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E. V. FRANCIS

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BIN LEVEL CONTROL

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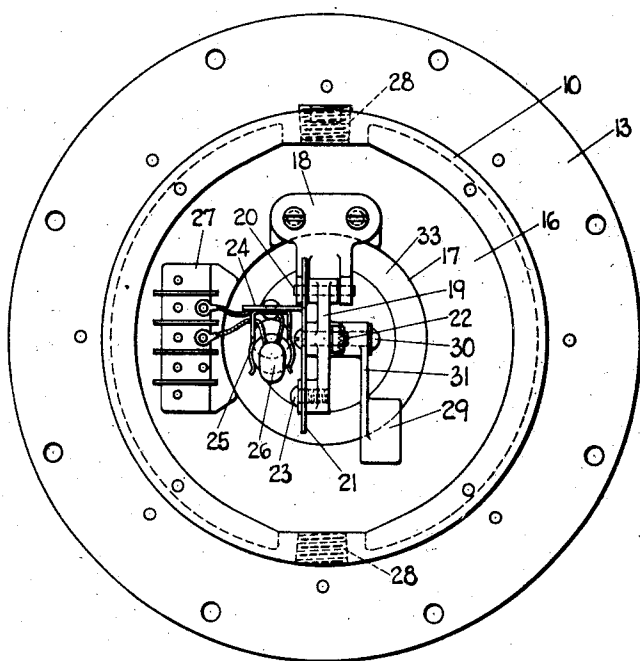


Fig. 1

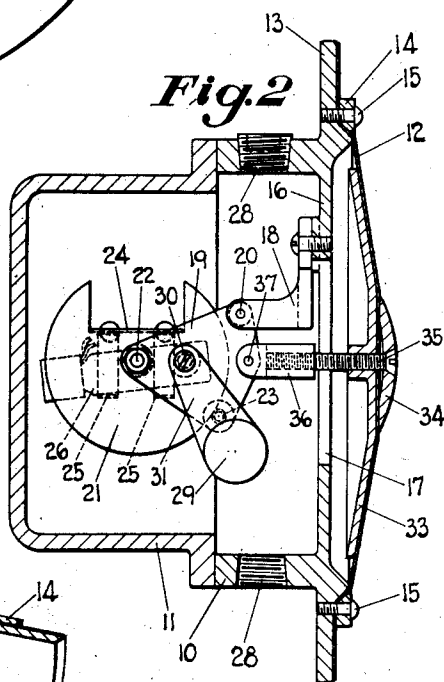


Fig. 2

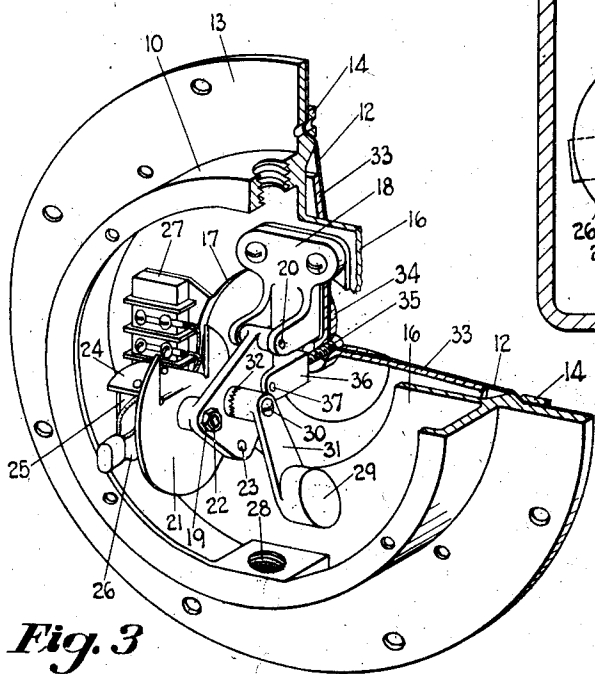


Fig. 3

INVENTOR,
EARLE V. FRANCIS,

BY *Harbor H. Hutton,*

ATT'Y.

UNITED STATES PATENT OFFICE

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BIN LEVEL CONTROL

Earle V. Francis, Columbus, Ohio, assignor to
The Jeffrey Company, a corporation of Ohio

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This invention relates to a control or switch device for indicating the level or height of material in a bin or other container.

An object of the invention is to provide an improved device of the above mentioned type and particularly one which may be attached to or placed in a bin or container in a plurality of selective positions, two illustrations of which are vertical and horizontal positions.

Another object of the invention is to provide a switch control device in which the sensitiveness of the actuating mechanism may be readily adjusted and in which the control device may be placed in any one of a plurality of different angular positions.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a rear elevational view of the control device of my invention, with the rear cover removed;

Fig. 2 is a transverse sectional elevational view through the device; and

Fig. 3 is a combination perspective and sectional view thereof.

The bin level control includes a main frame 10 which constitutes a significant portion of a housing or casing for the operating mechanism, which housing is completed by a removable cover 11 and a front flexible diaphragm 12 which is removably attached to an integral flange 13 of the main frame 10 by a removable ring 14 and screws or rivets 15.

