

- [54] **DEVICE FOR TRANSPORTING POURABLE GOODS**
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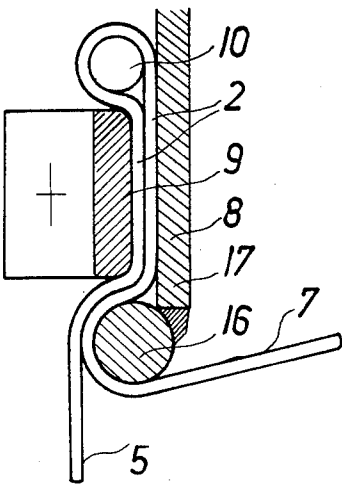
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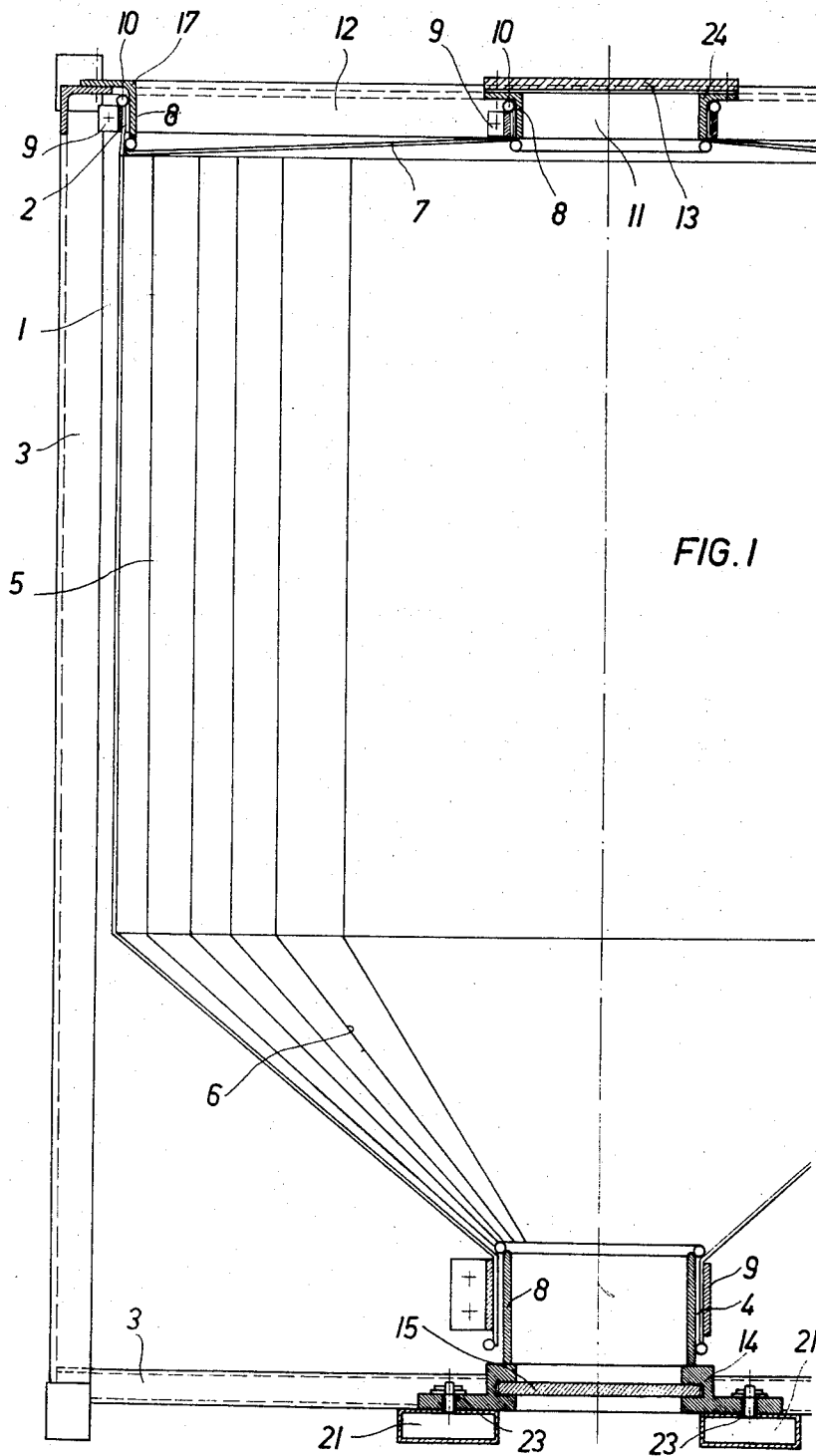
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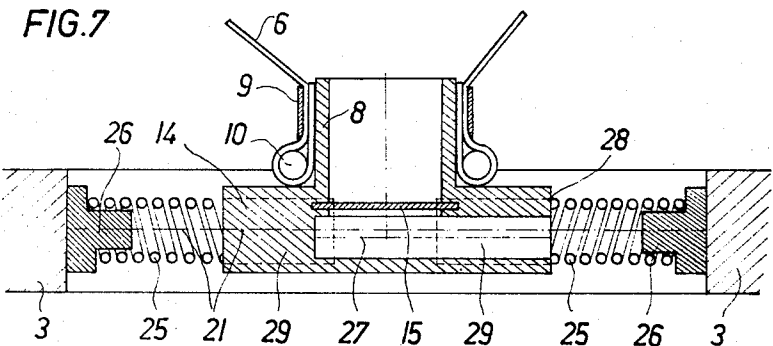
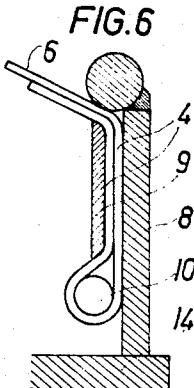
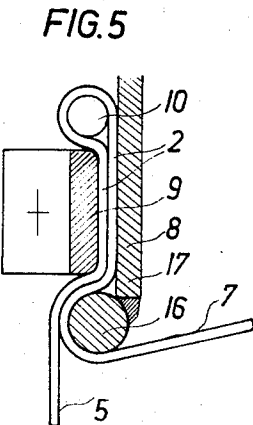
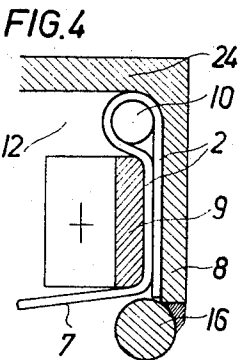
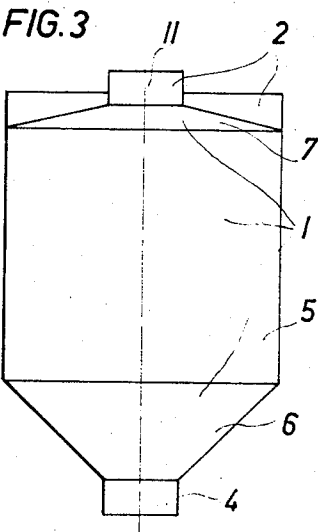
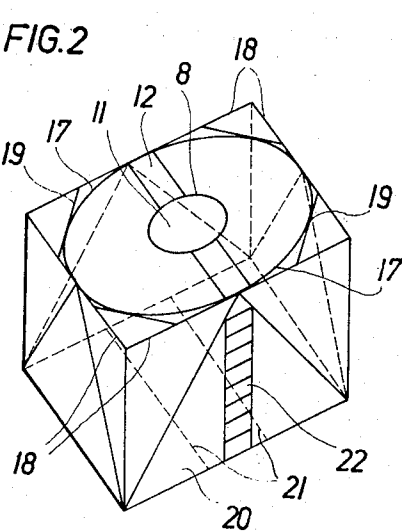
[57] **ABSTRACT**

Device for transporting pourable goods such as liquids or solids in bulk. Liquids are situated within a container made of a foldable sheet material and having upper and lower end regions. At its upper end region the container is carried by and suspended from a frame structure while at its lower end region the container is operatively connected with a guiding structure which guides the lower end of the container for movement in a predetermined direction which preferably extends in the direction of the travel of the device.

