May 12, 1970 A. SIBITZ 3,511,363

DISCHARGE VALVE FOR VIBRATORY CONVEYORS

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Fig. 1

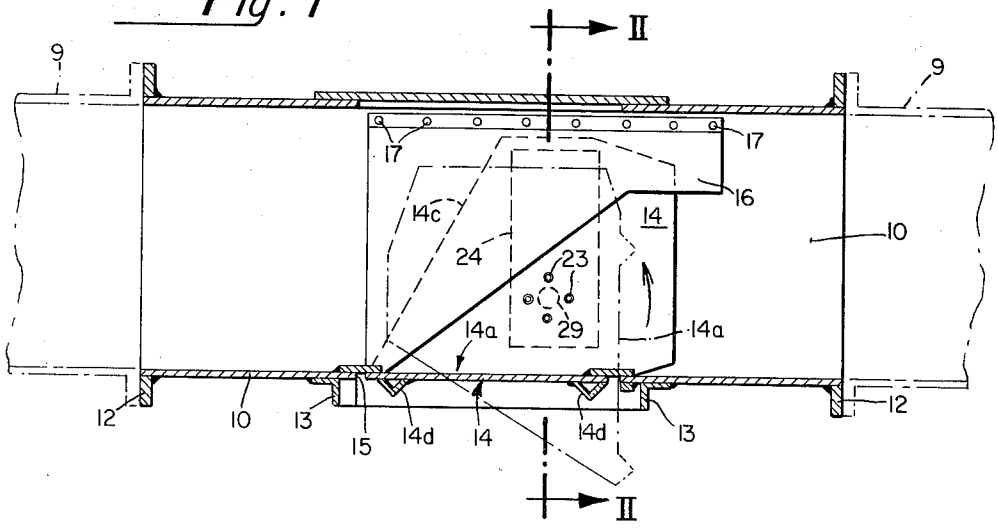

Fig. 2

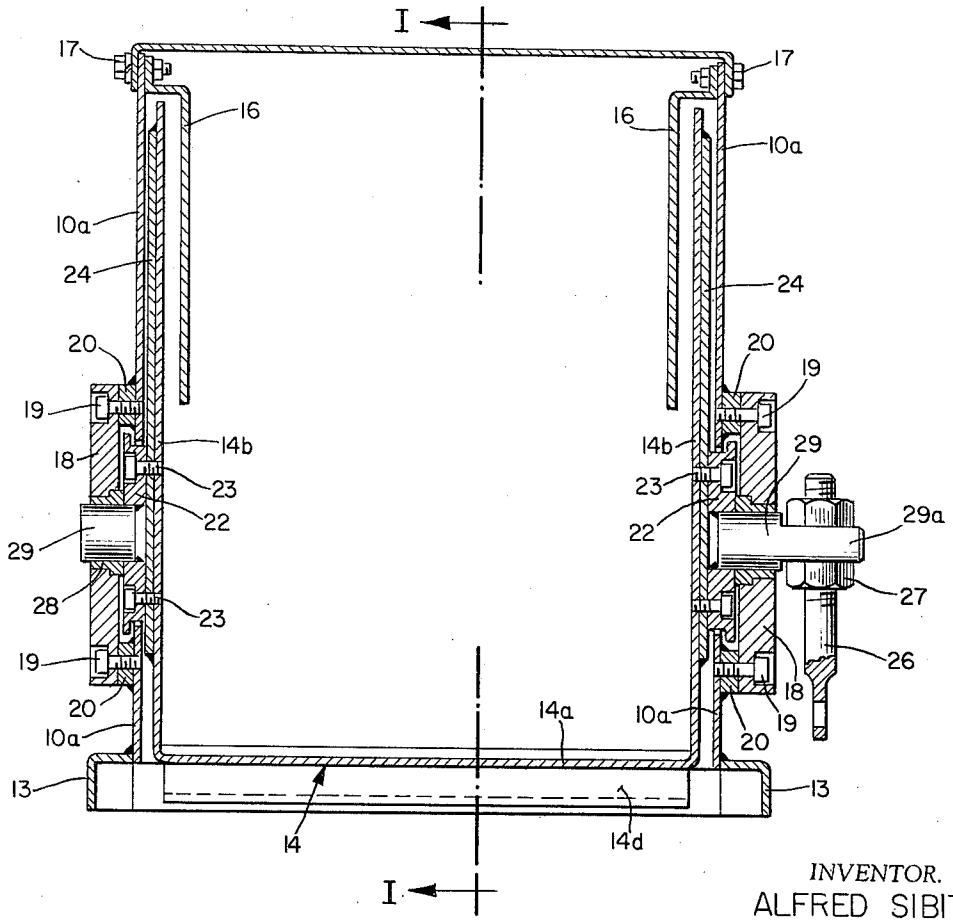

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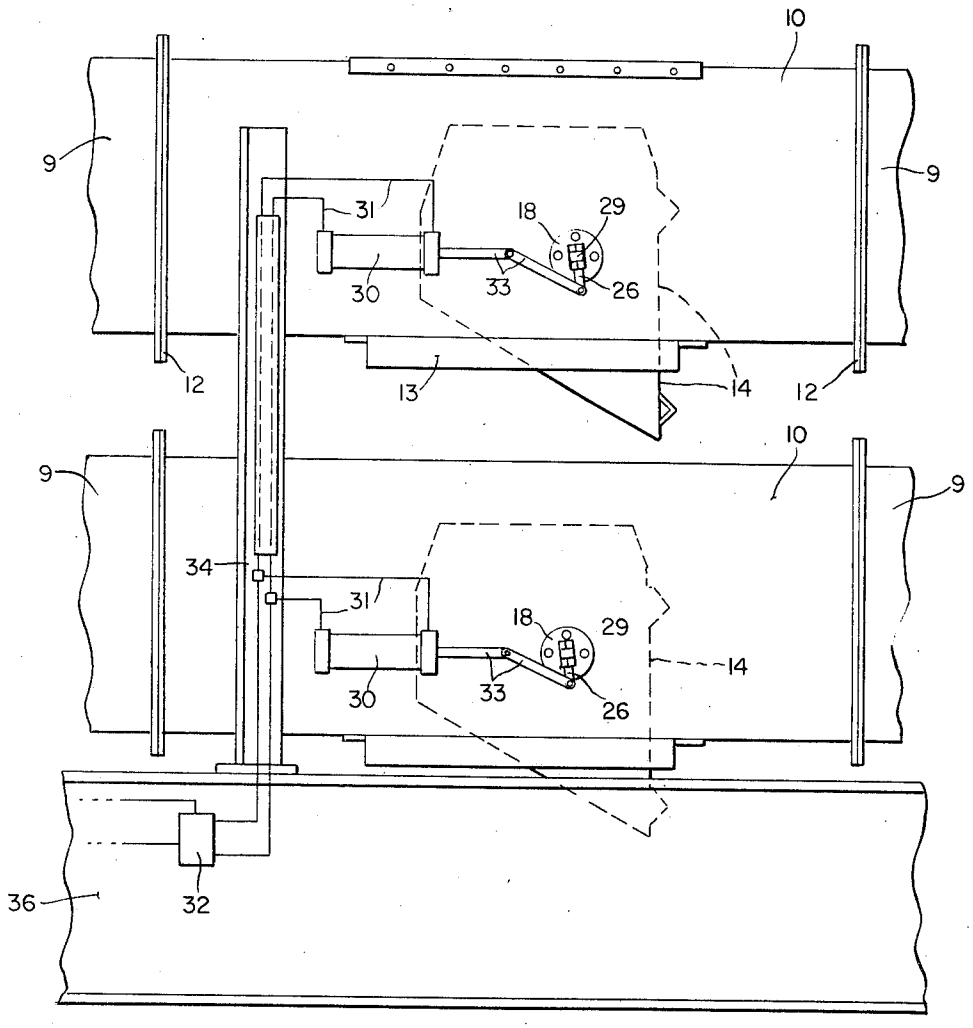
Fig. 3



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DISCHARGE VALVE FOR VIBRATORY CONVEYORS

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Int. Cl. B65g 27/00
U.S. Cl. 198—220 5 Claims

ABSTRACT OF THE DISCLOSURE

A discharge valve or flap for tubular or trough-shaped vibratory conveyors or chutes is disclosed for opening and closing a delivery opening on the underside of the conveyor. The flap has a bottom portion and upstanding side walls which decrease in height toward the rear or exit edge of the delivery opening. The flap is rotatable about a pair of horizontal axles or trunnions which are located on the center line of gravity of the flap, or at least close thereto. The flap is driven by means, such as a hydraulic cylinder, mounted on the vibratory conveyor and vibrating therewith. The discharge flap and its drive mechanism are set into the conveyor by flange connections.

FIELD OF THE INVENTION

This invention relates to vibratory conveyors and particularly to discharge flaps or valves for such conveyors.