The frame 10 includes an inwardly extending flange 16 provided with a central opening 17, which flange 16 carries a downwardly extending bracket 18 to which an operating plate or member 19 is mounted for swinging or pivotal movement on an axis which is preferably always horizontal or substantially horizontal and is provided by a pivot pin 20 carried by bifurcated arms of the bracket 18, between which arms the operating plate 19 is swingable on said horizontal axis.

The operating plate or member 19 is of generally triangular construction and near its outer end or apex it supports a generally disc-shaped switch carrier plate 21. Plate 21 is mounted for swinging movement at its center at the apex of operating plate 19 by means of a nut and bolt 22 which may be released to permit swinging of said carrier plate 21 on the horizontal axis of the bolt 22 for a purpose hereinafter explained more completely. The nut and bolt 22 may be clamped to

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clamp the plate 21 in any position to which it is adjusted.

Cooperating with the periphery or rim of the disc or plate 21 is a screw and washer 23, the screw of which is threaded into a boss on operating plate 19. This screw and washer 23 obviously provide releasable supplemental clamping means for clamping the carrier disc 21 in adjusted position.

A portion of the carrier disc or plate 21 is severed along opposite edges and bent over, providing a shelf 24 which carries a pair of downwardly extending clips 25 adapted to receive and releasably support a mercury tube type of switch 26. Two conductors leading from the tube or switch 26 lead to a terminal block 27 mounted on the flange 16 of the main frame or casing 10. The main frame or casing 10 is also provided with top and bottom threaded openings 28 which are adapted to receive conduits or box-hole connectors selectively so that wiring may be provided to and from the interior of the housing or container provided by the bin control.

To provide for adjustment of the sensitiveness of the device and also to provide proper control of the amount of force necessary to close the switch 26 for various positions of adjustment of the level control device, the operating plate or member 19 also carries a pivoted counterweight or counterbalance 29 which is adjustably mounted on said plate 19 by a screw 30. The counterweight 29 includes an integral arm 31 and this provides for swinging of the weight about the horizontal axis of the screw 30 when adjustment of the position of the counterweight and thus its effect is desired. Serrated friction producing means 32 are preferably provided so that when screw 30 is tightened, counterweight 29 will be locked securely in position relative to the plate 19.

Actuating means responsive to liquid or granular material level for operating the plate 19 and consequently the switch 26 under the control of the diaphragm 12 includes a reinforcing diaphragm disc 33. It is also to be noted that the periphery of the disc 33 has a greater diameter than the opening 17, as a consequence of which said disc 33 overlaps the flange 16. Furthermore, the periphery of said disc 33 is spaced close to the flange 16 or adjacent portion of the main frame 10 so that inward movement of the diaphragm 12 is limited by the periphery of the disc 33 striking or abutting the frame 10 or flange 16. This, of course, protects the diaphragm 12 by limiting the extent to which it can be deflected or stretched by material in contact therewith.

It also protects the internal mechanism by limiting the extent to which it can be moved by movement of the diaphragm 12 to the left, as viewed in Fig. 2 of the drawings. Disc 33 is removably attached to the diaphragm 12 by means of a clamping washer 34 and a screw 35 which threads into a boss in the disc 33 and at its inner end receives a clevis 36 which is pivotally attached on a horizontal axis to the operating plate 19 by a pin 37. The disc 33 reinforces substantially the entire area of the diaphragm 12, except the exposed and operating outer or peripheral part thereof.

If the parts are in the position illustrated in Figs. 1 and 2 of the drawings, it will be seen that the diaphragm 12 is substantially vertical or upright and this is one conventional operating position. In such a position the carrier disc or plate 21 is adjusted to the position illustrated in the drawings and as a consequence the mercury switch 26 is held in a position such that its internal contacts are open.

The counterweight 29 is adjusted to such a position that a vertical plane passing through the pivotal axis of the plate 19, disc 21 and counterweight 29, which are rigidly attached to pivot with it about the horizontal axis of shaft 20, passes near the center of said counterweight 29. Thus the weight of the plate 19, disc 21, switch or tube 26 and all other elements attached rigidly to the plate 19 will exert a predetermined force outwardly against the diaphragm 12. The plate 19 and structure attached to it will be swung about the pivot 20 by a counter force provided by material pressing against the diaphragm 12 and adequate clockwise swinging of said plate 19, as viewed in Figs. 2 and 3 of the drawings, will be provided to close the switch 26 in response to a predetermined level of material in a bin or container to which the bin level is attached. This force may be provided, for example, by attaching the flange 13 to a vertical wall of a bin or container or the entire unit may be suspended or otherwise supported inside such a bin or container.

To adjust the force which is necessary to swing the plate 19 and thus close the switch 26, or, in other words, to adjust the sensitiveness of the device, it is only necessary to swing the arm 31 and the counterweight 29 about the horizontal axis of screw 30 which can be effected by loosening the screw 30, after which it will be tightened to fix the counterweight 29 relative to the plate 19. For example, if the counterweight 29 is effectively moved toward the diaphragm 12 as by swinging the arm 31 in a counter-clockwise direction, the center of gravity of the composite structure, including the plate 19 and all parts attached to it, would effectively move to the right, as viewed in Fig. 2, thus reducing the force necessary to be exerted on the diaphragm 12 to actuate the switch 26. A swinging of the arm 31 in a clockwise direction will produce a reverse condition, requiring a greater force on the diaphragm 12 to actuate the switch 26.

