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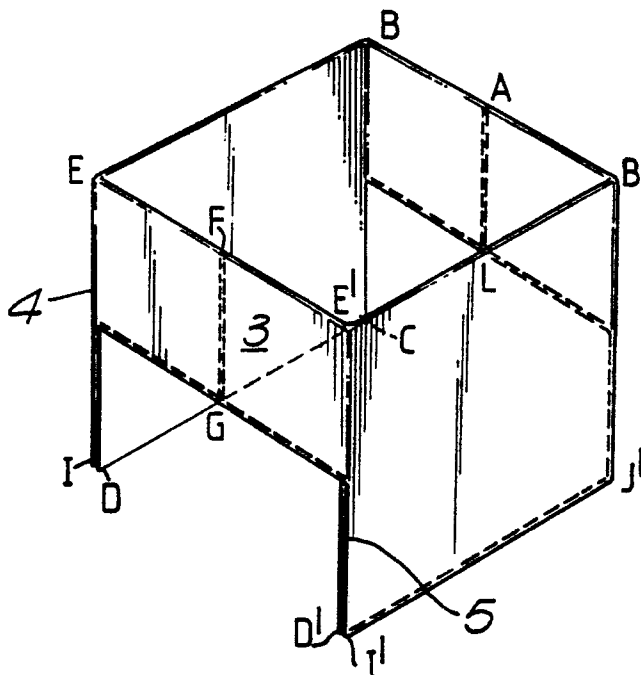
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(54) Intermediate bulk containers.

(57) Intermediate bulk containers formed of one piece of tubular material. They have double walled portions in which lifting loops can be inserted.

Fig. 4.



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Intermediate bulk containers

This invention relates to intermediate bulk containers (IBC's), and in particular to flexible intermediate bulk containers. Such flexible containers, which typically have a capacity of 0.5 to 3 m³, are generally in the form of sacks or bags and are widely used for the packaging, for transport and storage, of particulate materials, for example chemicals and fertilisers in bulk quantities. Typically when filled a flexible container has a cylindrical configuration of diameter 0.8 to 1.5 m and a height of 0.5 to 1.5 m.

In EP-A-80839 there is described an arrangement consisting of a flexible intermediate bulk container and a cradle therefor to support outer portions of the base of the intermediate bulk container above the surface on which the base rests. The cradle enables the tines of a fork-lift truck to be inserted beneath the outer portions of the base of the intermediate bulk container so that the latter, preferably together with the cradle, can be lifted. The flexible intermediate bulk container of the present invention need not be used in conjunction with such a cradle, but it is particularly beneficial when it is so used. By the use of an arrangement of flexible intermediate bulk containers and cradles it is possible to stack several cradle/filled bag combinations one above another.

Flexible intermediate bulk containers are widely used in industry and the market for these runs into millions of pounds. Accordingly there is a constant desire to simplify the manufacture of the containers in order to achieve a more efficient use of labour and to achieve as high a degree of automation as possible in the manufacturing process for accuracy and repeatability. Furthermore there is a continual desire to minimise wastage of material in the cutting and preparation of the containers, thereby reducing the costs.

It is a problem of the art to simplify the manufacture of containers and to minimise material wastage whilst maintaining the necessary properties of the container. A flexible intermediate bulk container has to be sufficiently strong to carry typically 0.5 to 3 m³ of material. If stacked, as preferred, the containers have to withstand considerable hoop stresses to enable a stable stack to be made. In addition it is generally desirable that the container, when used for fertiliser or the like, is impervious in order to protect the container contents from the weather.

Accordingly the present invention provides a flexible intermediate bulk container comprising a single piece of tubular material having a side wall of generally cylindrical configuration, when filled, said side wall having at least two double-walled

portions, having single walled portions spaced between said double-walled portions, at least two of said double-walled portions having a flap extension, said two or more flap extensions being joined to form a base to said container.

Preferably there are two diametrically opposed double-walled portions each of which comprises about a quarter of the cylindrical side wall, that is a 90° segment. Each of said double-walled portions has an integral flap extension. The two flap extensions are fastened together so as to form a base to the container. Conveniently the two flap extensions are fastened together at a region equidistant from the respective side walls from which they integrally extend. Conveniently the flap extensions extend from both the inner and outer walls of each of said double-walled portions so that the base of the container is double-walled.

It can be seen that as the container is formed of a single piece of tubular material, the construction of the present invention requires only one region of fastening. This is advantageous because the cost of fastening and the labour involved is a significant factor in the economics of the manufacture of intermediate bulk containers.

