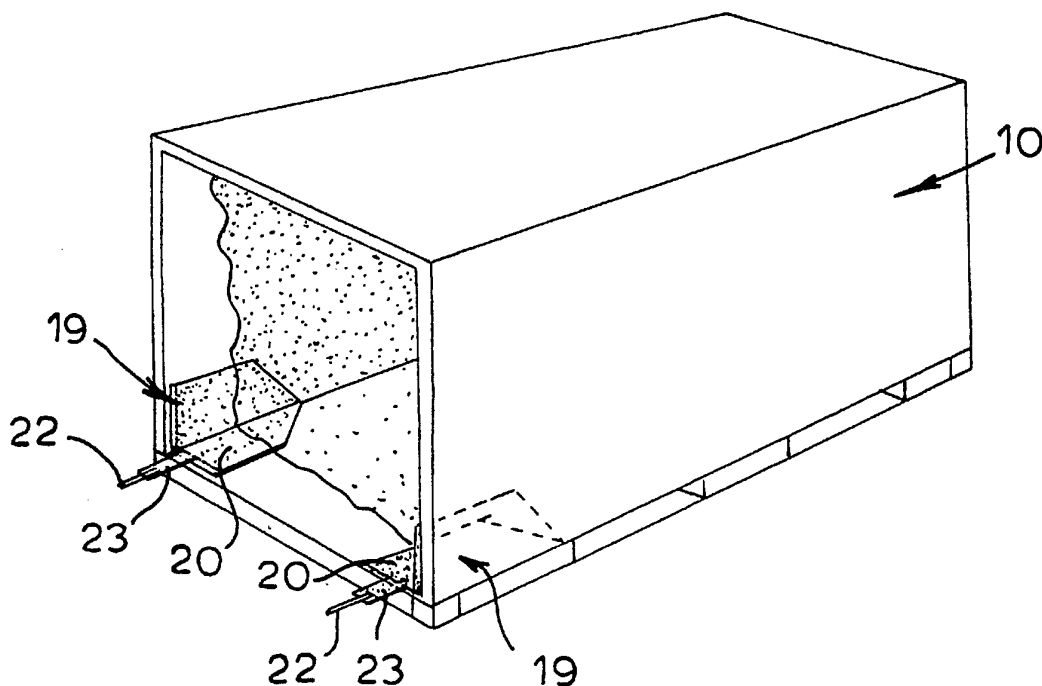




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(54) Title: CONTAINER LINERS



(57) Abstract

A flexible liner (12) for use in a method of discharging a container (10) fitted with the liner (12) has at least one inflatable bladder (20) disposed between a wall of the container (10) and the interior of the liner (12), whereby an increase in the bladder volume upon inflating that bladder (20) moves contained product inwardly away from the container wall to encourage that product to run towards the discharge. Two bladders (20) may be provided at/or adjacent each lower corner region (19) at the discharge end (14) of the liner (12) and are inflated during the last stage of product discharge.

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CONTAINER LINERS

This invention concerns flexible liners for containers, for use in the bulk transport of flowable particulate products. In particular, this invention relates to a method of discharging a bulk-transport container having a flexible liner, and to a flexible liner for a bulk transport container. The invention further relates to a container whenever fitted with such a liner.

Containers of standardised sizes are ever more being used for the transport of products. The products may be packaged appropriately and then the packages loaded into the container, or - depending upon the nature of the products - those products may be loaded directly into the container. In order to allow the direct loading of particulate products, such as powders, granules or the like, it is known to fit within a container a flexible liner for example of polyethylene which liner is provided with an inlet accessible when the liner has been fitted into a container, whereby a bulk product may be loaded into the liner for transport. A wide variety of particulate materials may be carried in bulk in this way, and in view of the isolation of the product from the ambient, even food products may conveniently be transported.

