Dec. 6, 1966 L. W. WATKINS 3,290,462

BIN-LEVEL SWITCH

Filed July 19, 1965

FIG. 2

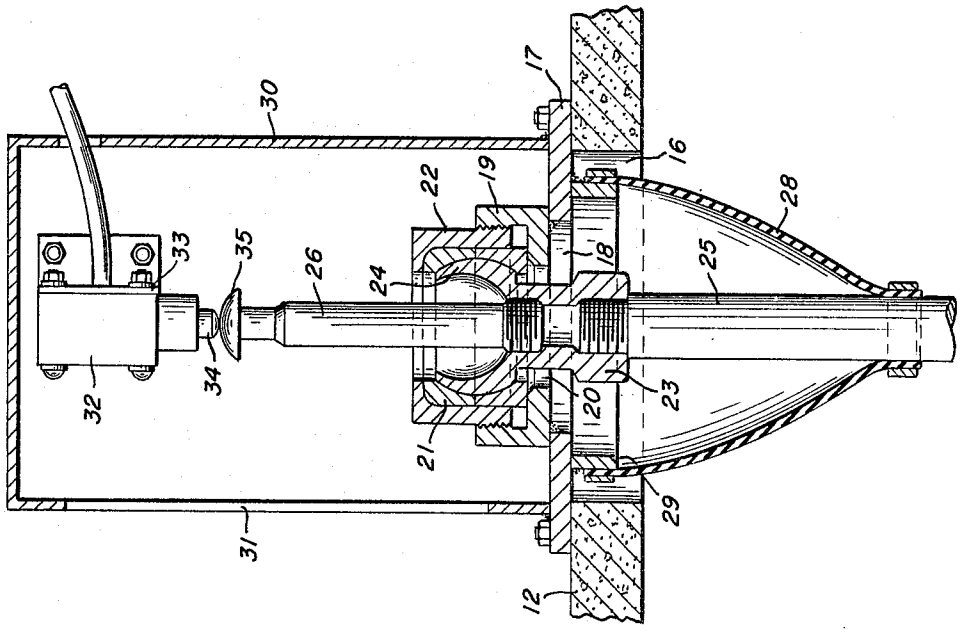
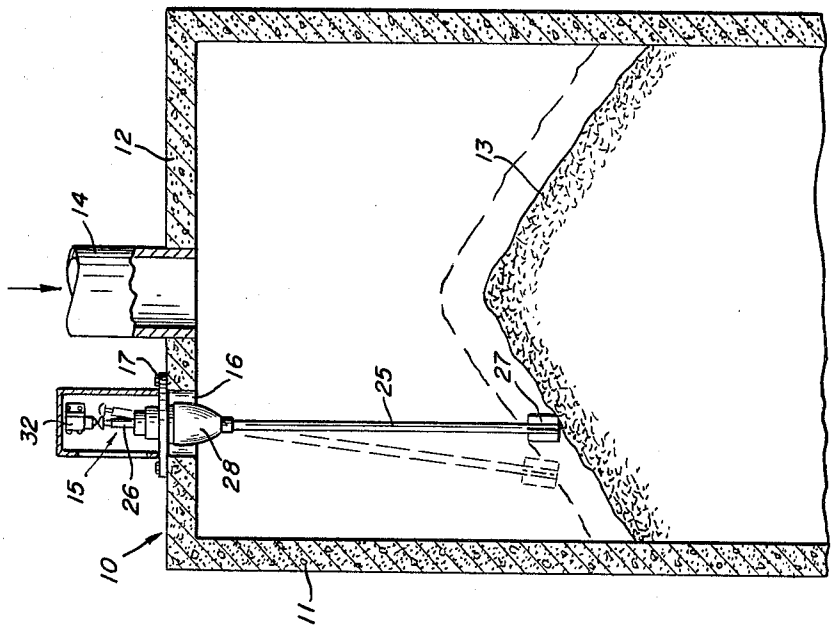


FIG. 1



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BIN-LEVEL SWITCH

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This invention relates to a control switch adapted to be actuated by the piling up of the solid contents of a storage bin or tank to a predetermined level. The switch may control a signal or the means supplying material to the bin or both.

Various types of bin-level control switches are generally known. One example is that shown in Mayer Patent No. 2,442,275. Such devices with which I am familiar are, however, subject to serious objections in that they require excessive maintenance and are uncertain or erratic in operation. The latter shortcoming is accentuated by the fact that storage bins are usually provided with vibrators to break down the condition called "hanging up" of the bin contents, and the vibrations induced thereby frequently cause false operation of the bin-level control device. Known bin-level switches, furthermore, are highly sensitive and require critical adjustment for proper operation. It is the object of my invention, therefore, to provide a device of the type mentioned which overcomes the aforementioned difficulties, requires substantially no maintenance even over extended periods of time and is always positive and certain in operation.

In a preferred embodiment, my invention comprises a pendent rigid rod, the lower end of which is adapted to be engaged by solid material piling up in the bin. The rod is pivoted for universal movement in a bearing carried on the bin structure or other suitable support. A rigid arm extends upwardly from the bearing and engages a two-position switch, so long as the rod is substantially vertical. When the rod is angularly displaced by the solid material piling up in the bin, the arm moves out of engagement with the switch and thereby permits it to shift from one position to another.

A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating the present preferred embodiment. In the drawings:

FIGURE 1 is a partial vertical section through the upper portion of a coal bunker or bin having the invention applied thereto; and

FIGURE 2 is a vertical central section through the device of my invention.