The fastening may be in any convenient way, for example stitching with a suitable thread, and/or using a layer, line or spots of adhesive and/or an adhesive tape or patch.

The base to the container is formed by fastening; with, in a preferred embodiment, about half of said base connected to the side wall by being integrally formed. Therefore about half of the said base is not connected to the side wall thus forming diametrically opposite gaps. In use the side wall assumes a generally cylindrical configuration and the base of the container assumes an approximate square configuration. The diametrically opposite gaps between the base and side wall can be closed by fastening means. This is not preferred as this introduces two further operations into the manufacture of the container. In a preferred aspect the gaps are not closed; the particulate material being stored or transported being held in an inner liner. Conveniently this inner liner is of a plastics material and, of course, the liner prevents particulate material from escaping through the gaps between the base and side wall of the container. The inner liner need not be very strong as the outer tubular material forming the container withstands the stresses imposed upon the system. Preferably the inner liner is fastened to the container, for example by means of an adhesive, during the manufacture in

order to ensure accurate positioning of the liner. The fastening need not be overall; indeed the liner may be simply held in place by a line, or spots, of adhesive.

The tubular material is preferably a fabric woven from fibres or tapes of a natural or synthetic material, for example of fabric weight 100 to 200 g.m⁻², such as a polyolefin tape, for example a high density polyethylene or oriented polypropylene. Alternatively the tubular material can be a film of plastics material, preferably an oriented film. In the latter case the direction of maximum orientation in the film should be parallel to the hoop direction of the container.

The inner liner, if present, is preferably an impermeable film of a plastics material. It need not be very tough but is preferably of waterproof material.

As has been previously mentioned the flexible intermediate bulk containers of this invention can be used with a cradle. The supporting cradle generally comprises a pair of supporting members disposed beneath the base of the container so that the container can sag into the space between the supporting members to a depth substantially equal to the height of the cradle, the supporting members being connected so that the maximum spacing between said supporting members, and their height, is sufficient to permit the interaction of the times of a fork-lift truck with the supporting members to permit lifting.

When the container is filled and resting on a cradle as aforesaid, the bulk of the weight of the container contents, and of any container/cradle combinations stacked on top thereof, is borne through the base of the container directly on to the surface on which the container and cradle are resting. However, upon lifting the container either alone or together with the cradle, by fork-lift truck tines disposed under the outer portion of the base of the container, the bulk of the load is transmitted directly to the parts of the base supported by the fork-lift truck tines as a result of frictional forces between the particles of the material within the container.

In general the containers of the present invention are designed to be handled by means of the supporting cradle. However, in some cases the end user may wish to lift the container from the supporting cradle prior to, or during, emptying. Such lifting can be accomplished by direct lifting of the double-walled portions of container, where of course there is greater strength, for example using conventional lifting gear such as clamps or the like. However in a preferred aspect of this invention a

separate web or rope may be inserted into the double walled sections. Such a web or rope is accessible to the end user in the single-walled regions and may be lifted by lifting gear.

In another aspect of this invention, suitably the container has at least one area having reinforcing threads woven in it. More suitably there is a plurality of such areas. These areas having reinforcing threads provide additional strength and facilitate the lifting from above of the container by the end-user's lifting gear. Conveniently these areas having reinforcing threads are provided in the form of bands running in the warp direction of the sleeve, that is from top to bottom.

In the case wherein there is a separate web or rope inserted in the partially double-walled embodiment, the regions of greatest stress on lifting are at the ends of each double-walled portion. Therefore it is preferred that the bands of reinforcing threads are positioned to strengthen these regions, acting as a "rip-stop".

The container is made from a single piece of tubular material so that the bottom of the container also has bands of reinforcing threads.

The reinforcing threads are conveniently of any synthetic polymer, such as polyester, polyolefin or polyamide.

By way of Example only, one embodiment of the invention is illustrated by reference to the accompanying drawings wherein

Figure 1 is a side view of a length of tubular material,

Figure 2 is a perspective view of the same length of tubular material,

Figure 3 is a schematic view of a partly constructed container,

Figure 4 is a perspective view of the construction of Figure 3,

Figure 5 is a plan view of a constructed container,

Figure 6 shows detail of an embodiment incorporating lifting loops,

Figures 7 to 10 show the stages in formation of an inner liner,

Figure 11 shows a container in combination with an inner liner and supported by a cradle,

Figure 12 is a perspective view of a cradle, and

Figure 13 is a side view of a length of tubular material showing how a number of containers can be cut.