The conventional way of discharging a powder-like material carried in a liner within a container is to allow the material to run under gravity out of a discharge provided at one end of the liner, by tipping the container. The wall of the container in the region of the discharge may be provided with an aperture having a door which, when opened, gives access to the discharge of the liner. In an alternative arrangement, at the end of the container provided with the conventional doors, a structure is provided within the

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container to retain the liner in position, the structure having an aperture giving access to the discharge. When the container is to be discharged, the container doors are opened and then access gained to the discharge through the aperture in the structure.

For some designs of liner, the discharge comprises a tube communicating with the interior of the liner and which tube is normally closed off, but which may be opened in order to allow product to run out of the liner. In the alternative, a funnel-like arrangement may be offered to the liner and the liner is then slit to allow product to run out of the liner into the funnel-like arrangement. The liner may be pre-slit, during manufacture, and the slit held closed with adhesive tape, which tape may be ripped off to open the slit, when the liner is to be discharged.

At the completion of a discharge operation, after the container has been tipped and product has been allowed to run out of the liner discharge, there is a tendency for the product to accumulate in the lower corner regions of the liner. Significant quantities of product may remain in the liner and steps may have to be taken to ensure the emptying of this material. For example, not infrequently an operator has to thrust a suitable implement into the container, between the liner and the container wall, physically to man-handle the liner to move product remaining within the liner, towards the discharge.

In a case where a structure is provided within the container at the discharge end, it is known to mount triangular fillets in the lower corner regions of the container, to minimise the likelihood of product accumulating in that area during a discharge operation. Despite that and depending upon the angle of repose of the product, significant quantities of product may still remain in the liner.

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It is a principal aim of the present invention to provide both a method of discharging a container having a liner and also a liner for the bulk transport of products, arranged to minimise the likelihood of product remaining within the liner, at the completion of a discharge operation.

According to one aspect of the present invention, there is provided a method of discharging a bulk-transport container having a flexible internal liner by tipping the container to cause transported product to run under gravity out of a discharge at one end thereof, in which method air is supplied under pressure to at least one inflatable bladder disposed between a wall of the container and the interior of the liner, whereby the increase in the bladder volume moves contained product inwardly away from the container wall to encourage that product to run towards the discharge.

According to a second aspect of the present invention, there is provided a flexible liner for a bulk transport container and including a discharge at one end, means defining at least one inflatable bladder at or adjacent said one end of the liner, and means to permit the introduction of air under pressure to the bladder to increase the volume thereof when the liner is in use within a container for the transport of product.

It will be appreciated that by employing a liner of this invention, and performing a discharge operation by the method of this invention, product may be encouraged to move towards the liner discharge when the container has been tipped. In this way, the likelihood of product remaining within the liner at the completion of a discharge operation, in the lower corner regions of the liner, is much reduced. Preliminary experiments have shown that by appropriate configuration of the bladder, and in particular by providing at least two

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bladders, one on each side of the liner and both disposed at or adjacent said one end of the liner, only very small quantities - if any - of product are likely to remain within the liner at the completion of a discharge operation.

The liner may be essentially conventional in form, and so manufactured from a plastics (such as polyethylene) film or sheet material of an appropriate gauge, having regard to the intended use of the liner. The plastics film may be tubular, to facilitate manufacture of the liner. The liner may include suspension arrangements to permit it to be fitted within a container, and also an anchoring arrangement for at least the end of the liner opposed to the discharge end, to ensure that the liner remains in the required position during a discharge operation.

The liner may have a discharge in the form of a tube which is joined to a wall of the liner at a lower part thereof around an opening therein, and which tube is normally closed by being folded, until the liner is to be emptied. The tube may flare to some extent in the region of its junction with the wall of the liner, so as to define a funnel-like formation. Another possibility is for a substantially rigid tube or funnel to be offered to a lower part of a wall of the liner at the time the liner is to be emptied, the discharge then being defined by a simple cut or slit formed in the liner either when the discharge operation is to commence, or during manufacture, the slit then being closed by strippable adhesive tape.

