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(54) **INNER CONTAINER FOR TRANSPORTING LYSINE**

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(57) **ABSTRACT**

The present invention describes an inliner **(1)** which is used for transporting lysine in containers. This inliner **(1)** has preferably been produced from woven, coated polypropylene and has the following features:

- a cuff **(4, 5)** at each of the upper and lower margins of the rear face **(3)** for fixing and securing the inliner **(1)** within the container
- where appropriate a cuff applied to the upper or lower margin of the front face **(8)** and serving for fixing the inliner **(1)** within the container
- feed apertures **(9)** on the front face **(8)**, these feed apertures **(9)** having been applied at the upper margin of the front face **(8)**
- discharge apertures **(10)** on the front face **(8)**, these discharge apertures **(10)** having been applied at the lower margin of the front face **(8)**
- two straps **(12)** applied along the edges of the front face **(8)**, each of which has at least one clasp **(13)**, these serving for suspension on steel bars.

INNER CONTAINER FOR TRANSPORTING LYSINE

[0001] The present invention relates to the use of an inliner known per se, attached within a container, for transporting lysine in this container.

[0002] Lysine is an amino acid produced in large quantities and used mainly as an animal feed additive. It can be obtained by various synthetic routes and is generally used in the form of the L-enantiomer. With annual amounts marketed being more than 50 000 metric tons, it is clearly desirable that the way in which the material is packed for transport facilitates loading and unloading. Care has to be taken here that no contamination of lysine takes place during transport and particularly during loading or unloading. Another problem is that lysine is highly hygroscopic and on absorbing water rapidly cakes to give hard clumps. The way in which the lysine is packed must therefore be such that it cannot take in water from outside.

[0003] Much of this lysine is marketed in paper sacks, but the amount which can be packed and sold in each sack is comparatively small. A large amount of packing material is therefore needed, and this cannot be reused. Each paper sack has to be individually opened by cutting, and this requires a large amount of additional work.

[0004] Some of this lysine is also marketed in what are known as big bags. These are large-capacity sacks, generally made from polypropylene. For road transport, sacks of this type are either cut open and their contents emptied into silo containers, or the sacks themselves can be transported in containers. However, big bags are difficult to stack, the result being high dead volume in the container. It is necessary to use large containers, and this increases transport costs.

[0005] It is an object of the present invention to provide a means of transport which can transport lysine simply and without contamination, and which in particular permits easy loading and unloading of the means of transport without any major labor cost. No contamination of the lysine should occur.

[0006] We have found that this object is achieved by using an inliner for transporting lysine in a container. The inliner with upper and lower face and rear and front face, and also two side faces made from coated woven polypropylene or from a material with comparable properties has the following features:

[0007] a cuff at each of the upper and lower margins of the rear face for fixing and securing the inliner within the container

[0008] where appropriate a cuff applied to the upper or lower margin of the front face and serving for fixing the inliner within the container

[0009] at least one feed aperture on the front face, this feed aperture having been applied at the upper margin of the front face

[0010] at least one discharge aperture on the front face, this discharge aperture having been applied at the lower margin of the front face

[0011] two straps applied along the edges of the front face, each of which has at least one clasp, these serving for suspension on steel bars.

[0012] Preferred embodiments of the inliner used according to the invention are found in the subclaims and are described below.

[0013] Instead of the woven polypropylene, a material with identical or similar properties may be used, but in particular must have appropriate stability and tensile strain at break. Examples of materials which may be used instead of the woven polypropylene are polyethylene and mixed polyethylene/polypropylene weaves. The preferred material is woven polypropylene.

[0014] The cuffs attached to the rear face of the inliner serve for fixing and securing the inliner within the container. The material from which they have been manufactured is frequently the same as that used for the receptacle itself, but the thickness of the material in the cuffs is preferably greater. Examples of methods of fixing and securing are suspension on suitable devices in the container or suspension on wooden boards or steel bars fixed within the container. There may also be one or more cuffs on the front face.

[0015] The inliner has at least one feed aperture on the front face for charging material. This has been attached at the upper margin so that complete filling with lysine becomes possible. The shape, size, and design of the feed aperture are suitable for the filling procedure. For example, it may be of pull-out design and/or resealable. On the front face there is also at least one discharge aperture attached, located at the lower margin of the front face, to ensure easy and complete discharge. The discharge aperture is of pull-out design and to this end has approximately the shape of a tube. Precise drawing-off of the lysine emerging from the apertures thus becomes possible. The discharge aperture is resealable, advantageously by means of a hook-and-loop fastening, for example the closures marketed with the name Velcro®.

[0016] On the front face of the inliner there is, at each edge, a strap which runs along the entire length of the side of the front face. Each of these straps has at least one clasp. The clasps serve for the fixing of one or more steel bars which may be attached within the container. The clasps are preferably capable of opening and reclosing, thus ensuring easy insertion of the steel bars. The steel bars serve for positioning of the inliner within the container and for absorbing the pressure exerted on the front face of the inliner by the lysine located in the receptacle, once the container has been opened. A high pressure has to be absorbed in particular when the container is tipped, i.e. its closed side raised to permit easier and more complete discharge of the lysine. Each of the straps on each edge of the front face has at least one clasp, preferably at least two clasps. In one preferred embodiment, between the clasps on the front face of the inliner a tube section has been attached, and the steel bars are passed through this. This provides a simple method of positioning the inliner, since the steel bars are generally adjustable in height. These tube sections, too, are advantageously capable of opening and resealing.