16 Claims, 7 Drawing Figures







DEVICE FOR TRANSPORTING POURABLE GOODS

BACKGROUND OF THE INVENTION

The present invention relates to transporting devices. In particular, the present invention relates to a device for transporting pourable goods such as liquids or solids in bulk.

The invention relates particularly to that type of device where the goods are contained within a silo-type of container made of a foldable sheet material which is suspended from a frame such as a steel frame.

Transporting devices of this general type are known. The container for the goods is fixed at a plurality of locations to the steel frame. Such containers have proved, in practice, however to be particularly prone to damage during transport, especially when the transporting vehicle is abruptly braked. Under these conditions the container is likely to burst, especially during an extreme change in acceleration or deceleration.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a device of the above general type which will avoid the above drawbacks.

In particular, it is an object of the present invention to provide a device which is constructed in such a way that the likelihood of bursting of the container during sudden braking or any abrupt change in acceleration, deceleration, or direction of movement, is very greatly reduced if not entirely eliminated.

Also, it is an object of the present invention to provide a construction of this type which is extremely rugged while at the same time is relatively simply and reliably protects the goods against escape from the container under all types of transporting conditions.

Also, it is an object of the present invention to provide relatively simple rugged construction for reliably connecting the container to a framework so as to be carried thereby.

In addition, it is an object of the present invention to provide for a device of this type a construction which makes it extremely convenient for an operator to climb up and move along the device for convenience in carrying out operations in connection with filling the container, for example, as well as in connection with inspecting the entire device.

It is especially an object of the present invention to provide for a device of this type a construction which will reliably absorb stresses resulting from shocks created in connection with sudden acceleration or deceleration.

In accordance with the invention the device includes a container means made of a foldable sheet material and adapted to contain the pourable goods which may take the form of a liquid or a solid in bulk. The container means has upper and lower end regions, and a frame means is operatively connected with the upper end region of the container means so as to carry the latter with the container means suspended from the frame means. A guide means is operatively connected to the lower end region of the container means to guide the lower end region for movement in a given direction which preferably is the direction of travel of the device during transport thereof. Preferably the container means is made in one piece of a sheet material, especially a woven fabric which may be coated with plastic.

The guide means at the lower end region of the container means is preferably operatively connected with the frame means for shifting movement with respect thereto, this guide means is particularly taking the form of a pin-and-slot connection with the frame means.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a fragmentary partly sectional schematic elevation of the symmetrically constructed container means and part of the frame means to which it is connected, the sectional illustration, particularly at the lower portion of FIG. 1, being taken in a plane which is perpendicular to the predetermined direction in which the guide means guides the lower end region of the container means for movement;

FIG. 2 is a schematic perspective illustration of the frame means;

FIG. 3 is a schematic front elevation of the foldable container means;

FIG. 4 is a fragmentary sectional elevation illustrating the manner in which the upper central region of the container means is connected with the frame means;

FIG. 5 is a fragmentary schematic sectional elevation illustrating the manner in which an upper peripheral region of the container means is connected with the frame means;

FIG. 6 is a schematic fragmentary sectional elevation illustrating the manner in which a lower central region of the container means is connected with the frame means; and

FIG. 7 is a fragmentary schematic elevation showing in section, in a plane parallel to the direction of movement provided by the guide means, the details of the structure at the lower region of the container means from which the goods is discharged.

