April 5, 1960 T. P. NELLIGAN 2,931,523

SELF-UNLOADING COMPARTMENT

Filed June 24, 1957

Fig. 1.

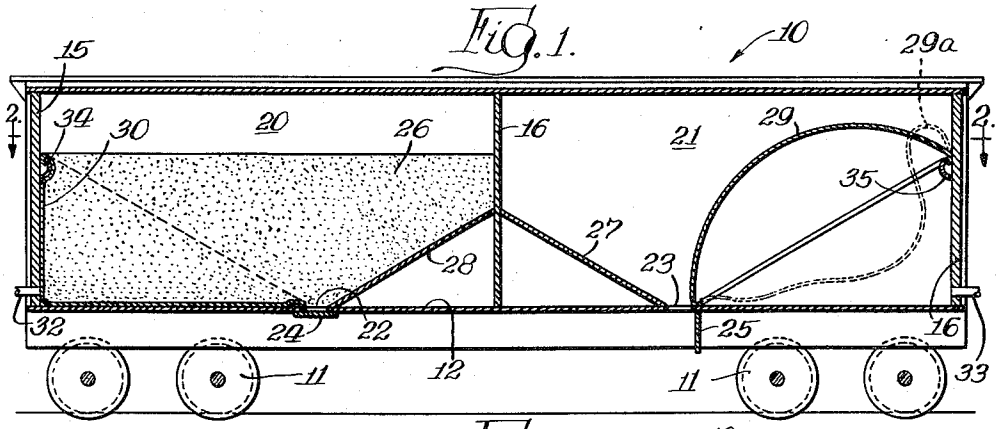


Fig. 2.

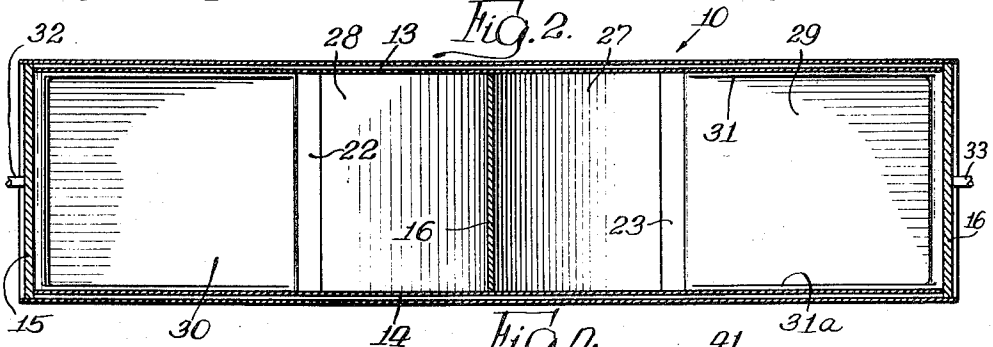


Fig. 4.

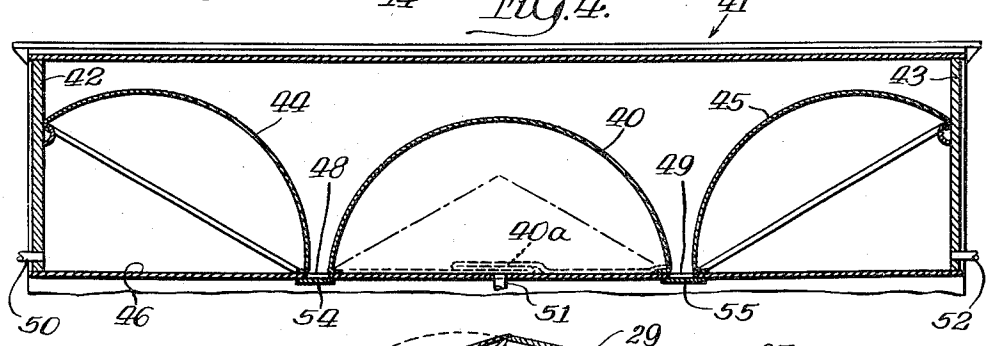
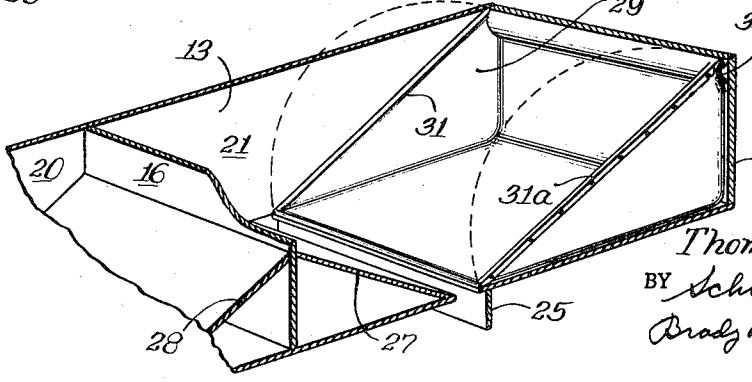


Fig. 3.



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SELF-UNLOADING COMPARTMENT

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4 Claims. (Cl. 214—82)

This invention relates to an unloading device and more particularly to a self-unloading compartment.

