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DEVICE FOR TRANSPORTING GRANULAR MATERIAL

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FIG. 1

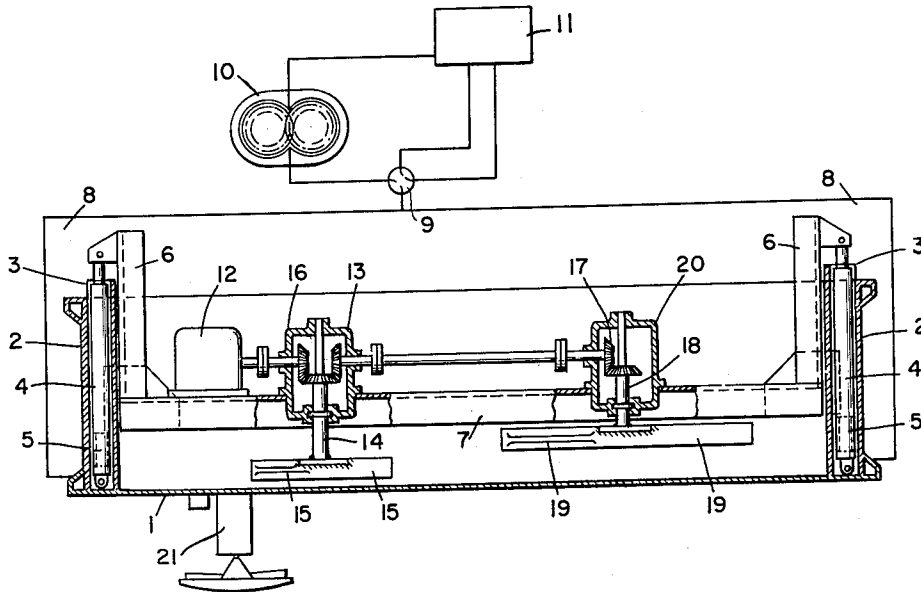
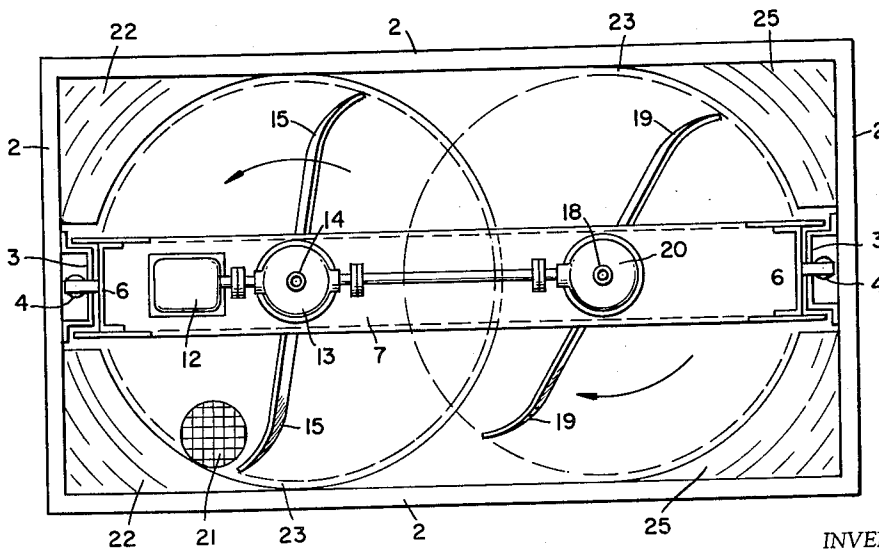


FIG. 2



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3,099,369 DEVICE FOR TRANSPORTING GRANULAR MATERIAL

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1 Claim. (Cl. 222-238)

The present invention relates to devices for transporting granular material.

More particularly, the present invention relates to devices which are adapted to be used in vehicles for the purpose of distributing sand, for example, to pavements which are covered with snow or ice so as to prevent such roads from becoming too slippery.

In devices of this latter type there is a particular problem involved in delivering the sand or other granular material to the structure which distributes the sand onto the roadway. Thus, a funnel unit receives the sand and distributes it onto the roadway, but at the present time considerable difficulty is involved in keeping a supply of the sand or the like moving to the distributor. Of course, it is known to provide laborers who manually keep a supply of sand or the like flowing toward the funnel of the distributor, but not only is this expensive but in addition the work is not very healthy not only from the standpoint of dust but also from the standpoint of the laborers becoming heated up while the vehicle is stationary and then being subjected to the cold blasts which arise during movement of the vehicle.

It is therefore a primary object of the present invention to provide a structure which will reliably deliver sand or other granular material to a device used for distributing the granular material.

A further object of the invention is to provide a device of this type which is capable of delivering the sand or the like efficiently to a discharge opening of a container which is not necessarily located centrally of the container so that the structure of the invention will reliably move the granular material from all parts of the container to the discharge opening irrespective of where the latter is located.

