apart. The yarns 24 in the liner may be spaced in the warp direction or the weft direction or both (as illustrated).

The inner or liner 22 is inserted into the bag 10 and the two are mechanically and electrically joined together. This may be done as illustrated by stitching along the top seams 26 either using a normal sewing thread and sandwiching a conductive metal braid, e.g. a stainless steel or copper braid, between the liner and the fabric whereby to ensure electrical connection as well as mechanical connection between the two. Alternatively, a normal

sewing operation may be carried out employing a conductive thread. In addition at least one side seam e.g. 28, connects the top perimeter to the bottom perimeter 30 where the seam is made in the same manner as described with relation to the top perimeter. Additionally one or more earths 32,34 comprising loops of conductive braid are left protruding from the exterior of the IBC to provide an earth connection if necessary or desirable in given circumstances.

A top may be attached to the bag as is conventional in this field and if so the top of the liner can be attached to the top of the bag walls 12 in the same sewing operation in which the liner is attached to the side walls 12. A discharge spout may also be attached to the base as is conventional in the art.

When completed, the IBC of the invention may be used in a conventional manner for the storage and transportation of particulate materials. However when subjected to a drop test the performance of the IBC of the invention is considerably better than that of an unlined IBC having side seams in that the bag of the invention passes the drop test whereas the unlined bag does not. The bag may be used therefore in the storage and transport of hazardous goods. In addition, the static performance ensures that the conductivity is less than 10^6 Ohms thereby preventing the build up of static electricity which may cause a spark and lead to explosions in sensitive areas, for example in the paint industry.

Claims

1. A container bag which comprises a body of flexible material containing one or more side seams and lifting loops and, in addition, provided with a woven inner lining, characterised in that both the body and the lining have conductive threads woven into the fabric and that the liner and the body fabric are connected to one another electrically.
2. A bag as claimed in claim 1 in which the liner is mechanically attached to the bag body, e.g. by stitching or adhesive.
3. A bag as claimed in claim 2 in which the attachment is at least the top edge thereof.
4. A bag as claimed in any claims 1 to 3 in which the liner has no base portion.
5. A bag as claimed in any claims 1 to 4 in which the body fabric is woven from polyethylene or polypropylene tape yarns.

6. A bag as claimed in claim 5 in which at least the side walls of the bag body are made from a fabric having reinforced zones or areas of interwoven reinforcing yarns. 5
7. A bag as claimed in any of claims 1 to 6 in which the fabric of the body has interwoven conductive threads, for example threads of spun metallised yarn, woven into the body fabric at regular intervals. 10
8. A bag as claimed in any of claims 1 to 7 in which the liner is provided with interwoven conductive threads, for example of spun metallised yarn, woven into the fabric thereof at spaced intervals. 15
9. A bag as claimed in any of claims 1 to 8 in which the body and liner are connected together by normal sewing thread and a braid of metallic material, for example copper or stainless steel, is sandwiched between the two thereby providing an electrical connection along the sewn seam. 20
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10. A bag as claimed in any of claims 1 to 8 in which the body and liner are connected together by means of a conductive sewing thread. 30
11. A bag as claimed in any of claims 1 to 10 in which an additional conductive wire or braid is provided to form an earth connection from one of the bottom corners of the bag. 35
12. A bag as claimed in any of claims 1 to 11 in which a conductive braid is employed around the bottom seams of the bag and up at least one side seam whereby to ensure a continuous circuit. 40
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FIG. 1

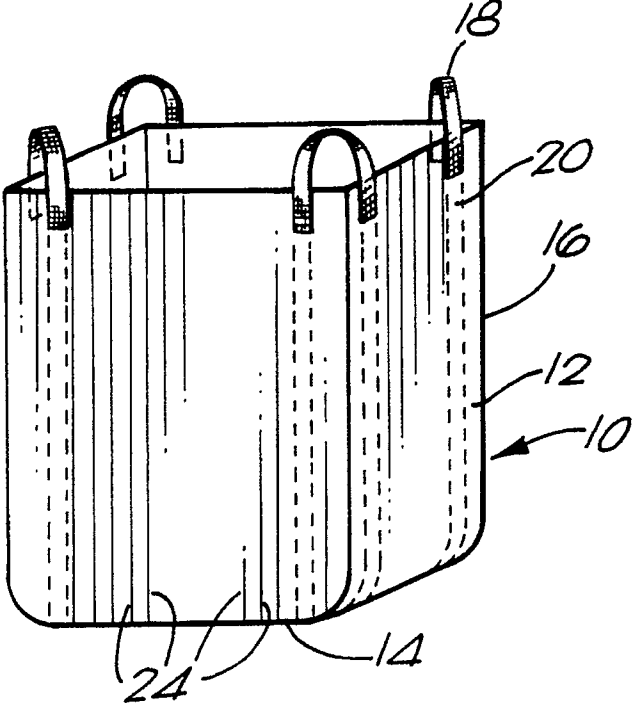


FIG. 2

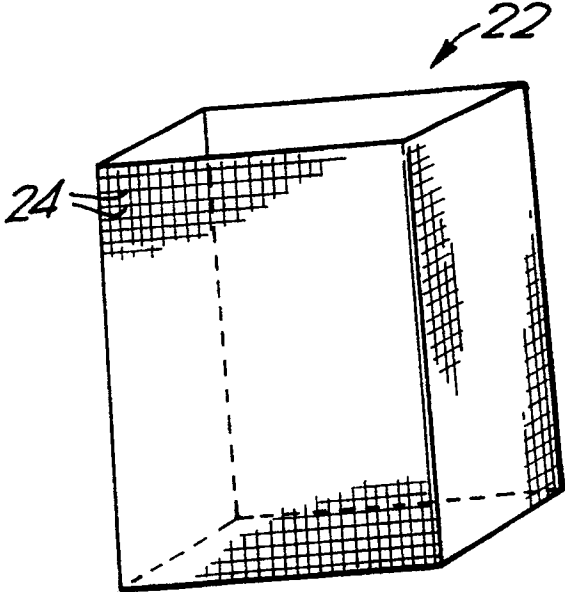


FIG. 3

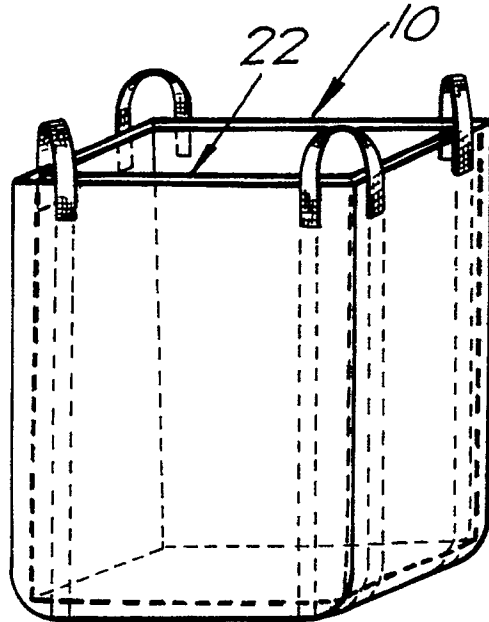


FIG. 4