DESCRIPTION OF THE PRIOR ART

The invention concerns a discharge valve or flap for conveyors, preferably vibrator conveyors, with tubular or gutter-shaped cross-section in which the flap either opens or closes a delivery opening introduced on the underside of the conveyor. To open and close the delivery opening, the flap is rotated about a horizontal axle. The material may discharge into a bin underlying the conveyor, or into another conveyor.

The discharge flaps or valves of the prior art rotate about a horizontal axis located at or close to the underside of the conveyor and running along the end of the flap. Thus, the axis of rotation of the flap is not at the center of gravity of the flap. As a result, when the flap must be quickly opened, or quickly closed, a very large opening force, or a very large closing force, is necessary, because the vibrational movements of the conveyor subject the flap to large accelerations. The large required opening or closing forces are produced in the prior art by spiral springs provided on each side of the flap.

In the prior art form of flap referred to above, the flap opens upward but it does not completely open because it is joined to the upper part of the conveyor, and the cross-section of free passage in the conveyor is narrowed because of the presence of the connecting element between the flap shaft and the flap bottom or floor. Also in the prior device, the operation of the flap is accomplished by a driving device located on the base frame of the conveyor, and if the conveyor be a vibrating conveyor, the driving device for the flap does not also vibrate. In practice, this type of drive, especially in conjunction with a vibrating conveyor, becomes complicated and subject to trouble and to considerable maintenance.

SUMMARY OF THE INVENTION

To avoid the disadvantages referred to above, the present invention proposes that the horizontal axis about which the flap rotates shall run through the center of gravity of the discharge flap, or at least close to it, so

that the forces of acceleration mentioned hereinabove are not effective. In accordance with the present invention, the foregoing is achieved by mounting the flap on a pair of axles or trunnions mounted for rotation in the side walls of the conveyor. Further, in accordance with this invention, when the conveying device is a vibrating conveyor, the driving device is mounted on the vibrating conveyor itself to engage the axle of rotation. Such driving device may be a hydraulic or pneumatic working cylinder which follows the working vibration of the conveyor. This provides a constructionally trouble free connection between the moving parts of the working cylinder and the axle of rotation of the flap.

According to the present invention, the flap itself consists of a bottom portion (which is the actual part which closes the discharge opening) and upstanding side walls which are secured to the horizontal axle or trunnions. The side walls preferably are of decreasing height toward the rear of the flap, i.e., toward the exit edge of the delivery opening.

Further, in accordance with the present invention, the discharge flap or valve, and the drive mechanism therefor, are designed as separate constructional elements which can be set into the vibrating conveyor, as by means of flanges, and which have a cross-sectional configuration which is adapted to that of the conveyor trough.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevational view, partly in section, of the discharge device of the present invention set into a vibrating conveyor;

FIG. 2 is a cross sectional view along the lines II—II of FIG. 1;

FIG. 3 is a simplified diagrammatic illustration of two discharge sections set into upper and lower vibrating conveyors, showing the drive means for opening and closing the discharge flaps.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a discharge section **10** set into a vibrating conveyor **9** and connected thereto by means of the flanges **12** provided at each end of the discharge section **10**. The discharge section **10**, and also the vibrating conveyor **9**, are shown to be of rectangular cross-section, but could have some other configuration.

The floor of the discharge section **10** is provided with a delivery opening framed by the angular member **13**. The discharge flap **14** comprises a bottom portion **14***a*, and upstanding side walls **14***b*. In the form illustrated in the drawing, the walls **14***b* are of decreasing height in the direction toward the delivery edge **15** of the opening, the side wall boundary being identified in FIG. 1 as **14***c*. On the underside of the bottom **14***a* of the flat **14**, reinforcing angle irons **14***d* are welded to give the flap sufficient self-rigidity.

Secured, as by screws **17**, to the upper edge of each of the side walls **10***a* of the discharge section **10**, is a metal sheet **16** which projects slightly inwardly and then downwardly to provide a space between the sheet **16** and the side wall **10***a* for receiving the side walls **14***b* of the flap **14**. The extent to which sheet **16** extends downwardly varies, being less at the front and greater at the rear, as seen clearly in FIG. 1 where the front is to the right and the rear is to the left. Thus, the sheets **16** provide a compartment on each side of the section **10** in which the side walls **14***b* of the flap **14** move as the flap **14** rotates during opening and closing movements.

The flap **14** is rotatable about the axle stubs **29** located at, or approximately at, the center of gravity of the rotatable flap. Each of the axle stubs **29** is mounted for rotation in a bearing **28** supported in a bearing sup-

port body **18** secured by screws **19** to the side wall **10***a* of the discharge section **10**. Spacers **20** are provided between the bearing support body **18** and the side wall **10***a* of the discharge section.