In Figure 1 there is shown a length of tubular woven polypropylene 1 having bands 2 of reinforcing threads running in the warp direction. The single piece of tubular material is shown in perspective in Figure 2 with the reinforcing threads omitted for greater clarity. The tubular material is cut along lines AB, BC, CD, DE, EF, GH, HI, IJ, JK, KL, AB',

B'C', C'D', D'E', E'F, GH', H'I', I'J', J'K', and K'L. This is a simple operation that is readily performed automatically. The relative proportions in which these cuts are made can vary considerably, for instance in Figure 2, BC is shown as equal to BJ but it can be equal to or greater than BJ.

To form a container according to the present invention the portion BCDE is folded inwards about dotted line BE so that edge CD meets edge JI. Similarly portion B'C'D'E' is folded inwards about line B'E' so that edge C'D' meets J'I'. Figure 3 shows the configuration thus achieved. Figure 4 shows the same configuration when viewed from an angle. Thus it can be clearly seen that in the side wall 3 there are two double-walled portions, 4,5. Edges JI, DC, D'C' and J'I' are folded inwards to meet at points G and L equidistant from side wall portions 4,5 and are fastened by stitching to result in the configuration shown in plan view in Figure 5 where stitching 6 fastens the edges. The side wall 3 assumes a slightly rounded configuration leaving gaps 7a, 7b at G and L between the said side-wall and the newly formed container base. As stated hereinbefore these gaps can be closed by stitching, glueing, taping or any other means.

Figure 6 shows the detail of the upper part of a container provided with two lifting loops. Each of the loops 8a, 8b is threaded through one double walled portion of the side wall. Sufficient material is provided so that both loops are able to be lifted by the same hook. The loops may be of any conventional material and conveniently a length of said webbing is threaded through the double-walled portion, cut off and the two ends of the webbing are stitched together to form a continuous loop.

As stated hereinbefore it is preferred to use the container of the present invention in combination with the inner liner, and is essential when the gaps 7a, 7b have not been closed. The inner liner may be any suitable liner known in the IBC art, particularly suitable liners include those of EP-A-80839. Thus the liner is conveniently formed from a lay-flat tube of impervious plastics film, eg polyethylene of thickness 200 μ m by folding operations as shown in Figures 7 to 10, to give a base region of generally hexagonal configuration QRSTUV in the lay-flat state. The base is formed in conventional manner by folding corners Y, Z of the bottom of the tube along lines QW, QX and TW, TX respectively into the lay-flat tube to give the configuration shown in Figure 8. The upper triangular flap QWT is folded upwards about line QT to give the configuration of Figure 9. The corners W, X are then folded about lines RS and UV respectively towards each other to give the hexagonal configuration of Figure 10. This configuration can then be secured by adhesion.

As hereinbefore stated the containers of this invention are usually used in conjunction with the supporting cradle. Suitable cradles are those disclosed in EP-A-80839. In Figure 11 there is shown an embodiment according to the present invention comprising a container having double-walled portions 4,5, sealed together at 18, a liner 9, filled with a particulate material, the container having a double-walled base supported by a surface 10. The liner 9 is fastened to the container in conventional manner for example by a line of spots 12a, 12b of a hot melt adhesive. The outer portions of the container base are supported from surface 10 by a wooden cradle 11, shown in perspective in Figure 12. The dimensions of the cradle are such that the tines of a forklift truck can be inserted in the openings 13a, 13b of the cradle.

The intermediate bulk container is preferably filled whilst positioned on the cradle as this enables the requisite amount of 'sag' to be achieved, and by using conventional vibratory filling devices the top of the particulate filling material can be rendered substantially flat. It may then be advantageous, after filling to substantially eliminate the air within the liner and to fold down the top of the liner material.

When the IBC and cradle are lifted, the bulk of the weight is transmitted directly to the fork-lift truck tines by inter-particle reaction. Only a relatively small proportion of the load i.e. that corresponding approximately to the hatched area 14 has to be transmitted to the fork-lift tines via tensile forces in the material of the base of the container. The size of the hatched area 14 for any given intermediate bulk container/cradle combination will depend on the nature of the particulate material within the IBC.