It is the general object of the present invention to produce a new and improved unloading device of the character described.

It is a more specific object of the invention to produce an unloading device particularly adaptable to provide for automatic unloading of compartments containing pulverulent material, such as small grains and the like which have a slump angle, that is, will flow so long as their upper surface is at an angle to the horizontal greater than the slump angle of the material.

As will hereafter become more readily apparent, one of the features of the invention is the provision of apparatus for emptying compartments, such as box cars, of loads of pulverulent material through suitable discharge openings in the bottoms or lower portions of the cars. In accomplishing this result I provide a membrane which may be in the form of a bag of flexible material, such as plastic, which is positioned to overlie a portion of the floor of the car. Means are provided for inflating the bag, thus, to elevate pulverulent material thereon to a point where the surface is at an angle to the horizontal equal to or greater than the slump angle of the material, so that it will thereby be caused to flow to the discharge outlet.

As previously pointed out, the apparatus of the present invention finds particular use as a means for unloading freight cars containing small grains, and a further feature of the invention resides in the fact that the apparatus may readily be incorporated in a common box car to convert the same into a self-unloading car. The apparatus may with equal readiness be removed from the car, so as to reconvert the same to normal usage.

At the present time it is not uncommon to provide self-unloading means for box cars used in carrying small grains but generally such means have comprised elaborate air duct systems for blowing the grain from the car and as such are difficult and expensive to install and require substantial modification of the car structure, so as to render it substantially unusable for other services.

Other objects and advantages of the present invention will be readily apparent from the following description and drawings in which—

Fig. 1 is a vertical longitudinal sectional view of a freight car provided with an embodiment of the invention,

Fig. 2 is a horizontal section along lines 2—2 of Fig. 1,

Fig. 3 is an enlarged fragmentary view of the lower right hand portion of Fig. 1, and

Fig. 4 is a view like Fig. 1 of a modified form of construction.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail several embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to Figs. 1–3 of the drawings, there is shown a box car 10 provided with wheeled trucks 11 and having a floor 12 at its bottom together with upstanding sidewalls 13 and 14 and end walls 15 and 16.

The box car 10 is divided by a central transverse partition 16 into two compartments 20 and 21. Each of the compartments is provided with a discharge opening in its bottom in the form of slots 22 and 23, each arranged to be closed by hinged doors 24 and 25.

When a door, such as the door 24, is opened the pulverulent material within the compartment 20, such as the grain 26, will flow outwardly of the opening 22 until the surface of the material is at an angle to the horizontal below the slump angle thereof. At this point the grain will no longer flow to and out of the opening. The grain in the center portion of the box car is maintained at or above its slump angle by virtue of the inclined floor portions 27 and 28 provided therein. These floor portions extend across the compartments from adjacent the centermost edges of the openings 22 and 23 upwardly to the central partition 16 and at an angle to the horizontal at least equal to the slump angle of the material to be transported in the car. If the material comprises small grains, such as barley or malt, the slump angle is approximately 30° and such would be the angle of the floor portions 27 and 28 to the horizontal.

With the floor arrangement shown in Figs. 1–3 a part of the material in the outermost portions of the compartments would remain therein after the doors 24 and 25 are opened as flow from such portions of the compartments to the discharge openings would terminate as soon as the surface of the material lay in a plane angulated with respect to the horizontal at the slump angle and intersecting the outermost edge of the discharge opening. To prevent such pocketing of the material there is provided in such portions of each of the compartments a membrane which can be moved by means of air pressure in an upward direction from a position beneath the pocketed material, thereby elevating the surface of the material above the inclined plane heretofore mentioned, thereby causing the material to resume its flow toward the discharge opening.

In the embodiments of the invention illustrated the membrane comprises the upper surface of inflatable bags 29 and 30 which may be made of plastic or other similar flexible material and which are secured within the compartments 20 and 21. As shown in Figs. 1–3 of the drawings one edge of each of the bags is secured across the compartments immediately adjacent the outermost edge of the openings 22 and 23 with the sides of the bags being secured by angle iron brackets 31 and 31*a* (in the case of the bag 29) to the sidewalls 13 and 14 of the car. Similar brackets are used to secure the edges of the bag 30 to the side walls. The edges of the bags opposite the edges secured adjacent the openings are secured to the end walls of the car along a horizontal line spaced above the floor of the car. Means in the form of suitable air line connections 32 and 33 are provided for inflating the bags 30 and 29, respectively.

In operation the bags are installed to occupy the solid line portion shown in Fig. 3, so that the interior surfaces of the bags are in contact with each other and the bag lies flat against the floor sidewalls and end walls of the car. In this position little space within the car is lost. To unload the car, the doors 24 and 25 are opened and the pulverulent material therein will flow outwardly through the opening until such time as the surface of the material in the outer ends of the compartments lies in or below the incline of the plane previously mentioned. At that time air may be intro-

duced into the bags by the air line connections 32 and 33, so as to inflate the bags, thereby raising the material thereon above the slump angle of the material. To avoid any pocketing at the outer extremity means are provided for retaining a bulge in the bag, such means being in the form of bolsters 34 and 35 which extend across the end walls of each car adjacent the point of attachment of the bag thereto. The effect of the bolsters is to cause the upper surface of the bag, upon initial introduction of air thereinto, to bulge adjacent the end walls, such as illustrated by the bag portion 29*a*. Continued introduction of air into the bags raises the material above the inclined slump angle plane thereby causing the material to flow to the discharge opening, with such inflation continuing until the bag reaches the fully inflated condition indicated by the bag 29 in solid lines in Fig. 1.

