

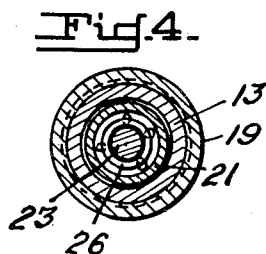
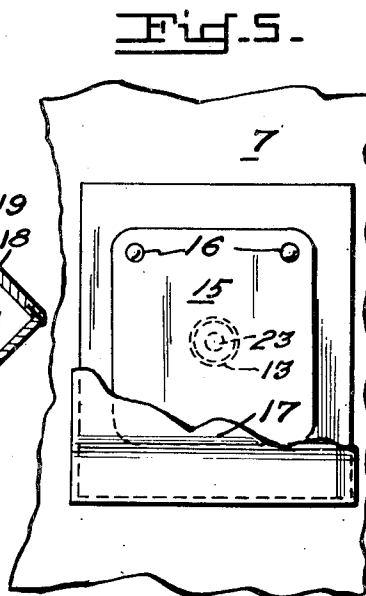
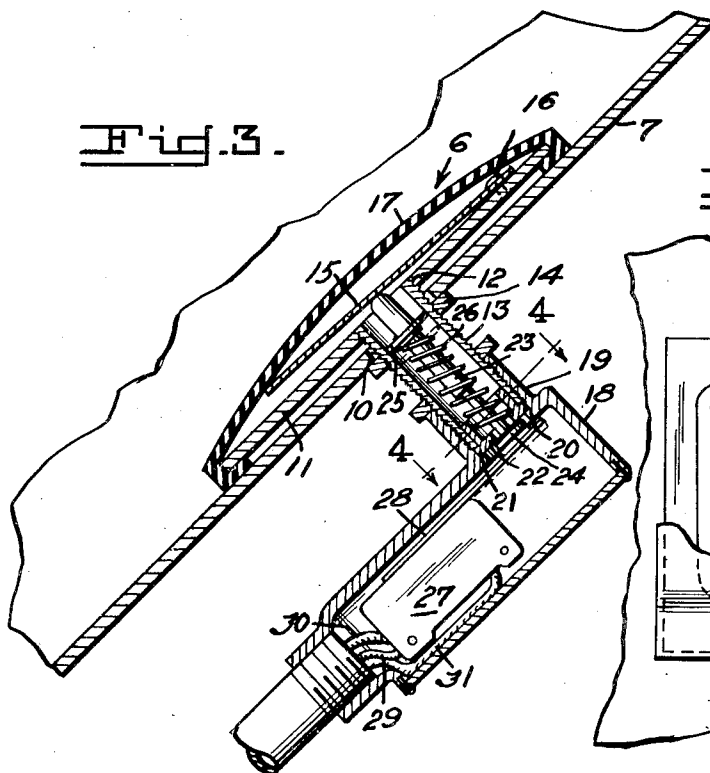
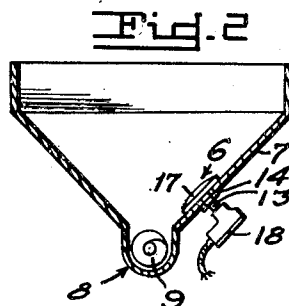
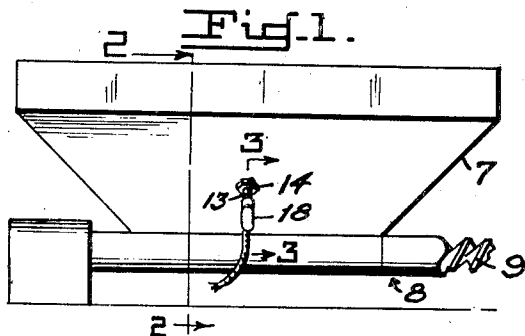
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2,475,404

PRESSURE RESPONSIVE SWITCH ACTUATOR

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PRESSURE RESPONSIVE SWITCH
ACTUATOR

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2 Claims. (Cl. 200—52)

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This invention relates to a mechanical actuating means for electric switches and more particularly to a pressure responsive switch actuator for bins, hoppers and other containers.