In a particularly beneficial aspect the length of tubular material 1, as partially depicted in Figure 1, can be cut to form a number of containers without any wastage of material. This is shown in Figure 13 wherein 15, 16 and 17 represent the material to form three containers of equal dimensions. Container 15 is cut out as described in relation to Figure 1; the tubular material is rotated through 90° about the cylindrical axis and container 16 is cut out (this container 16 is upside down in relation to container 15, but of course this makes no difference as the cut material is presented to the folding machine in the desired orientation); the tubular material is again rotated through 90° and the container 17 is cut out. It can be seen that there is no wastage of material. In Figure 13, section A₁, A₂, A₃ and A₄ are corresponding sections in the 4 containers. As can be seen A₁ and A₄ are upside down with respect to A₂ and A₃. In containers

formed in this fashion the reinforcing bands as shown in 2 on Figure 1 could not be present. Instead they would be positioned as shown partially in Figure 13.

more reinforcement areas, at least one such area being in the form of a band running in the warp direction of the tubular material.

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Claims

1. A flexible intermediate bulk container comprising a single piece of tubular material having a side wall of generally cylindrical configuration, when filled, said side wall having at least two double walled portions, having single walled portions spaced between said double walled portions, at least two of said double walled portions having a flap extension, said two or more flap extensions being joined to form a base to said container.

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2. A container according to claim 1 wherein there are two diametrically opposed double walled portions each of which comprises substantially a 90° segment of the cylindrical side wall and each of which has an integral flap extension.

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3. A container according to claim 2 wherein the said two flap extensions are fastened together at a region equidistant from the respective side walls from which they integrally extend.

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4. A container according to any one of the preceding claims wherein the flap extensions extend from both the inner and outer walls of each of said double walled portions so that the base of the container is double walled.

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5. A container according to any one of the preceding claims wherein the flap extensions are fastened or joined together so as to form said base to said container by means of suitable thread, and/or by the use of a layer, line of adhesive, and/or by the use of an adhesive tape or patch.

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6. A container according to any one of the preceding claims which is provided with an inner liner.

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7. A container according to claim 6, wherein the liner is formed from an impermeable film of waterproof plastics material.

8. A container according to any one of the preceding claims wherein the tubular material is a fabric woven from fibres or tapes of a natural or synthetic material or from a film of plastics material.

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9. A container according to any one of the preceding claims wherein a web or rope is inserted into the double walled portions to provide a means of lifting said bulk container.

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10. A container according to any one of the preceding claims wherein reinforcing threads are woven into the tubular material to provide one or

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Fig. 1.

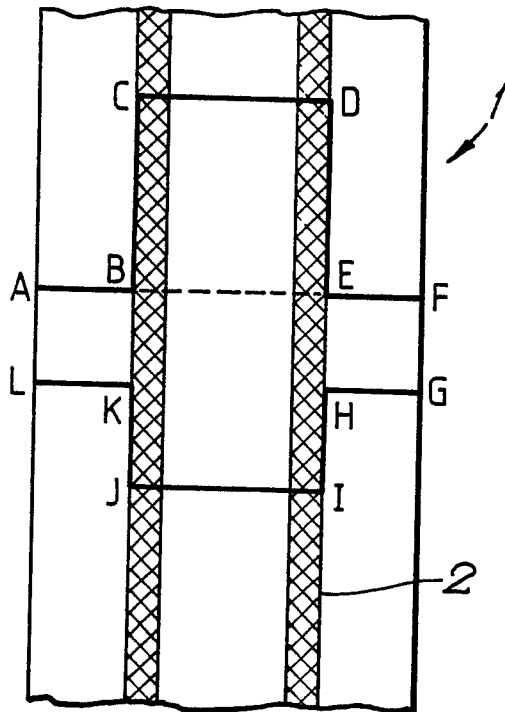


Fig. 2.

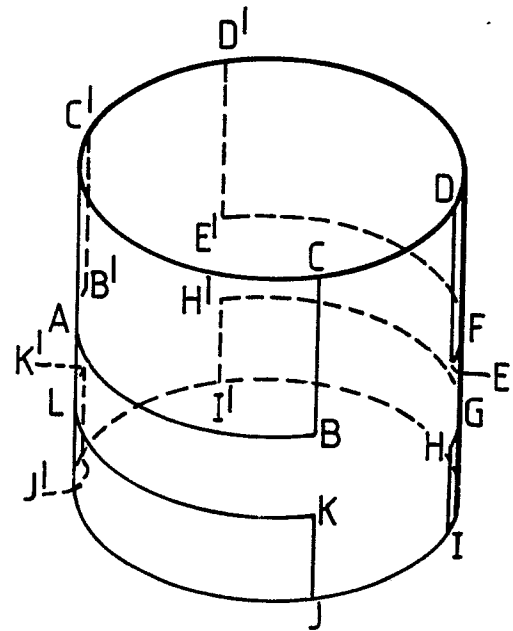


Fig. 3.