The or each bladder may be defined by a flexible sheet, for example of a plastics material similar to that of the liner, secured in a substantially gas-tight manner internally or externally to the liner whereby the liner itself forms a wall of the bladder. Preferably, however, the or each bladder is separately

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formed and comprises a flexible substantially closed bag-like structure which is attached to the liner at the required position.

5 An inflation pipe may communicate with the bladder, to permit the bladder to be inflated from a position external of the container. Such a pipe may be furnished with a one-way valve, so that once the bladder has been inflated, it remains in that condition. Alternatively, the emptying operation may
10 be performed by cyclically inflating the bladder, in which case no valve need be provided.

Further inflatable bladders may be provided on the liner at other positions so as to assist the discharge of product. For example, two further bladders may be
15 disposed in the region of the lower edges of the liner, one on each side thereof and part-way along the length of the liner. Another possibility would be to provide one or more bladders under the lower surface of the liner; these bladders may be inflated sequentially
20 towards the discharge end of the liner, so as to move product within the liner towards the discharge end. When more than one bladder is provided, it will be appreciated that the bladders may be inflated either simultaneously, or in a sequence which is chosen to
25 assist the movement of product towards the discharge.

The bladder itself may be provided with a number of internal compartments, which may be inflated sequentially from one end of the bladder. In the case of a bladder disposed in the region of the discharge
30 end of the liner, the internal compartments may be inflated in sequence from the end of the bladder further from the discharge end. This may be achieved by providing an inflation pipe opening into the furthest compartment, there being relatively small
35 openings between adjacent compartments to permit air to flow from one compartment to the next.

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By way of example only, one specific embodiment of container liner constructed and arranged in accordance with the present invention and which may be used in a discharge operation of this invention will now be described in detail, with reference to the accompanying drawings, in which:-

Figure 1 is a diagrammatic, partially cut-away view of a container fitted with a liner of this invention;

Figure 2 is a view similar to that of Figure 1, but with the container doors removed and showing the liner bladder configuration;

Figure 3 is a vertical cross-section through the container, in the region of the discharge end thereof;

Figure 4 shows in greater detail the bladder of Figures 2 and 3;

Figure 5 shows an alternative form of bladder; and

Figure 6 shows yet another form of bladder, which is inflatable sequentially from one end.

Referring initially to Figure 1, there is shown a conventional container 10 of a kind used for the transport of a wide variety of goods and products. The container has a pair of rear-opening doors 11, but to permit the container to be used for the transport of powder-like products in bulk in association with an internal liner 12, the lower region of the doors 11 are provided with a gate 13 which may be lifted as shown in Figure 1 whilst leaving the doors 11 closed, to give access to a discharge 14 of the liner.

The discharge 14 is in the form of a funnel 15 made from essentially the same material as the liner and secured thereto so as to communicate with the interior of the liner. The funnel 15 leads into a short discharge tube 16. Before the container is to be emptied, the tube 16 is closed and folded away with the funnel 15 and the gate 13 remains closed. Filling of

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the liner within the container may be performed through a fill-pipe 17 extending through an opening in the top wall of the container. Two alternative positions for such a fill-pipe are shown in Figure 1.

5 The liner is suspended from the upper region of the container by suitable elements in a manner known in the art. The end of the liner remote from the discharge 16 is secured to the base of the container 10 by means of adhesive strips 18. These serve to anchor
10 the liner against slippage, during an emptying operation by tipping of the container, towards the discharge end.

 Figures 2 and 3 show a modification of a conventional liner, to assist the emptying thereof.
15 Disposed in the two lower corner regions 19 of the liner are two inflatable bladders 20, one on each side respectively of the liner. Each bladder is in the form of a substantially closed tube, secured to the outer surface of the liner 12 by means of adhesives,
20 conveniently in tape form (not shown). Each bladder 20 extends along the length of the liner for a short distance, and also overlies both a part of the side wall of the liner and a part of the base wall thereof.