It is also an object of the present invention to provide a device of the above type which does not form a permanent part of the vehicle so that after the vehicle is used for sanding purposes, for example, the structure of the invention may be removed and the vehicle can then be used for any other desired purposes.

It is also an object of the present invention to provide a structure of the above type which will make the best possible use of the available tailgate, liftgates, or the like even though such gates are of a relatively elongated rectangular shape which is not best suited for the delivery of the granular material.

The objects of the present invention also include the provision of an extremely rugged and at the same time simple structure which is relatively inexpensive and which at the same time will operate reliably over a long period of time to produce the desired results.

With the above objects in view, the present invention includes in a device for transporting a granular material a container having a bottom wall formed with a discharge opening which the granular material falls through and a rotary blade means carried by the container for rotation about an axis spaced from the discharge opening, this blade means serving to deliver to the discharge opening a granular material which is in the container.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claim. The invention itself, however, both as

to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a partly sectional partly schematic side elevation of a structure according to the present invention; and

FIG. 2 is a top plan of the structure of FIG. 1.

Referring now to the drawings, the structure of the invention includes a container provided with a bottom wall 1 and with four side walls 2, this container being open at the top. This container 1, 2 may be formed by a lift of the vehicle or of a trailer, such hollow lifts conventionally having the rectangular configuration which is illustrated in FIG. 2. On the other hand, if desired, a special container 1, 2 may be provided and fastened in any suitable way removably onto the tailgate or liftgate of a vehicle.

In either event the container 1, 2 has set into the latter a pair of standards 3 in the form of vertically extending profiled beams, and these standards 3 may be removably fixed to the left and right side walls 2 which are shown in FIGS. 1 and 2 in any suitable way as by suitable bolts and nuts. Each of these standards 3 carries a cylinder 4 in which a piston 5 is slidable, and each piston 5 has a piston rod which extends upwardly through the top end of each cylinder 4.

A vertical member or guide means 6 is fixed to each piston rod at the upper end of the latter and extends downwardly alongside of the standard 3, in the manner shown most clearly in FIGS. 1 and 2, and to the bottom end of each member 6 is fixed an end of an elongated carrier 7 which is in the form of a strong profiled beam extending longitudinally along the container in the interior thereof spaced over the bottom wall 1 thereof. Thus, during vertical movement of the pistons 5, which move at all times in synchronism, the carrier 7 will be raised or lowered. The cylinders 4 communicate with a pressure conduit 8 for a fluid such as oil under pressure, and this fluid such as oil is delivered to or removed from the conduit 8 by way of a four-way valve 9 which communicates with a pump 10 and with a supply reservoir 11.

The carrier 7 carries an oil motor 12 which through a bevel gear drive 13 drives a vertical shaft 14 to rotate the latter about its axis, and the shaft 14 at its bottom end is welded or otherwise fixed to an elongated blade 15. The blade 15 has the configuration which is most clearly evident from FIG. 2, and the shaft 14 together with the blade 15 forms a rotary blade means which is rotatable about the axis of the shaft 14. The blade 15 has its outer ends curved in opposite directions in the manner shown in FIG. 2. Thus, the blade 15 in this way forms a pair of diametrically opposed radial blades extending in opposite directions from the axis of the shaft 14. A suitable bearing and housing means 16 is provided for the bevel gear drive 13 as well as for the shaft 14, and it will be apparent from FIG. 1 that as the bearing means 16 moves up and down the shaft 14 and blade 15 will also move up and down so as to have their elevation adjusted.

The bevel gear drive 13 is connected with a second bevel gear drive 17 located in a housing 20 which is also carried by the carrier 7 and which forms a bearing for a shaft 18 which is parallel to the shaft 14 and which carries at its bottom free end a second blade 19 identical with the blade 15 but angularly out of phase therewith in the particular example illustrated. In the example shown in the drawings the blades 15 and 19 will rotate in opposite directions but are respectively located at different elevations so that although the circles through which they sweep overlap each other the blades will never

engage each other. As is apparent from FIG. 2, the structure operates so that the granular material which is moved by the blade 19 is delivered to, receive by, and further transported by the blade 15 which receives the granular material from the blade 19 at the region where the pair of circles through which the blades sweep overlap each other. The blade 15 then delivers the granular material to the discharge opening 21 which is formed in the bottom wall 1 of the container 1, 2.

The arrangement of the drives 13, 17 can also be provided in such a way that the blades 15 and 19 rotate in the same direction, and in this case the blades can be located in the same horizontal plane without any danger of engaging each other simply by properly displacing one of the blades angularly with respect to the other while rotating the blades always at the same speed, although even in this case it is preferred to arrange the blade 19 at an elevation slightly higher than the blade 15 so that a certain amount of granular material will remain beneath the blade 19 to be received and further transported by the blade 15, as in the example illustrated in the drawing, to the discharge opening 21.

As is particularly evident from FIG. 2, the circular area through which the blade 15 sweeps is located over the entire discharge opening 21 through which the granular material falls to the funnel of the distributor.