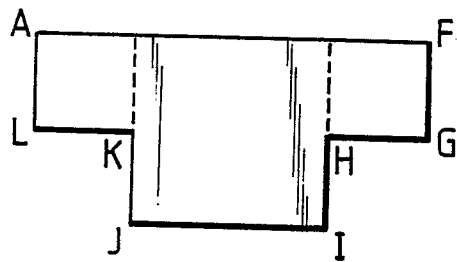


Fig. 4.

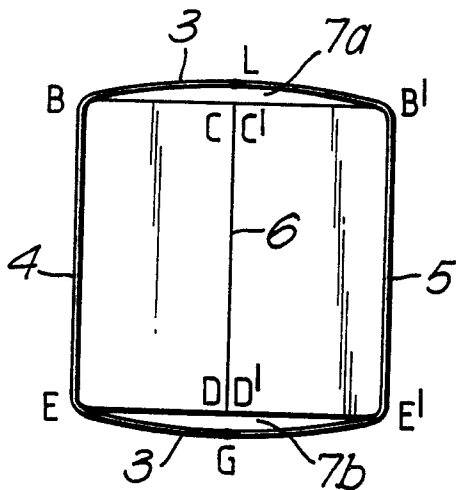
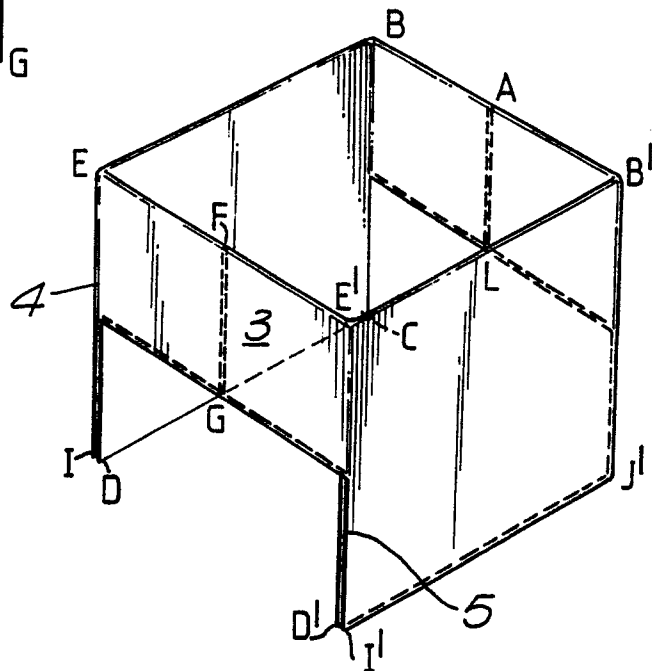


Fig. 5.

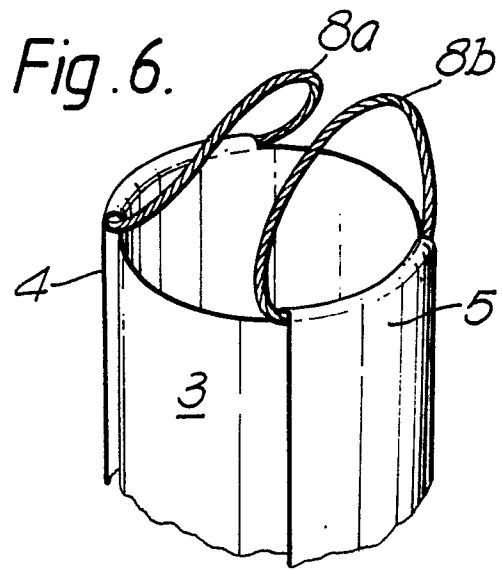


Fig. 7.

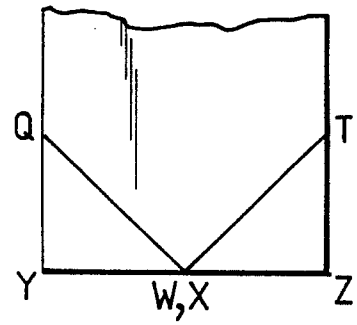


Fig. 8.