 Each bladder is provided with an inflation pipe 22
25 which leads away from the liner. Prior to a discharge operation, the two inflation pipes 22 may be folded to lie within the container, but may become accessible on opening the gate 13. Each pipe 22 extends into the respective bladder 20, through a relatively flexible
30 tube 23, which tube terminates within the bladder closely adjacent a side wall thereof. The tube 23 may readily be collapsed against an adjacent wall of the bladder, and so may serve as a kind of flap valve to retain air under pressure within the bladder.

35 Figure 5 shows an alternative form of bladder which may be used instead of that illustrated in

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Figures 2 and 4. The bladder of Figure 5 is of essentially the same construction as that of Figure 4, but extends for a greater length along the sides of the liner.

5 The bladder of Figure 6 is, externally, similar to that of Figure 5, but is internally divided into a number of separate compartments by welds 24 between the opposed parts of the tube defining the bladder. A relatively narrow opening 25 is formed in each weld,
10 whereby air may move from one compartment to the next adjacent compartment. The inflation pipe 22 and tube 23 extend within the bladder to the end compartment 26, so that on supplying air to the pipe 22, this compartment 26 will inflate first. Air will bleed
15 through the openings 25 so as gradually to inflate each compartment in turn, back towards the end of the liner. Of course, the pipe 22 and tube 23 could extend externally of the bladder, and communicate through the bladder wall to the end compartment 26.

20 When the container is to be emptied, the gate 13 is raised and the discharge 14 of the liner is unfolded. At the same time, the inflation pipes 22 are pulled clear of the container itself, to permit the connection of an airline thereto. The container is
25 then lifted at the end remote from the discharge 14, so as to cause contained product to flow under gravity out of the discharge. As shown on the right-hand side of Figure 3, there is a tendency for product to accumulate in the lower corner regions of the container, at the
30 discharge end thereof. However, by inflating the bladders 20, by means of an airline connected to the two pipes 22, the bladders will expand in volume into the interior of the container, as shown on the left-hand side of Figure 3. This moves the product away
35 from the base and side wall corner regions of the container and encourages that product to flow into the

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funnel 15 for discharge from the container.

5 The bladders may be provided with a simple inflation pipe and no flap valve (tube 23), so that the bladders will remain inflated only so long as an airline is connected thereto. In this way, the bladders may be inflated cyclically as emptying progresses, to minimise the likelihood of product accumulating in the lower corner regions of the liner.

10 The alternative configurations of bladder, shown respectively in Figures 5 and 6, may be suitable for use with products which flow less easily, so as to encourage the products to move towards the discharge 14 of the liner.

15 After the container has been emptied in the manner described above, the liner is removed from the container and is disposed of in an environmentally-acceptable manner - and preferably by being recycled.

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CLAIMS

1. A method of discharging a bulk-transport container having a flexible internal liner by tipping the container to cause transported product to run under gravity out of a discharge at one end thereof, in which
5 method air is supplied under pressure to at least one inflatable bladder disposed between a wall of the container and the interior of the liner, whereby the increase in bladder volume moves contained product inwardly away from the container wall to encourage that
10 product to run towards the discharge.
2. A method as claimed in Claim 1, in which at least two bladders are inflated, respectively disposed at or adjacent each lower corner region at the one end of the container.
- 15 3. A method as claimed in Claim 2, in which there are at least two further bladders disposed respectively one on each lower side of the liner part way along the length thereof from said first-mentioned pair of bladders, the further bladders also being inflated
20 during a discharge operation of the liner.
4. A method as claimed in Claim 1 or Claim 2, in which the inflation of the or each bladder is performed cyclically.
5. A method as claimed in any of the preceding
25 Claims, in which the or each bladder is inflated progressively, from a part thereof further from said one end of the container back towards said one end thereof.
6. A flexible liner for a bulk transport container
30 and including a discharge at one end, means defining at least one inflatable bladder at or adjacent said one end of the liner, and means to permit the introduction of air under pressure to the bladder to increase the volume thereof when the liner is in use within a

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container.

7. A liner as claimed in Claim 6, wherein there are defined two bladders, one on each side of the liner and both disposed at or adjacent said one end of the liner.