Also, as is indicated in FIG. 2, filler pieces 22 and 25 can be located in the left and right corners, respectively, of the container 1, 2, these pieces 22, 25 having surfaces which are inclined downwardly toward the bottom wall of the container while moving inwardly away from the side wall thereof and at the same time leaving free the areas through which the blades sweep. Thus, these filler pieces 22, 25 may be placed in the conventional hollow liftgate (not shown) of a vehicle so as to promote the flowing of granular material toward the area in which the blades 15 and 19 operate.

Before the container 1, 2 is filled with the granular material the oil under pressure is delivered to the cylinders 4 so as to raise the pistons 5 and locate the carrier 7 together with all of the structure carried thereby at the highest elevation, and at this time the lowermost blade 15 will be located at an elevation which is approximately the same as the top edges of the side walls 2. Then the container is filled with the granular material in any suitable way such as by a conveyor, by power shoveling, or by hand shoveling. Before the distribution of the granular material onto the roadway starts, a valve which controls the flow of the granular material downwardly through the discharge opening 21 is opened so that the material starts to fall through the discharge opening 21 to the distributor, and then the oil motor 12 is set into operation so as to rotate the blades 15 and 19. These blades guarantee that the granular material reaches the opening 21 to fall therethrough to the distributor, this distributor being purely conventional and forming no part of the present invention. As the level of the granular material moves downwardly in the container the valve 9 is manipulated so as to permit the oil to flow out of the cylinders and thus cause the carrier 7 with the structure carried thereby to move downwardly.

As can be appreciated, if the structure of the invention were not set into the container 1, 2 and the latter were filled with sand or the like, this granular material would fall through the opening 21 but the falling of the granular material through the opening 21 would stop well before the container was empty. In other words the granular material located directly over the opening 21 would fall therethrough and some additional granular material would fall therethrough, but there would be practically no discharge of the granular material spaced at any substantial distance laterally from the opening 21. With the rotary blades 15 and 19, however, this granular material which is spaced even at a considerable distance from the opening 21 is reliably transported to the latter

to fall therethrough, and with the structure of the invention it becomes possible to make full use of the rectangular configuration of the liftgates or the like of a conventional vehicle. Thus, if the container 1, 2 were square, for example, or even round in cross section then the second blade 19 would not be required. However, as a result of the second blade 19 advantage can be taken of the entire area of conventional structures such as lift containers of conventional trucks, so as to make use of all of the volume of such containers to store the granular material which can be delivered with the structure of the invention to the discharge opening 21.

Of course, variations in the structure of the invention are possible without departing from the invention. For example, instead of blades 15 and 19 which extend in opposite directions from the axis of the shafts 14 and 18, respectively, it is possible to provide only a single blade extending in only one direction from the axis of the shaft 14 or 18, or it is possible to provide more than two blade portions extending radially from the axis of the shaft 14 or 18. Furthermore, the drive for the blades can come from the plant of the vehicle itself or an electric motor may be provided for this purpose. Also, the bearings provided by the housings 16 and 20 can remain stationary and the blades themselves can be moved with respect to the bearings vertically so as to have their elevation adjusted.

The structure of the invention is of particular advantage inasmuch as it can be removed from the container 1, 2 simply by disconnecting the standards 3 and raising the latter together with the elements 6, 7 and the structure carried thereby out of the container 1, 2 and then the vehicle can be used for whatever other purposes desired, so that with the structure of the invention it is not necessary to provide a vehicle especially designed for the purpose of distributing sand or the like and suitable for no other purpose so that it remains idle during the large part of the year.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of granular material transporting structure differing from the types described above.

While the invention has been illustrated and described as embodied in structure for transporting sand to sand distributors of vehicles for use on icy roads, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claim.

What is claimed as new and desired to be secured by Letters Patent is:

In a device for dispensing granular material, in combination, an elongated container having an endless side wall and a bottom wall formed adjacent said side wall with a discharge opening through which the granular material falls from the container; an elongated substantially horizontal carrier located over and extending along said bottom wall within said container; guide means cooperating with said carrier for guiding the latter for movement upwardly away from and downwardly toward said bottom wall; a pair of bearing means distributed along and carried by said carrier; a pair of rotary blade means respectively supported for rotation by said pair of bearing means, said pair of blade means respectively sweeping through overlapping areas and including blades located

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below said carrier between the latter and said bottom wall for engaging the granular material to transport the latter to said discharge opening to fall therethrough, the space in said container beneath said blades being completely free and unobstructed and said container defining a single interior space common to and housing said blades; a pair of cylinders carried by the container adjacent opposite ends of said carrier and extending vertically; a pair of pistons respectively slidable in said cylinders in response to the supply of fluid to or from the latter; a pair of piston rods respectively fixed to said pistons and connected with said carrier so that the latter moves up and down in response to movement of said pistons; and drive means operatively connected to said pair of rotary

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blade means for driving the same, said drive means being carried by said carrier and moving therewith.

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