The distance through which the plate 19 must move to actuate the switch 26 may be adjusted by rotation of the disc 21 which will control the non-operating position of tilt of the switch 26. That is, rotating the disc 21 counter-clockwise, as viewed in Fig. 2, will increase the angle through which plate 19 must move to actuate said switch 26, and clockwise rotation thereof will produce a reverse condition.

As previously mentioned, the bin level indicator

may be operated in a great variety of positions. For example, it may be rotated ninety degrees on a horizontal axis parallel with the axis of pin 20. This can be visualized by rotating the drawing ninety degrees counter-clockwise and viewing Fig. 2. Under such conditions it is obvious that the parts must be adjusted to bring them into proper position. To do this, disc 21 is rotated substantially ninety degrees in a clockwise direction. Furthermore, counterweight 29 is adjusted by swinging arm 31 until it is at approximately one hundred and eighty degrees from the position illustrated in said Fig. 2. The important thing in this adjustment of the counterweight 29 is that its center of gravity should be on the left-hand side of a vertical plane passing through the axis of pivot pin 20, with the entire unit considered as rotating ninety degrees as above suggested. This, of course, is necessary to the end that the complete pivot assembly, including the plate 19, disc 21, switch 26 and counterweight 29, have a center of gravity which is to the left of the pivot pin 20 (still considering the entire unit rotated ninety degrees, as above suggested), to the end that this will produce an outward or upward force on the screw 35 and diaphragm 12 which are to be overcome by the material pressing downwardly on said diaphragm 12.

It is further obvious that, if desired, the unit may be placed in any desired position relative to a horizontal axis parallel with the axis of the pin 20, and by rotating the disc 21 the switch 26 can be adjusted so that it is normally just off of a circuit closing position and can be moved to a circuit closing position by adequate force on the diaphragm 12 overcoming the reaction force provided by the plate 19 and all the parts carried by it, including particularly the counterweight 29. For any position to which the complete unit is adjusted, the disc 21 is always first adjusted so that the switch 26 is slightly off horizontal as it is clearly illustrated in Fig. 2 of the drawings when viewed in its normal position thereon.

After this is done, the arm 31 is swung to effect adjustment of the position of the counterweight 29 so that the complete assembly, including the plate 19, disc 21, switch 26 and counterweight 29, produces a force with respect to the axis of the pin 20 which is always toward the diaphragm 12 or, in other words, tends to move the diaphragm 12 outwardly against the force of the material which is relied up to move it inwardly and actuate the switch 26. The amount of this force which is necessary to actuate the switch 26 can, of course, be readily adjusted by adjusting the arm 31 about the pivot 30.

It is thus evident that a bin level control or bin actuating switch assembly has been provided which is very flexible and the sensitiveness of which can be very readily adjustable.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. A level control switch mechanism including a frame; a member pivotally mounted on said frame on a horizontal axis, a switch carrier connected to said member for adjustable movement relative thereto on a horizontal axis through an

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angle of at least 180 degrees, means for locking said carrier to said member in any one of a plurality of positions, a counterbalance connected to said member for adjustment relative thereto on a horizontal axis and adjustable to opposite sides of a vertical plane passing through the pivotal mounting of said member, a switch mounted on said carrier and operable by tilting of said member about its pivotal axis, and level responsive operative means for tilting said member.

2. A level control switch mechanism including a frame, a member pivotally mounted on said frame on a horizontal axis, a switch carrier connected to said member for adjustable movement relative thereto on a horizontal axis through an angle of at least 90 degrees, means for locking said carrier to said member in any one of a plurality of positions, a counterbalance connected to said member for adjustment relative thereto on a horizontal axis and adjustable to opposite sides of a vertical plane passing through the pivotal mounting of said member, a switch mounted on said carrier and operable by tilting of said member about its pivotal axis, and level responsive operative means for tilting said member.

3. A level control switch mechanism including a frame, a member pivotally mounted on said frame on a horizontal axis, a switch carrier connected to said member for adjustable movement relative thereto on a horizontal axis, means for locking said carrier to said member in any one of a plurality of positions, a counterbalance con-

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nected to said member for adjustment relative thereto on a horizontal axis and adjustable to opposite sides of a vertical plane passing through the pivotal mounting of said member, a switch mounted on said carrier and operable by tilting of said member about its pivotal axis, and level responsive operative means for tilting said member.

4. A level control switch mechanism including a frame, a member pivotally mounted on said frame on a horizontal axis, a switch carrier connected to said member for adjustable movement relative thereto on a horizontal axis, means for locking said carrier to said member in any one of a plurality of positions, a counterbalance connected to said member for adjustment relative thereto on a horizontal axis, a switch mounted on said carrier and operable by tilting of said member about its pivotal axis, and level responsive operative means for tilting said member.

EARLE V. FRANCIS.

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