5 8. A liner as claimed in Claim 7, wherein there are defined two further bladders, both disposed in the region of the lower edges of the liner, part way along the length thereof and spaced from the bladders in the corner regions.

10 9. A liner as claimed in any of Claims 6 to 8, wherein said bladder-defining means comprises a flexible sheet secured in a substantially gas-tight manner to the liner whereby a part of the liner forms a wall of the bladder.

15 10. A liner as claimed in any of Claims 6 to 8, wherein the bladder-defining means comprises a flexible substantially closed bag-like structure attached internally or externally to the liner at the required position.

20 11. A liner as claimed in any of Claims 6 to 10, wherein the or each bladder is provided with a tube leading away from the interior of the bladder whereby air may be introduced to the interior of the bladder from a position external of a container within which
25 the liner is fitted.

12. A liner as claimed in Claim 11, wherein said tube is provided with a one-way valve to retain air within the bladder.

30 13. A liner as claimed in Claim 12, wherein said valve comprises a length of readily-collapsible tubing disposed adjacent a wall of the bladder whereby the air pressure within the bladder will collapse against the wall and so close off the tubing.

35 14. A container whenever fitted with a liner as claimed in any of Claims 6 to 13 for the bulk transport of products.

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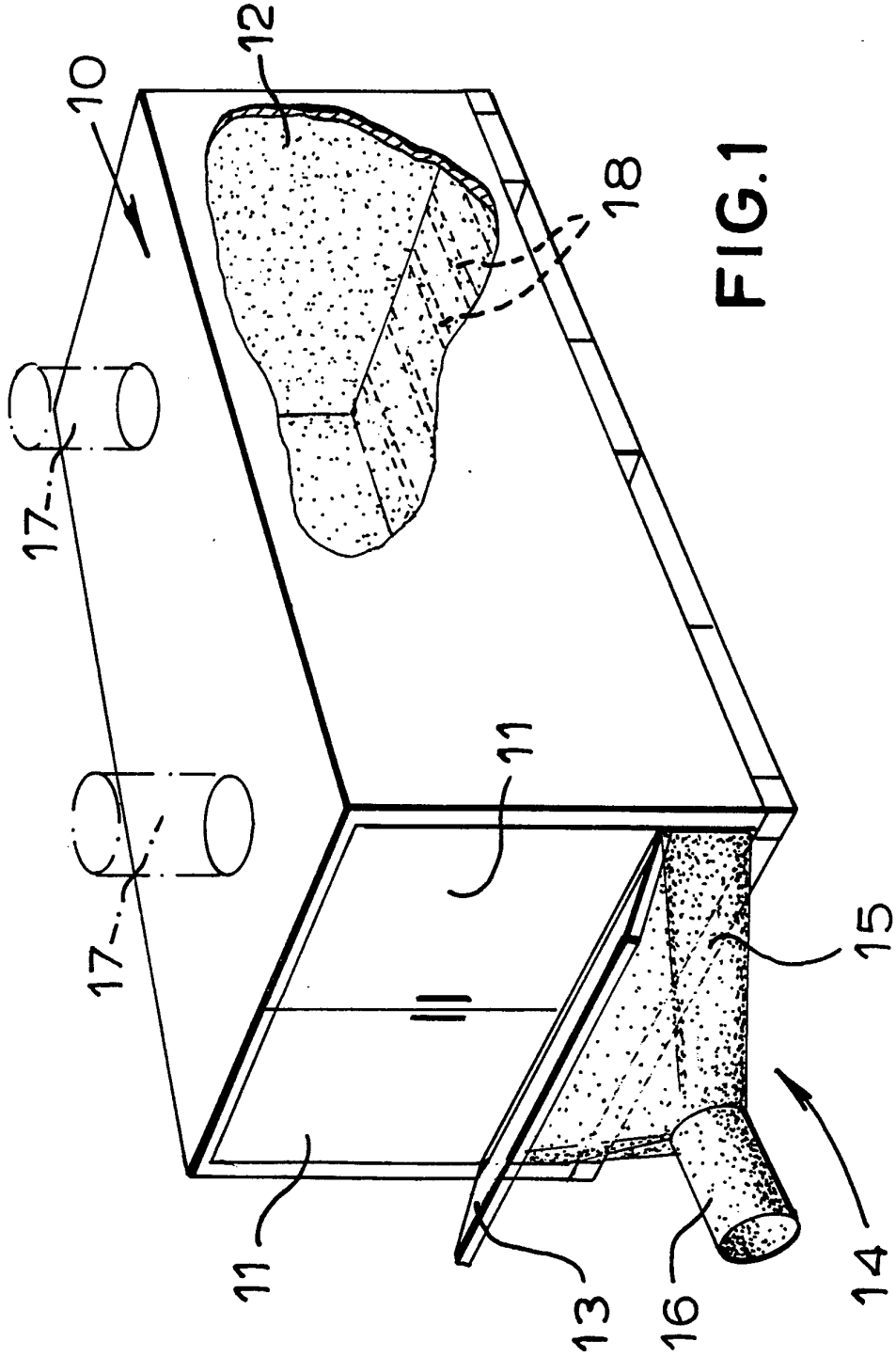
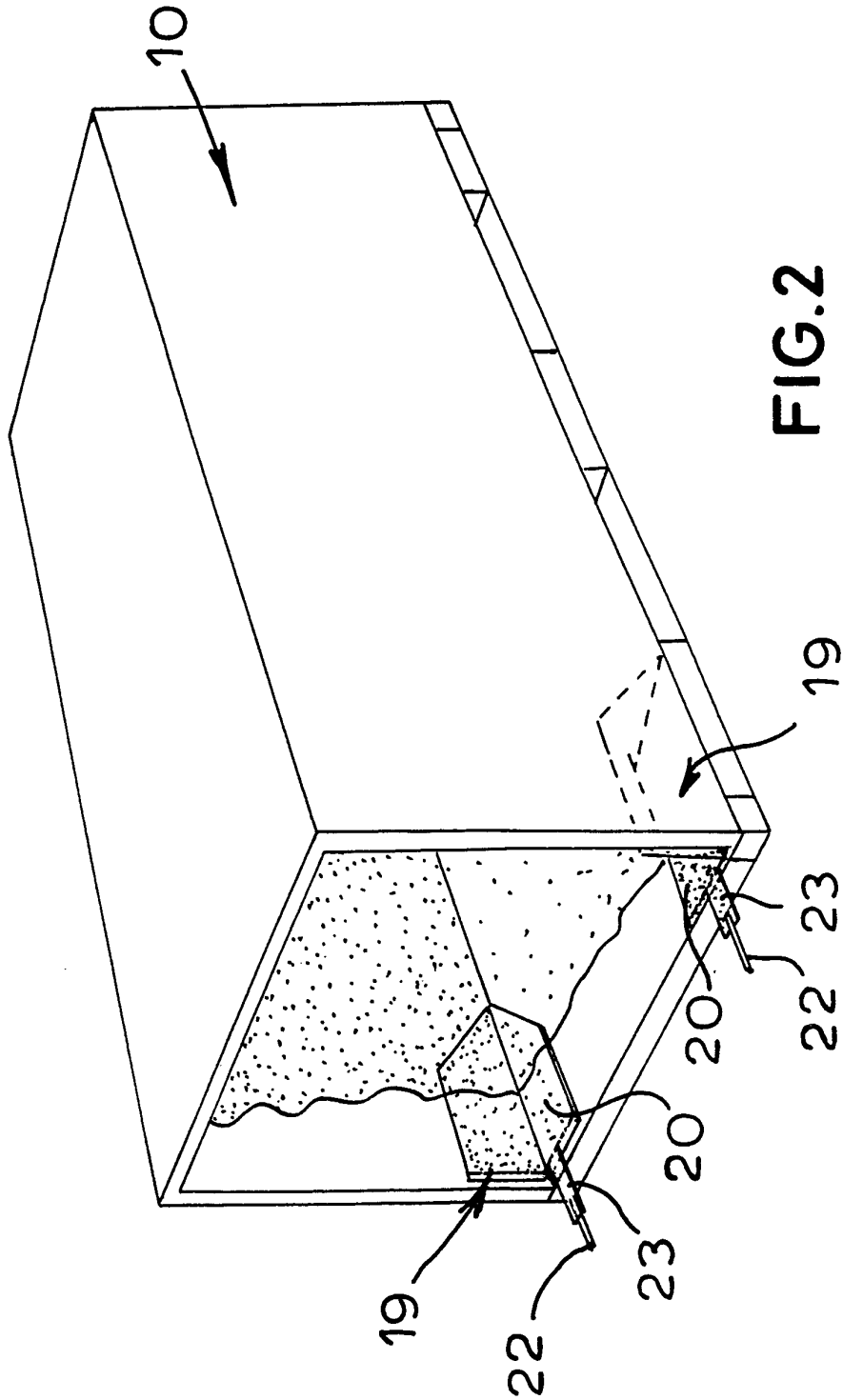