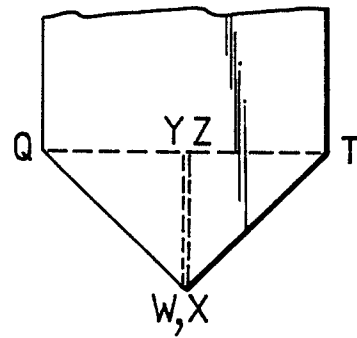


Fig. 9.

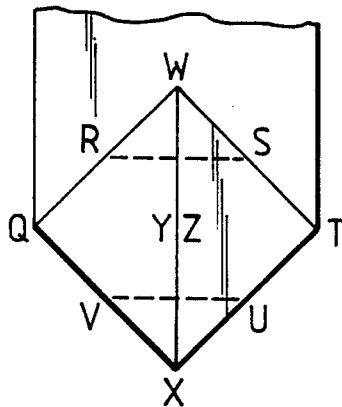


Fig. 13.

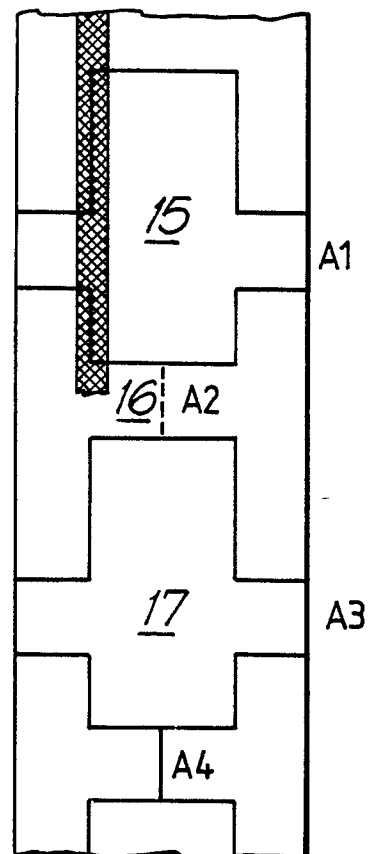


Fig. 10.

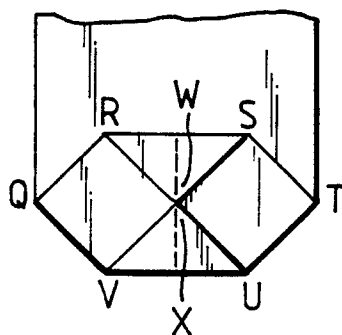


Fig. 11.

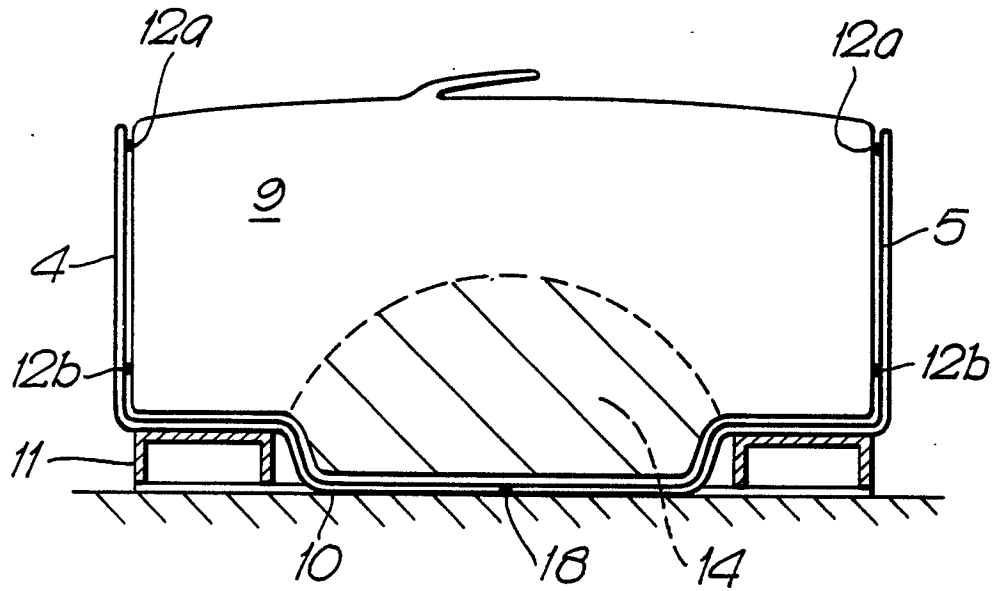


Fig. 12.

