July 27, 1954 R. A. SHIELDS 2,684,871

TRANSPORT CONTAINER

Filed March 3, 1950 2 Sheets-Sheet 1

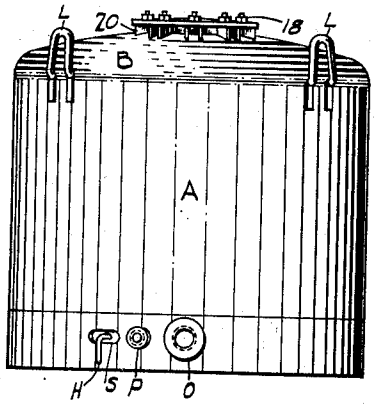

Fig-1.

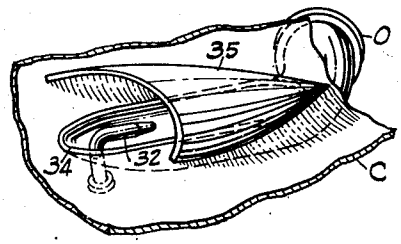

Fig-6.

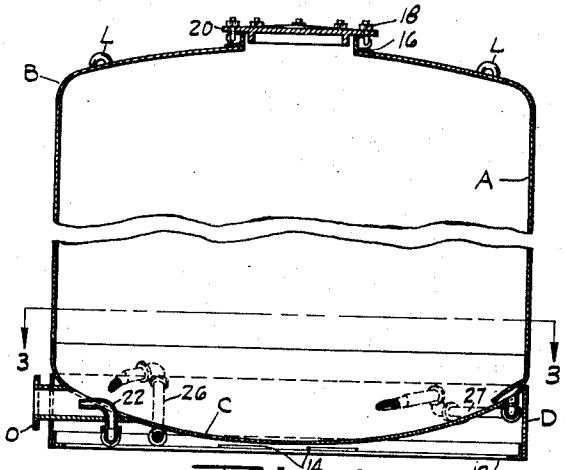

Fig-2.

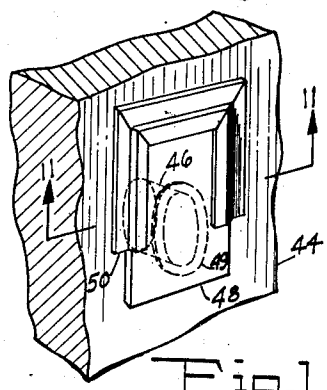

Fig-10.

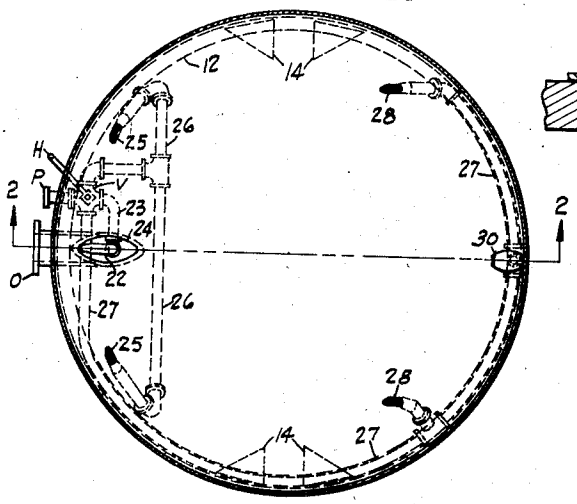

Fig-3.

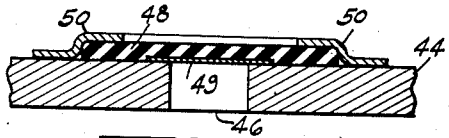

Fig-11.

INVENTOR

Robert A. Shields

July 27, 1954 R. A. SHIELDS 2,684,871

TRANSPORT CONTAINER

Filed March 3, 1950

2 Sheets-Sheet 2

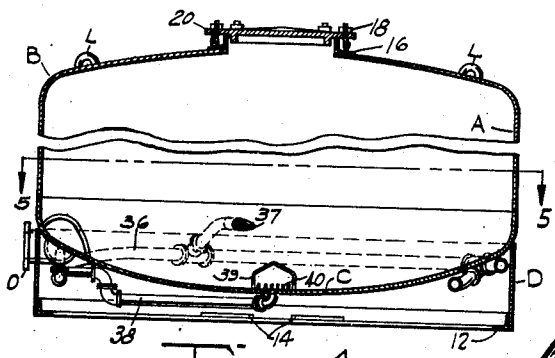

Fig-4.