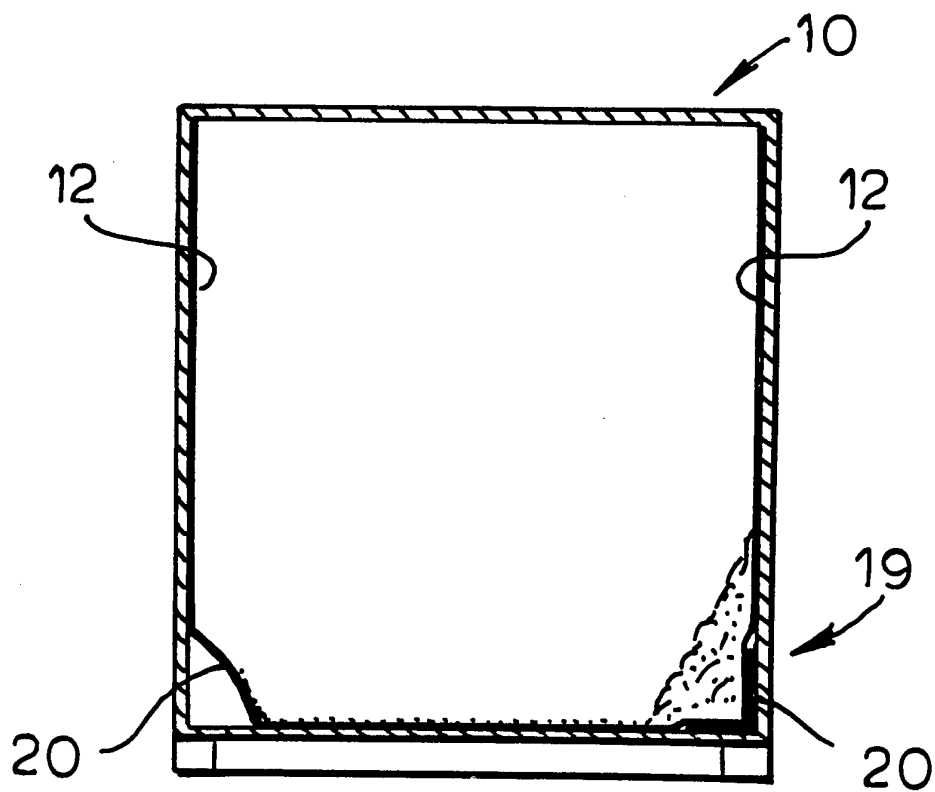
FIG. 1

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3/4

FIG. 3



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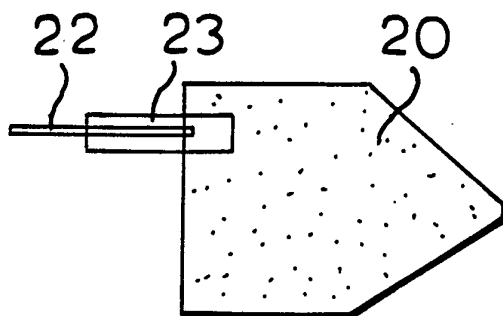