The connection between the axle stubs **29** and the flap **14** can be achieved in a variety of ways. In the drawing, the axle stubs **29** are shown welded to ring members **22** which are secured to the side walls **14***b* of the flap **14** by the screws **23**. In the preferred form, a reinforcing metal sheet **24** is interposed between the ring member **22** and the side wall **14***b* and is secured to the side wall **14***b* as by welding.

Rotation of the flap **14** on the axle stubs **29** is accomplished by means of a lever **26** which is secured, as by nuts **27**, to an extension **29***a* of the one axle stub **29**, the right axle stub as viewed in FIG. 2. Any suitable drive means may be provided for moving the lever **26** to rotate the flap between opening and closing positions. To move from open to closed position, and vice versa, the flap **14** is rotated 90° about the axle stubs **29**, as is indicated in FIG. 1.

In FIG. 1, the flap **14** in closed position is shown in solid lines, except that where the side walls of the flap are hidden by the metal sheet **16** the flap side walls are shown in dashed line. The flap **14** in open position is shown in FIG. 1 in dot-and-dash lines. To change the flap **14** from closed to open position, the flap is rotated 90° about the axle **29**, in the counter-clockwise direction as viewed in FIG. 1. This brings the floor **14***a* from the horizontal position to the vertical position, as viewed in FIG. 1. To close the flap **14**, the flap is rotated 90° in the clockwise direction.

As previously indicated, any suitable means may be employed to rotate the flap **14** the required 90°. FIG. 3 illustrates in simplified diagrammatic form one suitable means. In FIG. 3, a pair of tubular vibrating conveyors **9** are shown, one above the other, and a discharge section **10** is shown inserted into each of the conveyors and connected thereto by the flanges **12**. Each of the discharge sections **10** is provided with a flap **14** rotatable about the axle **29** which is mounted in the bearing support **18**. Rotation of the axle **29** is effected by the lever **26** which is adapted to be pulled and pushed through an angular movement of 90° by the piston and linkage **33** of the pneumatic cylinder **30** to which compressed air is supplied through the conduits or hoses **3**. The air hoses **31** are supported on a bracket **34** and are supplied from a regulating valve **32** mounted on the base **36**. In FIG. 3, the flaps **14** are in the open position and the piston **33** is in its extended position. To close the flaps, the extended piston **33** is retracted, thereby to effect clockwise movement of the lever **26** through an angular arc of 90°, thereby to effect closing of the flap.

In FIG. 3, since the pneumatic cylinders **30** are mounted on the side walls of the discharge section **10**, the cylinders **30** follow the vibratory motion of the vibrator conveyors.

As already indicated above, by supporting the flap **14** for rotation about an axle **29** which intersects the center of gravity of the flap (or is at least in the close vicinity thereof) the force necessary for swinging the flap from the open to the closed position, and vice versa, is substantially reduced. As a consequence, the power elements required to execute the swivel movement of the flap, which in the present illustration are the air cylinders **30**, can be relatively small and fed directly to the compressed air source through flexible compressed air hoses or tubes. In brief, the construction provided by the present invention is relatively simple and cheap in comparison with devices of the prior art intended to perform the same function.

What is claimed is:

1. In combination:

(a) a conveyor having a bottom and two side walls;

(b) a delivery opening in said bottom of said conveyor;

(c) a discharge valve, said discharge valve in one position closing said delivery opening and in another position uncovering said opening;

(d) said discharge valve comprising a rotatable structure having a bottom and side walls, the bottom of said rotatable valve structure being shaped for closing said delivery opening;

(e) a trunnion supported on opposite side walls of said conveyor and located substantially on the center of gravity of said rotatable valve structure and above the bottom thereof, said rotatable valve structure being attached to and pivoting about said trunnions to assume closed and open positions;

(f) drive means for opening and closing said valve.

2. Apparatus according to claim **1** characterized in that said trunion at one side of said conveyor extends outwardly from the side walls thereof, and in that said drive means includes lever means attached to said trunnion extension for rotating said discharge valve.

3. Apparatus according to claim **2** characterized in that said conveyor is a vibrating conveyor and in that said drive means includes actuable piston means seated directly on the conveyor and following its vibratory motions.

4. Apparatus according to claim **3** characterized in that the side walls of said rotatable structure possess a height which decreases toward the exit edge of the delivery opening.

5. Apparatus according to claim **4** characterized in that said rotatable structure and said trunnion are mounted in a separate flanged tubular or gutter-type section having a cross-section corresponding to that of said conveyor and adapted to be set into said conveyor and attached thereto as an intermediate portion thereof.

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U.S. Cl. X.R.

198—205