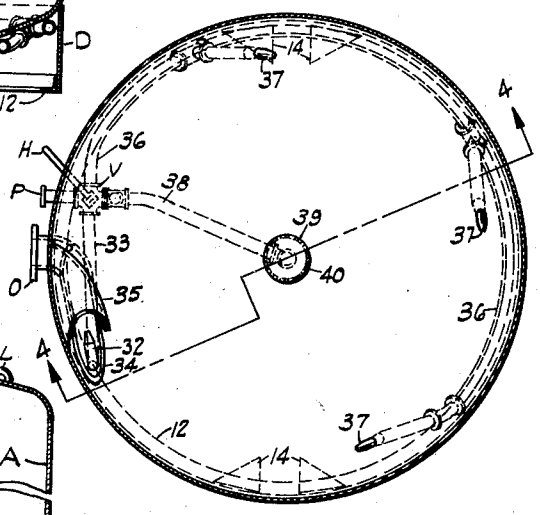

Fig-5.

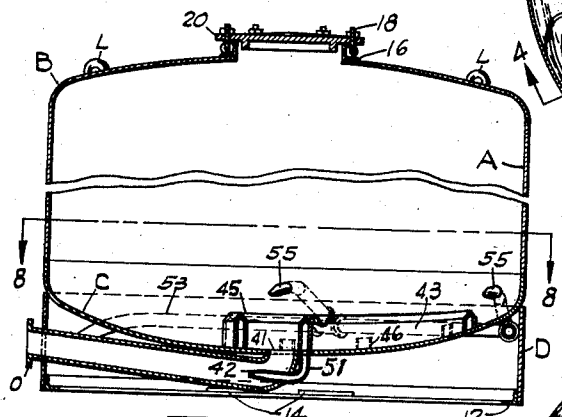

Fig-7.

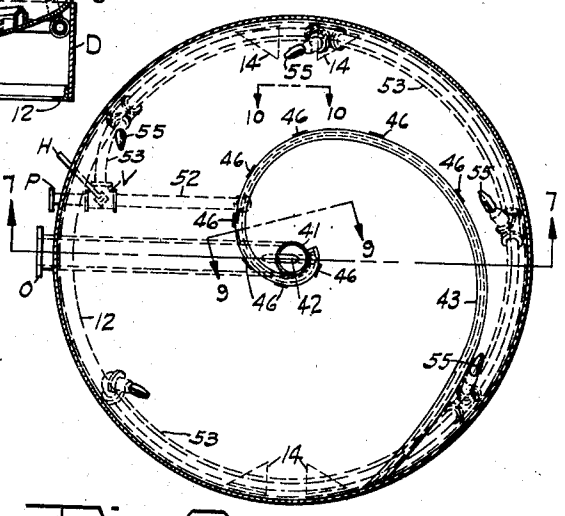

Fig-8.

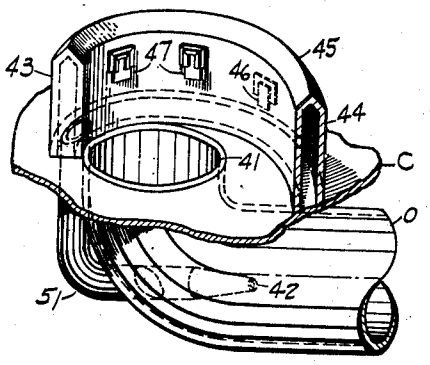

Fig-9.

INVENTOR

Robert A. Shields

Patented July 27, 1954

2,684,871

UNITED STATES PATENT OFFICE

2,684,871

TRANSPORT CONTAINER

Robert A. Shields, Bloomsburg, Pa., assignor to A C F Industries, Incorporated, a corporation of New Jersey

Application March 3, 1950, Serial No. 147,365

6 Claims. (Cl. 302—53)

1

This invention relates to transport containers in general and in particular to such containers adapted for the shipment of pulverulent materials such as flour, cement, etc., or granular materials such as sugar, salt, grains, etc.

The bulk of pulverulent and granular materials is now shipped in small packages such as paper bags, sacks or cartons. Recently attempts have been made to ship these materials in large lots from the factory to the point of use or to packaging plants. The transport containers as heretofore built have generally been of the gravity discharge type with a small number being of a combined gravity and pneumatic pressure type. With this latter combined type the containers could not be designed properly to withstand high pressures and of necessity were much higher than desirable and the center of gravity was too high to give a stable container during transit. It is an object, therefore, of the present invention to provide a container adapted for straight pressure discharge and in which both ends of the container are substantially identical.

A further object of the invention is the provision of a transport container having pressure actuated nozzles so positioned as to completely clean the container of the material being transported.