Referring now in detail to the drawings, and for the present, to FIGURE 1 particularly, a bunker or bin **10** having a side wall or walls **11** and a top **12** is adapted to receive a filling **13** of coal or the like through a central charging port **14** in the top. As indicated, the coal charged into the bin **10** rises to successively higher levels, the top of the pile maintaining a generally conical shape. My invention, indicated generally at **15**, is mounted in top **12** or other convenient generally horizontal support, between port **14** and side wall **11**. In the illustrated embodiment, a hole **16** in top **12** has a plate **17** secured thereover, on which the device of my invention is mounted.

Referring now to FIGURE 2, plate **17** has a hole **18** approximately centrally thereof and a shallow cup **19** threaded internally and provided with a bottom opening **20** is secured thereover by welding. A horizontally split spherical seat **21** is positioned on the bottom of cup **19** and secured centrally thereof by a gland **22**. A coupling **23** has a spherical head **24** open at the top positioned in seat **21** for universal movement therein. Seat **21** and head **24** together constitute a universal ball-and-socket pivot bearing. The lower portion of coupling **23** is tapped to receive a rigid reach rod **25** threaded thereinto and the intermediate portion of the coupling is similarly tapped to receive a rigid arm **26** in upstanding relation to head **24**.

Rod **25** extends downwardly from plate **17** for a suitable distance so the lower end thereof will be engaged by coal piling up in the bin, thereby tilting the rod in the pivot bearing afforded by seat **21** and head **24**, when the coal level in the bin has risen to a predetermined height. A shield **27** composed of web-plates radially attached to rod **25** takes the impact of lumps of coal rolling down from the extreme top of the bin contents. A flexible dust shield or stocking **28** is banded to rod **25** a short distance below plate **17** and the upper end thereof is banded to a sleeve **29** welded to the plate and extending around the hole **18** therein.

A housing **30** is welded to plate **17** in overlying relation to the universal bearing **21**, **24**. The housing has an access opening **31** in the side wall and on the interior thereof a plunger switch **32** is mounted on a transverse plate **33**. The plunger of the switch, indicated at **34**, rides on a mushroom-shaped head **35** on the upper end of arm **26**, at all times except when the rod **25** is tilted to a substantial angle to the vertical as shown in dotted lines in FIGURE 1. This holds the switch plunger in one of its two extreme positions (e.g. the open position). When rod **25** is tilted sufficiently by increase of the coal level to a predetermined height, head **35** will move away from plunger **34** leaving it clear to shift to its other position (e.g. the closed position) under spring pressure or gravity. A cable **36** provides connections to switch **32** and is brought out externally of housing **30**.

Switch **32** may be utilized to control an alarm signal or, through suitable relays and contactors, to shut off the feed of coal to the bin through port **14**. The circuits for such control are well known and need no further description here.

It will be evident from the foregoing that the device of my invention will operate positively when the coal level rises to the predetermined height. At the same time, when the coal level falls, the arm **25** will immediately return by gravity to its vertically pendent position. Thus all difficulty from either failure to tilt or sticking in tilted position is avoided. The entire construction of the device, furthermore, is so sturdy and well protected that practically no maintenance is required beyond occasional oiling of the interengaging surfaces of seat **21** and head **24**.

Among other advantages of my invention is the fact that the rod **25** must be tilted through a predetermined angle before switch operation will result. Thus minor movements of the rod such as may result from a lump of coal flying at random will not give rise to a false operation. A further major advantage is that my device is not sensitive to vibrations applied to a bin to remedy "hanging up" and does not need close or critical adjustment. In addition, the device may be made at low cost since the several elements are standard parts or substantially so.

Although I have disclosed herein the preferred embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention as set forth in the claims.

I claim:

1. The combination with a storage container, of a generally horizontal support therein, a ball-and-socket bearing having its socket mounted on said support, said support having an opening therein below said bearing, a rigid reach rod depending from the ball of said bearing through said opening so that the lower end of the rod will be engaged by material piling up in said container, an on-off

switch mounted above said support and having a plunger projecting downwardly therefrom and a rigid arm extending upwardly from the ball of said bearing, said arm having a mushroom-shaped head on its upper end adapted to engage said plunger except when said rod is tilted to a substantial angle with the vertical.

2. A pendent-arm bin-level control device comprising a support member located a predetermined distance above the desired maximum level of bin contents and a ball-and-socket bearing mounted on said member, a rigid reach rod depending from the ball of said bearing, so that the lower end of said rod is adapted to be engaged by bin contents piling up to said level, a rigid arm extending upwardly from the ball of said bearing and a two-position switch mounted above said bearing adapted to be engaged by the upper end of said arm and held thereby in one position until said rod is tilted through a substantial angle from its normal vertically pendent position whereupon said switch is self actuated to its other position, said ball being open at the top and having a coupling extending downwardly therebelow, said rod and arm being screwed into said coupling from opposite ends thereof.

3. A pendent-arm bin-level control device comprising

a support member located a predetermined distance above the desired maximum level of bin contents and a ball-and-socket bearing mounted on said member, a rigid reach rod depending from the ball of said bearing, so that the lower end of said rod is adapted to be engaged by bin contents piling up to said level, a rigid arm extending upwardly from the ball of said bearing and a two-position switch mounted above said bearing adapted to be engaged by the upper end of said arm and held thereby in one position until said rod is tilted through a substantial angle from its normal vertically pendent position whereupon said switch is self actuated to its other position, said arm having a mushroom head for engaging said switch.

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