DESCRIPTION OF A PREFERRED EMBODIMENT

As is particularly apparent from FIG. 1, the container means 1 is provided at its upper end region with extensions 2, and it is by way of these extensions 2 that the container means is fixed to and suspended from the illustrated frame means formed by the steel frame 3. The lower end region of the container means 1 forms the discharge end for the goods situated within the container means 1 and has the configuration of a discharge funnel 6 which is tapered as illustrated. The freely swingable lower end region of the container means 1 is operatively connected with the frame means 3 by a guide means 14 which guides the lower end region 6 of the container means 1 for movement in a predetermined direction with respect to the frame means 3. This latter direction is preferably the same as the direction of travel of the device of the invention. In its simplest form the guide means 14 has the construction of a pin-and-slot connection between the lower end region of the container means 1 and the frame means 3. Thus, the bottom end of the container means 1 is fixed with a pair of elongated side flanges which extend perpendicularly to the plane of FIG. 1 and which are formed with elongated slots. These side flanges rest upon elongated bottom frame members 21 of the frame means 3. These frame members 21 extend perpendicularly to the plane of FIG. 1 and are preferably arranged in the direction of travel. The members 21 fixedly carry

bolts 23 which extend upwardly through the slots in the side flanges of the guide means 14 so that in this way the pin-and-slot connection which forms the guide means is provided. These bolts carry nuts which can be tightened to a predetermined extent for forming a means for adjusting the frictional engagement between the guide means 14 and the frame means 3 so that in this way the extent to which movement of the bottom end of the container means is frictionally resisted can be adjusted. In addition it is possible to provide, as shown in FIG. 7, a spring structure to form shock absorbers at the bottom end of the container means, to absorb any shocks in connection with movement provided by way of the guide means 14.

It is the guide means 14 which carries the discharge structure which is operated for discharging the contents of the container means 1 out of the latter. This discharge structure may include a slidable valve plate 15 shown in its closed position in FIG. 1 and capable of being shifted to an open position for releasing the goods out of the container means 1. In addition it is possible for the discharge structure to have, as shown in FIG. 7 and described in greater detail below, connections 28 for pneumatic or electro-mechanical conveyer structure used to convey the goods away from the container means 1 during discharge of the goods out of the latter.

The container means 1 has a top inlet opening 11 through which the goods is introduced into the container means 1. This filling opening 11 of the container means 1 as well as an upper circular or ring-shaped filling portion 24 of the frame means 3 are located at the top end of the container means 1. The filling portion 24 of the frame means 3 is fixed with the remainder of the frame means 3 by way of an elongated frame portion 12 in the form of a walk along which an operator may walk across the top of the frame means to and from the filling opening 11 of the container means 1 at the filling portion 24 of the frame means 3.

As is shown in FIG. 4, at the location of its filling opening 11, the container means 1 is connected by way of a clamping means to the circular filling portion 24 of the frame means 3. This clamping means is formed by an inner ring 8 which forms an inner cylindrical part of the filling portion 24 of the frame means 3. This inner ring 8 is surrounded by a clamping ring or collar 9 of the clamping means 8, 9. Between the ring 8 and the clamping collar 9 is an extension 2 of the top wall 7 of the container means, this extension 2 forming an extension of the top wall 7 at its central opening 11 where the fabric which forms the container means is folded back upon itself in the manner shown in FIG. 4 and has the tubular configuration surrounding the ring 8, surrounded by the clamping ring 9, and forming the filling opening 11. Thus, the circular extension 2 at the central top region of the container means 1 is clamped directly to the frame means by way of the clamping means 8, 9 shown in FIG. 4.