A yet further object of the invention is the provision of a transport container having pressure nozzles so arranged as to establish a cyclonic action to remove all material from the container.

A still further object of the invention is the provision of a transport container having pressure actuated nozzles so directed as to set up a cyclonic action in conjunction with guide means to direct the material out of the container.

Another object of the invention is the provision of a transport container having special valve arrangements preventing entrance of material into the pressure pipes.

These and other objects of the invention will be apparent to persons skilled in the art from a study of the following description and accompanying drawings, in which

Fig. 1 is an elevational view of the improved container;

Fig. 2 is a sectional view taken substantially on line 2—2 of Fig. 3;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a sectional view similar to Fig. 2 but taken on line 4—4 of Fig. 5 and showing a modified form;

Fig. 5 is a sectional view taken substantially on line 5—5 of Fig. 4;

Fig. 6 is a fragmentary perspective view of the discharge outlet of Figs. 4 and 5;

2

Fig. 7 is a sectional view taken substantially on line 7—7 of Fig. 8 and discloses a still further modification of the container;

Fig. 8 is a sectional view taken substantially on line 8—8 of Fig. 7;

Fig. 9 is a fragmentary perspective sectional view taken substantially on line 9—9 of Fig. 8;

Fig. 10 is a fragmentary elevational view looking in the direction of the arrows 10 of Fig. 8, and

Fig. 11 is a sectional view taken substantially on line 11—11 of Fig. 10.

Referring now to the drawings in detail it will be seen that the container is made of a cylindrical shell A, to the upper end of which is welded a convex end B with a substantially convex lower end C welded or otherwise secured to the lower end of the cylindrical section. In order to support the container in an upright position and provide space for necessary piping, a skirt D is welded or otherwise secured to the bottom convex head and forms substantially a continuation of the cylindrical shell A. The lower edge of the skirt is stiffened by an angle or other structure 12, giving added bearing area to support the container and to this angle may be welded or otherwise secured triangular shaped plates 14 by means of which the container may be held in proper position on a container car, such as shown in applicant's copending application for Container Car, Serial No. 147,366 filed March 3, 1950. The convex upper end B has a central opening cut therein and stiffened by an angle or other shaped frame 16 to which is fastened swinging bolts 18 adapted to engage and hold in place a pressure retaining inlet cover 20. The bottom convex end C is pierced at the desired point to permit the outlet pipe O to have opening into the container. This outlet pipe as clearly shown extends outwardly through the skirt D previously referred to. Adjacent the outlet O is a pipe connection P for the entrance of pressure matter, such as air, to the piping system of the container. The flow of this pressure matter will be controlled by a valve V by means of an operating handle H extending through a slot S in the supporting skirt. Since the container is adapted to be carried on road, rail or water vehicles lifting loops L are attached to the upper ends of the cylindrical shell so that hoist chains may be attached for movement of the container between the different means of transport or from the transport vehicle to a fixed base for discharge.

Referring now to the form shown in Figs. 2 and 3 it will be seen that the outlet pipe O intersects the bottom convex head C and extends radially outward through the supporting skirt. Mounted within the outlet is a main discharge nozzle 22

connected by pipe 23 to the valve V. The intersection of the round outlet pipe O with the convex bottom C produces an elliptical opening 24 as viewed in plan Fig. 3. Located on either side of the opening 24 are nozzles 25 which nozzles are connected by pipes 26 to an outlet of the four-way valve V. Extending from the fourth outlet of the valve V is a pipe 27 which follows along the skirt D and is connected by branches to nozzles 28 and to a fixture 30 welded or otherwise attached in the container directly opposite the outlet pipe O. The nozzles 25 direct material carried within the container toward the outlet 24 as do nozzles 28 and fixture 30. While the nozzles 25 and 28 produce a more directional jet of pressure fluid, the fixture 30 will provide a broad fan tending to sweep the entire lower area of the container bottom C. This is most economically done by welding only the upper edges of the fixture 30 to the container end, leaving the air or other pressure fluid escape along portions of the side and inner end.

Referring now to the form shown in Figs. 4, 5 and 6 it will be seen that the main outlet nozzle 32 has been mounted in the outlet pipe O, which in this case is curved, having the inner end extending circumferentially of the container bottom end C and in this case the end of the pipe is welded or otherwise secured to the bottom of the container which has an opening 34 cut therein giving access to the outlet pipe O. In order to shroud the outlet and to guide material into the outlet a curved protecting plate 35 is welded to the container bottom and shell and serves in effect as a continuation of the outlet pipe within the container. The main outlet nozzle 32 is connected by pipe 33 to one port of the four-way valve V, while the opposite port is connected by pipe 36 to nozzles 37, which nozzles are directed to deliver their blast of pressure fluid in a substantially tangential direction. The fourth outlet port of the valve V is connected by pipe 38 to a central structure 39 which is welded or otherwise secured within the container and has its bottom edge serrated as at 40 so as to deliver a complete fan of air or other pressure fluid over the entire bottom of the container. In other words, this fixture 39 will direct a plurality of jets in a radial direction, thereby clearing the central portion of the container.