FIG. 4

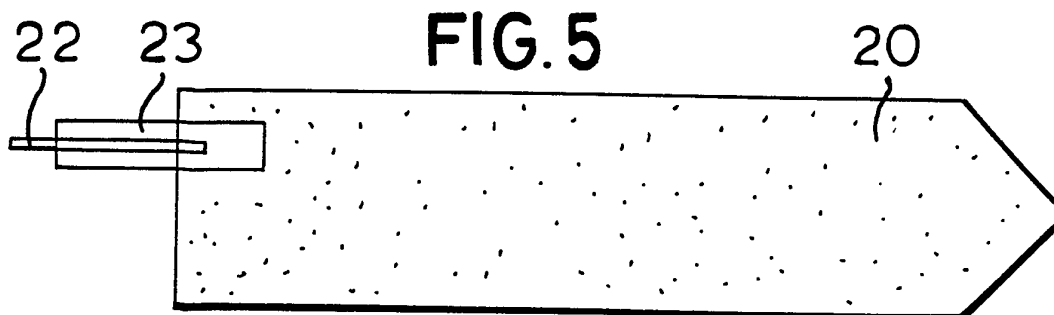


FIG. 5

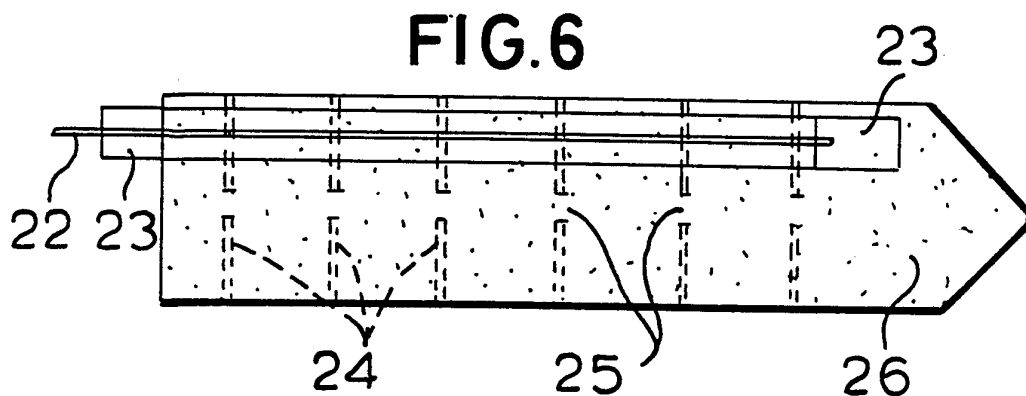


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 94/01477

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65D88/62 B65D90/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used) -

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 538 563 (INSTA-BULK INC.) 28 April 1993	1,2,6,7
A	see column 20, line 1 - column 25, line 34; claims; figures ---	4,9-11, 14
X	DE,A,20 27 842 (ZUMSTEIN SEN.) 21 January 1971	1,2,6,7
A	see page 2, line 18 - page 3, line 8; claims; figures ---	3,5, 8-11,14
A	GB,A,2 110 192 (MOBILKRAFT LIM.) 15 June 1983 see page 2, line 20 - line 51; claims; figures ---	4,5,9,14
A	DE,A,32 19 910 (HARMS SIGURD) 1 December 1983 see claims; figures -----	4,5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

25 October 1994

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

information on patent family members

International application No.
PCT/GB 94/01477

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0538563	28-04-93	NONE	
DE-A-2027842	21-01-71	BE-A- 751539 FR-A- 2049978 NL-A- 6908718	07-12-70 26-03-71 09-12-70
GB-A-2110192	15-06-83	NONE	
DE-A-3219910	01-12-83	NONE	