In order to avoid slipping of the central tubular extension 2 of the container means 1 with respect to the clamping means 8, 9 shown in FIG. 4, the portion of the central upper extension 2 which is folded back upon itself surrounds a reinforcing ring 10 in the form of a cable or metal ring situated in the hem which is formed by the folded back portion of the fabric which forms the extension 2 shown in FIG. 1. Thus, this ring 10 inserted in and surrounded by the extension 2 is situated

directly over the clamping ring 9 which does not have a diameter greater than the reinforcing ring 10, so that downward slipping of the container means 1 with respect to the clamping ring 9 is prevented. A further securing of the container means 1 to the frame means 3 is achieved by welding the bottom edge of the ring 8 and an additional ring 16 which also has an outer diameter substantially equal to the outer diameter of the ring 9 when the latter is in its clamping position shown in FIG. 4, so that by way of this circular ring 16 downward slipping of the clamping ring 9 is prevented. This clamping ring 9 is in the form of a circular ring having a pair of adjoining ends provided with outwardly directed flanges located directly next to each other and capable of being bolted together for releasably holding the clamping ring 9 in its clamped position shown in FIG. 4, one of the flanges at one of the ends of the ring 9 being apparent from FIG. 4 extending from the left of the remainder of the ring 9.

In order to achieve a hermetic seal of the contents within the container means 1, a closure in the form of a steel closing plate 13 is provided over the filling opening 11 of the container means 1. This closure plate 13 forms a removable cover means which is releasably connected with the filling portion 24 of the frame means 3.

As is apparent from FIG. 2, the steel frame means 3 is made up of a framework of elongated bars, trusses, and the like, forming a network as illustrated in FIG. 2. The frame means 3 is of a generally cube-shaped or parallelepiped configuration and has side walls provided with elongated members which give each side wall of the frame means 3 the configuration of a K-frame. The top wall of the framework carries an elliptical supporting ring 17 from which the container means 1 is suspended at the top end of its cylindrical side wall 5, by an additional extension 2 extending upwardly from the top end of the cylindrical wall 5, as shown in FIG. 5 and described in greater detail below. The frame means 3 is provided with elongated bars 18 which define the upper edges at the periphery of the top wall of the frame means 3, and the supporting ring 17 is fixed, as by welding, directly to the central regions of each of the upper bars 18 forming the upper edges of the frame means 3. Thus, the ring 17 from which the container means 1 is directly supported is itself supported by the frame means 3 at the upper edge regions 18 thereof. It is preferred also to provide reinforcing bars 19 extending across the corners defined by the peripheral bars 18 at the top of the frame means 3. These reinforcing bars 19 are fixed at their ends, as by welding, to the bars 18, and the ring 17 may additionally be fixed to central regions of the reinforcing bars 19. Thus the bars 19 together with the bars 18 form a surrounding frame of octagonal configuration fixed to and carrying the elliptical ring 17 from which the container means 1 is suspended.

The bottom wall 20 of the frame means 3 is provided with the elongated bars 21 indicated schematically in FIG. 2 and shown in section in FIG. 1. These bars 21 form a pair of supports which preferably extend in the direction of travel of the entire device of the invention. It is to these elongated bars 21 that the guide means 14 is connected, as described above. Preferably the framework is provided with a ladder 22 which forms an extension of the upper elongated frame portion 12 along which an operator may walk, so that by climbing up the

ladder 22 the operator will have access to the elongated frame portion 12 along which the operator may move. As was indicated above, it is this frame portion 12 which directly carries the filling portion 24 of the frame means where the filling opening 11 of the container means 1 is located.

FIG. 3 schematically illustrates the container means 1 which is made in one piece of a foldable fabric such as a fabric woven from polyester fibers, such as a Trevira fabric. This fabric is coated with a plastic. The container means 1 has the cylindrical side wall 5 provided with the extensions 2, as described above, as well as, at the lower end region of the container means, the funnel-shaped portion 6 which terminates in an extension 4 for a purpose described below in connection with FIG. 6. The top wall 7 of the container means 1 is relatively flat while being slightly inclined and tapered in a direction opposite to the portion 6, as is apparent from FIG. 3. This top wall 7 is provided at the filling opening 11 with extensions 2 as shown in FIG. 4 and described above. The extension 4 at the lower end region 6 of the container means 1 serves to connect the container means with the guide means 14 as well as with the structure for discharging the contents of the container out of the latter.