In the embodiment of the invention just described it will, of course, be realized that the space beneath the floor portions 27 and 28 is lost as no material is carried therein. If the loss of the space beneath the inclined floors is to be avoided, such floors can be replaced by inflatable bags, similar to bags 29 and 30, but, of course, proportioned to fit into the area vacated by the floors 27 and 28. The end walls of such bags are, of course, secured to the central partition in the same manner as the bags 29 and 30 are secured to the end walls of the car. Also, if desired, the central partition above the uppermost portion of the floors 27 and 28 (or above the end walls of bags substituted for the floors) may be omitted, although the existence of the partition sometimes facilitates loading and unloading of the car by virtue of the division of the contents into smaller units.

Another method for utilizing the space beneath the floor portions 27 and 28 is shown in the embodiment of the invention of Fig. 4. Here the floor portions 27 and 28 are replaced by a third inflatable bag 40. Referring to this figure it will be noted that the box car 41 is undivided between the end walls 42 and 43, so as to constitute but a single compartment. Inflatable bags 44 and 45, similar to the bags 29 and 30, are located adjacent the ends of the compartment with their inner edges being secured to the floor 46 of the car adjacent the outermost portions of the discharge openings 48 and 49 provided in the floor bottom. The edges of the bag 40 are located adjacent the centermost edges of the openings 48 and 49 and, of course, the bag 40 extends transversely across the center of the car. Means in the form of air line connections 50, 51 and 52 are provided for inflating each of the bags, and in unloading the car the bags 44 and 45 are inflated and operate in the same manner as the bags 29 and 30. The bag 40 is inflatable from the dotted line position indicated by 40*a* in the drawing to the solid line position of Fig. 4, thereby to elevate material in the center region of the car to a point above the slump angle.

It is believed to be clear from the foregoing that the freight car illustrated in Fig. 4 may be unloaded by inflating each of the bags 40, 44 and 45 to cause the material therein to flow out of the openings when the doors 54 and 55 controlling such openings are swung to open position. Again, like in the embodiments of Figs. 1–3, the edges of the bags in the embodiment of Fig. 4 may be secured in the desired position by means of angle iron brackets and, thus, are readily removable from the car to permit it to be used for purposes other than the transportation of the pulverulent material. It will also

be clear that the principles of the present invention may be employed in connection with compartments other than those provided by freight cars, for example the compartments provided by truck trailers and the like.

I claim:

1. A self-unloading device for discharging pulverulent material comprising means forming a compartment having a floor, opposed sidewalls and an end wall extending upwardly from the floor, a discharge slot in the floor, an inflatable bag in the compartment positioned to overlie the floor between the discharge slot and the end wall, means securing the bag to the opposed sidewalls along parallel lines slanting upwardly from adjacent the discharge slot to the end wall, and means for introducing air under pressure into the bag to lift material thereon above the slump angle of the material to cause the material to slide to and into the discharge slot.

2. The device of claim 1 in which said bag is secured to the end wall above the floor and including means on the end wall for retaining a bulge in the bag in the area thereof immediately adjacent the top portion of the bag.

3. A self-unloading freight car for discharging pulverulent material comprising a vertical partition extending transversely of the car at its center to divide the car into a pair of compartments, a floor portion in each compartment slanting upwardly from the bottom of the car said partition at approximately the slump angle of the material, a discharge slot extending transversely of the car in each compartment at the lower end of said floor, an inflatable bag in each compartment positioned to overlie the bottom thereof between the discharge slot and the end wall of the car, means securing opposite sides of each bag to the sidewalls of the car along a line slanting upwardly from adjacent the discharge slot to the end wall, means securing the side of each bag intermediate said opposed sides to the end walls along a generally horizontal line along the end wall and above the bottom of the car, and means for introducing air under pressure into each bag to lift material thereon above the slump angle of the material to cause the material to slide to said discharge slot.

4. A self-unloading device for discharging pulverulent material comprising means forming a compartment having a floor, opposed sidewalls and opposed end walls extending upwardly from the floor, a pair of spaced discharge slots extending transversely of the compartment from sidewall to sidewall, a first inflatable bag in the center portion of the compartment secured along its edge to the floor adjacent the centermost side of each slot, a second inflatable bag at one end of the compartment secured along one edge to the floor adjacent the outermost side of one slot and secured along its opposite edge to the adjacent end wall along a line spaced above the floor, a third inflatable bag at the other end of the compartment secured along one edge to the floor adjacent the outermost side of the other slot and secured along its other edge to the other end wall along a line spaced above the floor, and means for introducing air under pressure into each of the bags to lift material thereon above the slump angle of the material to cause the material to slide to the discharge slots.

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