Referring now to the form shown in Figs. 7 to 11 it will be seen that the outlet pipe O extends into the center of the container and thence directed upwardly to pierce the bottom end C providing an opening 41. The main nozzle 42 is located in this outlet pipe immediately below the opening 41 and is directed to move material out through the outlet pipe O. Welded or otherwise secured to the inner surface of the bottom C is an upstanding hollow structure 43 which is spirally curved and extends from adjacent the shell of the container inwardly to terminate in an end concentric with the edges of the outlet 41. As best shown in Figs. 7 and 9 this spirally curved structure is formed by spaced plates 44 joined by an inverted V top 45. Spaced along the bottom outer edge of the spirally curved structure are a plurality of outlets 46, while located adjacent the upper edge of the inner wall are a small number of outlets 47, these outlets being located only in the zone immediately above the outlet opening 41. Outlets 46 and 47 are preferably covered by elastic flap valves, which, as shown in Figs. 10 and 11, are formed by a sheet of elastic material 48, to which is vulcanized or otherwise secured a small steel plate 49 which will prevent collapse of the

elastic material into the outlet opening. The sheet of elastic material is held in proper position by a frame 50 to which it is vulcanized or otherwise secured and which frame is secured to the walls 44 by any suitable means, such as spot welding. The main outlet jet 42 is preferably connected by a short pipe 51 to the interior of the spirally curved structure 43 and the interior of this spirally curved structure by means of a pipe 52 to an outlet of the three-way valve V. The other outlet of the valve V is connected by means of a circumferentially extending pipe 53 to a plurality of jets 55. These jets 55 are directed circumferentially of the container so as to cause a swirling or cyclonic movement of the material in the container. The outlets 46 also preferably discharge downwardly and circumferentially to add to this swirling action and prevent building up of material on the outer side of the curved guiding structure 43. As previously stated, the flaps covering outlets 47 are directed downwardly so as to assist in moving the swirling material into the outlet opening 41.

The valves V have the plugs ported so that when pressure is being supplied through pipes P to the container, the pressure will be supplied at all times to the main discharge nozzles 22, 32 and 42 of the respective modifications. Also, in the forms shown in Figs. 2 to 6 inclusive pressure will also be supplied to nozzles 28 and 30 of Fig. 3 and central structure 39 of Fig. 5. When the container is substantially empty the valve will be moved to its second position, thereby turning pressure fluid into nozzles 25 of Fig. 3 and 37 of Fig. 5 and cutting off the fluid from the nozzles 28, 30 of Fig. 3 and central structure 39 of Fig. 5, but pressure will always be supplied to the main nozzles 22, 32 and 42 irrespective of the setting of the valve. In the form shown in Fig. 8 pressure fluid will at all times be supplied irrespective of valve setting to the main nozzle 42 and outlet openings 46 and 47. When it is desired to thoroughly clean the container at the end of the emptying cycle, the valve will be moved to throw pressure into jets 55. It is, of course, obvious that the above illustration with respect to the setting of the valves and sequence of operation of the jets will be varied in accordance with the type of material being transported and experience in the discharging of this type of material.

It is to be noted that in the forms shown in Figs. 3 and 8 the outlet pipe extends radially of the container, while in Fig. 5 the main portion of the outlet pipe extends circumferentially of the container. It should also be noted that in Figs. 5 and 8 the jets tend to swirl the material into a guide structure which diverts the swirling material into the discharge outlet, thus in effect establishing a cyclonic movement of the material. In the structure of Fig. 8 this cyclonic movement is a true cyclonic movement due to the swirling and directing of the material toward the vortex, while a low pressure area is established due to the ejector action of the main nozzle 42. It should also be noted that in each of the modifications the main nozzle is active all of the time during discharge and one or more sets of secondary nozzles are active to move the material toward the outlet and, since these secondary nozzles discharge at the bottom of the container, they tend to lift the same in the container and intimately mix it with the pressure fluid. In this manner the material is fluidized and will readily flow to the low pressure area established at the outlet by the main discharge jet.