FIG. 5 shows in detail how the container means 1 is suspended from the supporting ring 17. Thus, the cylindrical side wall 5 of the container means 1 is folded back upon itself to form the peripheral upper extensions 2 shown in section and in detail in FIG. 5. These extensions 2 form a hem in which a reinforcing ring 10 is located, the ring 10 of FIG. 5 surrounding and being of a diameter greater than the ring 10 of FIG. 4. Thus the ring 10 of FIG. 5 surrounds the larger ring 17 shown in FIG. 5. The extensions 2 of FIG. 5 are also fixed with the ring 17 by way of a clamping means 8, 9. Thus, the ring 17 itself forms part of the clamping means, namely the ring 8 thereof, while the outer flexible clamping ring 9 is placed around the extensions 2 shown in FIG. 5 clamping the latter against the exterior surface of the ring 17 which forms the clamping ring 8 of FIG. 5. The size of the reinforcing ring 10 in FIG. 5 is such that the extensions 2 shown in FIG. 5 cannot slip down with respect to the clamping ring 9 which again has at its adjoining free ends outwardly directed ears or flanges which can be bolted together for pulling the ring 9 tightly around the extensions 2 clamping the latter against the exterior surface of the ring 17. In this case also the ring 17 is welded at its bottom edge to a ring 16 over which the clamping ring 9 is located so that the clamping ring 9 cannot slip down, and the portion of the wall 7 which is shown in FIG. 5 extends radially inwardly toward the central filling opening of the container means 1, with the portion of the top wall 7 shown in FIG. 5 extending up to and actually being a continuation of the portion of the wall 7 shown in FIG. 4.

Referring to FIG. 6, the lower end region 6 has the extension 4 referred to above. This extension 4 in effect is the same as the extension 2 of FIG. 4 except that it is positioned reversely with respect to the extension 2 of FIG. 4. Thus in the case of FIG. 6 there is also a clamping means 8, 9 formed by an inner ring 8 surrounded by an outer clamping ring 9 with the part of the extension 4 which is folded back upon itself forming a hem in which the reinforcing ring 10 is located so that the hem which houses the ring 10 cannot slip past the clamping ring 9. In this case also the free top edge

of the inner ring 8 of the clamping means 8, 9 is welded with a ring 16 situated in this case over the ring 9 so that a secure connection is provided as illustrated in FIG. 6. In the case of FIG. 6 the inner clamping ring 8 is directly welded to and extends upwardly from and in fact forms part of the guide means 14.

Referring to FIG. 7, the guide means 14 is shown in section in a plane which extends parallel to the elongated bars 21 which extend in the direction of travel and with respect to which the guide means 14 is capable of frictionally sliding, as described above. The manner in which the inner ring 8 is fixed to and extends upwardly from the guide means 14 is clearly apparent from FIG. 7. It is to be understood that the central sectional portion of FIG. 7 where the clamping ring 8 is located is in a plane situated nearer to the viewer of FIG. 7 than the plane of the springs 25 which are shown in FIG. 7. Thus on opposite sides of the horizontal center line of the guide means 14, there are a pair of forward and a pair of rear shock-absorbing springs 25 forming a spring means with each spring 25 being supported at its outer end on a pin 26 carried by the frame means 3 and extending into the coils of the springs as shown in FIG. 7. The inner portions of the springs 25 which are nearest to the center line of the container means 1 are guided on suitable sleeves 29 which are schematically represented in phantom lines in FIG. 7 and which are fixed to the guide means 14 on opposite sides of the central region thereof which extends in the direction of travel of the device. Along its horizontal center line the guide means 14 is formed with an elongated bore shown in FIG. 7 and in which it is possible to accommodate the discharge means 27 shown schematically and serving to discharge the contents the container means 1 out of the latter. At its right portion, as viewed in FIG. 7, the guide means 14 is provided with the schematically illustrated connections 28 for a pneumatic or electro-mechanical conveyer structure for receiving the goods in the container means 1 and conveying the goods beyond the container means 1 during discharge of the latter. The discharge structure 27 which is shown in phantom lines schematically in FIG. 7 is separated from the interior of the container means 1 by the valve 15 which is shown in its closed position in FIG. 7. The cylindrical or circular valve plate 15 can be shifted in any desired manner from the closed position shown in FIG. 7 to an open position releasing the goods for movement by gravity to the discharge means 27 and to the conveyer means connected to the guide means 14 by way of the structure 28 when it is desired to discharge goods from the interior of the container means 1.