[0017] In another preferred embodiment of the present invention, attached to the upper and/or lower side faces of the inliner there are devices which can be used to fix the receptacle within the container. These may be cords, for example, securely incorporated into the material of the receptacle, or else loops, into which suitable means of fastening, such as cords or carabiner hooks or the like may

be inserted. There may also be devices of this type which serve for fixing attached to the upper and/or lower front face and/or to the rear face.

[0018] The inliner used according to the invention is generally composed of at least six lengths of fabric, these having been connected to one another in a suitable manner, for example by sewing or adhesive-bonding. In one preferred embodiment, the inliner used according to the invention has seams which are dust-tight. One method of achieving this is to use triple-stitched seams, specifically with two external threads and with one internal continuous thread.

[0019] Once the inliner has been attached to the container intended for transport, the lysine is charged through the feed aperture(s). Once transport or shipping has been completed, the lysine is discharged from the inliner via the discharge aperture(s) which are of pull-out design and are resealable. Since the aperture(s) are of pull-out design, the lysine can be conveyed in a controlled manner to a particular site, for example a drum or a sack, by varying the direction of the withdrawal aperture. Often, tipping of the container toward the side on which the container's discharge aperture is located permits easy removal of the lysine.

[0020] Unlike when big bags are transported in a container, there is little dead volume present when the inliner is used according to the invention. For example, when using the inliner a 20-foot container is needed to transport 20 metric tons of lysine, whereas a 40-foot container is needed to convey the same amount of lysine when transporting big bags.

[0021] The example below will now provide further clarification of the invention and illustrates one preferred embodiment of the inliner used according to the invention.

[0022] The inliner **1** is composed of lengths of woven polypropylene connected to one another via seams, such as the seam **2**. The seams are preferably dust-tight. On the rear face **3** of the inliner **1**, on the upper face, there is an upper cuff **4** for fastening the inliner within the container, for example using a steel bar. Attached at the lower margin of the rear face **3** there is a lower cuff **5**, which serves for fixing the inliner **1**. The fixing may be achieved with a suitable means of fixing other than a steel bar, for example a wooden board. At both edges of each of the upper and lower side faces **6***a*, **6***b*, there are cords **7** attached with which the inliner **1** can be fixed within the container. On the front face **8** there are inlet apertures **9**, attached at the upper margin of the front face **8**. There are also outlet apertures **10** in the lower part of the front face. These are of pull-out design and can be opened and resealed by means of a hook-and-loop tape **11**. A strap **12** runs along each edge of the front face. On the straps there are clasps **13**, which can be used to fix steel bars. The steel bars serve to absorb the pressure exerted by the lysine once the container has been opened and in particular tipped. The straps extend beyond the edge of the front face and can be used for positioning of the inliner. Positioning may also be achieved by way of steel bars inserted into the clasps. This can be achieved with particular ease by way of the tube section **14**, which receives the steel bar. The inliner can be fixed within the container by way of a cuff **15** on the lower margin of the front face **8**.

[0023] Key

[0024] **1** Inliner

[0025] **2** Seam

[0026] **3** Rear face

[0027] **4** Rear upper cuff

[0028] **5** Rear lower cuff

[0029] **6***a* Upper side face

[0030] **6***b* Lower side face

[0031] **7** Cord

[0032] **8** Front face

[0033] **9** Inlet aperture

[0034] **10** Outlet aperture

[0035] **11** Hook-and-loop tape

[0036] **12** Strap

[0037] **13** Clasp

[0038] **14** Tube section

[0039] **15** Cuff

We claim:

1. The use of an inliner **(1)** with upper and lower face and rear and front face, and also two side faces made from coated woven polypropylene or from a material with comparable properties with the following features:

a cuff **(4, 5)** at each of the upper and lower margins of the rear face **(3)** for fixing and securing the inliner **(1)** within the container

where appropriate a cuff applied to the upper or lower margin of the front face **(8)** and serving for fixing the inliner **(1)** within the container

at least one feed aperture **(9)** on the front face **(8)**, this feed aperture **(9)** having been applied at the upper margin of the front face **(8)**

at least one discharge aperture **(10)** on the front face **(8)**, this discharge aperture **(10)** having been applied at the lower margin of the front face **(8)**

two straps **(12)** applied along the edges of the front face **(8)**, each of which has at least one clasp **(13)**, these serving for suspension on steel bars

for transporting lysine in a container.

2. The use as claimed in claim 1, wherein on the side faces **(6***a*, **6***b*), preferably on the upper and lower side faces, there are devices for securing the inliner **(1)** by lashing.

3. The use as claimed in claim 2, wherein the devices are cords **(7)** or loops, preferably loops.

4. The use as claimed in any of claims 1 to 3, wherein the inliner **(1)** has been manufactured from woven polypropylene, preferably from coated, woven polypropylene.

5. The use as claimed in any of claims 1 to 4, wherein the discharge apertures **(10)** are of pull-out design.

6. The use as claimed in any of claims 1 to 5, wherein the discharge apertures **(10)** are resealable, preferably by means of a hook-and-loop fastening **(11)**.

7. The use as claimed in any of claims 1 to 6, wherein the seams **(2)** are dust-tight.

8. The use as claimed in claim 7, wherein the seams **(2)** have been triple-stitched using two external threads and one internal continuous thread.

9. The use as claimed in any of claims 1 to 8, wherein, between the clasps **(13)** on the front face **(8)**, a tube section **(14)** has been attached and serves for positioning of the inliner **(1)** within the container

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