While the invention has been described more or less in detail with specific reference to three modifications, it will be obvious that other modifications and arrangements of parts and operation may be made without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. A pressure container for the handling of pulverulent or granular material comprising, a substantially cylindrical shell, convex ends secured to the shell to form a closed container, means to support the container in an upright position, a pressure retaining cover sealing an inlet opening in the upper convex end, an outlet secured to the lower convex end adjacent the center thereof and opening into the container for carrying material out of the container, nozzle means directed into the outlet to move material therethrough, secondary nozzle means opening into the container and adapted to agitate and move the material in the container, means to supply matter under pressure to said nozzles to substantially fluidize and move the material toward and through the outlet, guide means secured within the container to direct the moving material toward the outlet and being spirally curved from the shell to the outlet, and said secondary nozzles being so directed as to establish a whirling of the material with the center coincident with said outlet.

2. A pressure container for the handling of pulverulent or granular material comprising, a substantially cylindrical shell, convex ends secured to the shell to form a closed container, means to support the container in an upright position, a pressure retaining cover sealing an inlet opening in the upper convex end, an outlet secured to the lower convex end adjacent the center thereof and opening into the container for carrying material out of the container, nozzle means directed into the outlet to move material therethrough, secondary nozzle means opening into the container and adapted to agitate and move the material in the container, means to supply matter under pressure to said nozzles to substantially fluidize and move the material toward and through the outlet, guide means secured within the container to direct the moving material toward the outlet, said guide means being formed as a hollow conduit for matter under pressure.

3. A pressure container for the handling of pulverulent or granular material comprising, a substantially cylindrical shell, convex ends secured to the shell to form a closed container, means to support the container in an upright position, a pressure retaining cover sealing an inlet opening in the upper convex end, an outlet secured to the central portion of the lower convex end and opening into the container for carrying material out of the container, an upwardly projecting spirally curved guide structure extending from the edge of the lower convex end inwardly to the edge of the outlet opening, a main nozzle to move material through the outlet, secondary nozzles positioned on the convex side of said curved guide and having openings directed tangentially thereof, and additional nozzles positioned adjacent the inner end of the curved guide on the concave side thereof and having openings directed vertically into the outlet opening.

4. A pressure container for the handling of pulverulent or granular material comprising, a substantially cylindrical shell, convex ends secured to the shell to form a closed container, means to support the container in an upright position, a pressure retaining cover sealing an inlet opening in the upper convex end, an outlet secured to the central portion of the lower convex end and opening into the container for carrying material out of the container, an upwardly projecting spirally curved guide structure extending from the edge of the lower convex end inwardly to the edge of the outlet opening, a main nozzle to move material through the outlet, secondary nozzles positioned adjacent the periphery of the lower end and having openings directed circumferentially thereof to move material against said guide structure, and an additional nozzle directed to move the material along the guide structure and into the outlet opening.

5. A pressure container for the handling of pulverulent or granular material comprising, a substantially cylindrical shell, convex ends secured to the shell to form a closed container, means to support the container in an upright position, a pressure retaining cover sealing an inlet opening in the upper convex end, an outlet secured to the central portion of the lower convex end and opening into the container for carrying material out of the container, an upwardly projecting spirally curved guide structure extending from the edge of the lower convex end inwardly to the edge of the outlet opening, a main nozzle to move material through the outlet, secondary nozzles positioned on the convex side of said curved guide and having openings directed tangentially thereof, and additional nozzles positioned adjacent the inner end of the curved guide on the concave side thereof and having openings directed vertically into the outlet opening, said secondary and additional nozzles being formed by elastic material covering openings in the guide structure.

6. In a pressure container for the handling of pulverulent or granular material comprising, a substantially cylindrical shell, convex ends secured to the shell to form a closed container, means to support the container in an upright position, a pressure retaining cover sealing an inlet opening in the upper convex end, an outlet secured to the lower convex end and opening into the container for carrying material out of the container, a main nozzle to move material through the outlet, and secondary nozzles to move material toward the outlet, said secondary nozzles consisting of an opening into the container, an elastic sheet covering the opening to prevent ingress of material from the container, and means securing the elastic sheet in position on substantially three sides whereby pressure fluid may escape from the opening and be directed by said elastic sheet toward the outlet.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
752,598	Schwend	Feb. 16, 1904
2,115,023	Kennedy	Apr. 26, 1938
2,147,300	Kennedy	Feb. 14, 1939
2,191,096	McCurdy	Feb. 20, 1940
2,238,051	Hackley	Apr. 15, 1941
2,274,708	Kennedy	Mar. 3, 1942

FOREIGN PATENTS

Number	Country	Date
136,583	Great Britain	Dec. 24, 1919
641,056	France	July 27, 1928