With the above-described structure of the invention it is possible for the lower funnel-shaped discharge portion of the container means 1 to swing in the direction of shocks so that the energy of these shocks encountered during travel will be elastically absorbed within the filled container means 1 without any damage to the latter. The structure of the invention is particularly designed to absorb shocks of this type encountered in connection with switching operations during rail transportation.

What is claimed is:

1. A device for transporting pourable goods such as liquids or solids in bulk, comprising container means for containing the pourable goods, said container means being composed of a foldable sheet material and

having upper and lower end regions, frame means operatively connected with said upper end region of said container means for supporting the latter with said container means suspended from said frame means, and guide means operatively connected with said frame means and said lower end region of said container means for guiding said lower end region for movement in a predetermined direction, whereby during transportation said direction may be selected to extend in the direction of travel of the container means.

2. The combination of claim 1 and wherein said container means is made in one piece and is composed of a woven fabric coated with plastic.

3. The combination of claim 1 and wherein said container means has a cylindrical side wall situated between said upper and lower end regions, said lower end region of said container means having a tapered, funnel-shaped configuration and said upper end region of said container means having a relatively flat but tapered configuration inclined oppositely to said lower end region.

4. The combination of claim 1 and wherein said container means has a side wall provided at said upper end region of said container means with extensions which are directly connected with said frame means for fixedly suspending said container means from said frame means.

5. The combination of claim 1 and wherein a clamping means clamps said container means to said frame means.

6. The combination of claim 5 and wherein said container means carries a reinforcement means which engages said clamping means to limit slipping of said container means with respect to said clamping means.

7. The combination of claim 1 and wherein said frame means has at said upper end region of said container means a filling portion through which said container means can be filled and an elongated frame portion connecting said filling portion to the remainder of said frame means and forming a walk along which an individual can move across the top of said frame means.

8. The combination of claim 7 and wherein said con-

tainer means has at the region of said filling portion of said frame means an extension, and clamping means clamping the latter extension to said frame means at said filling portion thereof.

9. The combination of claim 7 and wherein a removable cover means is carried by said filling portion of said frame means for closing said container means.

10. The combination of claim 1 and wherein said guide means has the form of a pin-and-slot connection with said frame means and a means operatively connected to the latter connection for adjusting the frictional engagement between said guide means and frame means.

11. The combination of claim 1 and wherein a spring means is connected between said frame means and guide means for yieldably and resiliently resisting movement of the lower end region of said container means with respect to said frame means in said direction.

12. The combination of claim 1 and wherein said guide means carries a means for discharging the goods out of said container means.

13. The combination of claim 1 and wherein said frame means has a cube-shaped configuration and includes side walls made up of frameworks of predetermined configuration.

14. The combination of claim 13 and wherein each side wall of said frame means has the form of a K-frame.

15. The combination of claim 13 and wherein said frame means has a top wall provided with a supporting ring from which said container means is suspended, said supporting ring being fixed to the remainder of said frame means, and a clamping means clamping said container means to said supporting ring.

16. The combination of claim 15 and wherein said supporting ring has an elliptical configuration and said frame means having elongated members extending along upper edges of said frame means, said elliptical supporting ring being fixed to central regions of said elongated members.

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