While the invention is adapted for use in hoppers, bins and containers generally, it has been illustrated and will be described in conjunction with a hopper or bin of a coal stoker to function in response to the lowering of the level of the fuel of the hopper or bin beyond a predetermined point for shutting off the motor which drives the stoker worm by the actuation of an electric switch and for simultaneously energizing an audible or visual signal, connected to said switch, for indicating a low supply of fuel in the hopper or bin.

More particularly, it is an object of the present invention to provide a switch actuator of extremely simple construction, which is reliable and durable in operation, simple and inexpensive to manufacture, which may be quickly and easily installed on hoppers, bins or containers already in use, and which will function automatically to energize or de-energize an electric circuit without resetting.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawing, illustrating a preferred embodiment and application thereof, and wherein:

Figure 1 is a side elevational view of a stoker hopper or bin shown equipped with the invention;

Figure 2 is a cross sectional view thereof taken substantially along a plane as indicated by the line 2—2 of Figure 1;

Figure 3 is an enlarged transverse sectional view through the switch actuator, taken substantially along a plane as indicated by the line 3—3 of Figure 1;

Figure 4 is a cross sectional view taken substantially along a plane as indicated by the line 4—4 of Figure 3, and

Figure 5 is a plan view of the switch actuator with a portion of the cover shown broken away.

Referring more specifically to the drawing, the pressure responsive switch actuator, designated generally 6, is shown mounted in one of the inclined side walls of a hopper or bin 7 forming a part of a fuel stoker 8, and as best illustrated in Figure 2, the switch actuator 6 is shown disposed adjacent the bottom or discharge part of the hopper 7 and in which the feed worm 9 of the stoker 8 is disposed.

In order to mount the switch actuator 6 in the hopper 7, it is only necessary to drill a single opening 10 in the inclined wall thereof, and as best seen in Figure 3. The switch actuator 6 includes a substantially flat mounting plate 11 which is provided with an opening 12 which is preferably centrally disposed relatively thereto

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for receiving one end of a tubular member 13 which is anchored in the opening 12 and which projects from one side thereof through the hopper opening 10. The tube 13, if desired, may be formed integral with the mounting plate 11 or may be fixedly or detachably secured thereto and is externally threaded to receive a lock nut 14 which bears against the outer side of the hopper 7, around the opening 10 for detachably mounting the plate 11 on the inner side of the hopper and over the opening 10 thereof.

A pressure responsive actuator plate 15 is attached adjacent one end thereof to the mounting plate 11 in a manner to permit a limited pivotal movement of the plate 15 relatively to the plate 11. The mounting of the plate 15 on the plate 11 is preferably accomplished by means of a pair of shoulder rivets 16 which loosely engage the plate 15 to permit the free end thereof to rock toward and away from the plate 11. Likewise, as best seen in Figures 3 and 5, the pressure responsive plate 15 is pivotally mounted on the mounting plate 11 at its upper end and adjacent the upper end of the plate 11 or remote to the bottom or discharge end of the hopper or bin 7, for a purpose which will hereinafter become apparent.

A flexible cover 17 is disposed over the plate 15 and combines with the mounting plate 11 to provide a collapsible housing therefore. The flexible cover 17 may be formed of any suitable flexible material such as rubber, canvas, leather or the like and the edge portion thereof is disposed beneath the edge of a mounting plate 11 to be clamped between said mounting plate and the hopper wall by tightening of the lock nut 14 so as to position the central portion of the cover 17 loosely over the pressure responsive plate 15 so that it will not prevent it from swinging outwardly to its position of Figure 3.

A switch housing 18 is provided with an internally threaded angularly disposed nipple 19 which threadedly engages the outer end of the tube 13 and which is provided with a restricted inner end 20 to engage a retaining washer 21, which is mounted in the outer end of the tube 13 and to retain said washer 21 so positioned. The washer 21 is provided with a restricted opening 22 for reciprocally receiving a plunger rod 23 having a head 24 at its outer end which is larger than the opening 22 for limiting the upward or inward movement of said plunger rod relatively to the tube 13. The plunger rod 23, adjacent its opposite, upper end is provided with a collar 25 which is fixed thereto and which slidably engages the bore of the tube 13 to combine with the opening 22 for guiding the plunger rod 23 in its reciprocatory movement. An expansion coil spring 26 is contained within the tube 13 and on the plunger rod 23 and has one end thereof seating

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against the retaining washer 21 and the opposite end bearing against the collar 25 for urging the plunger rod 23 upwardly and against the pressure responsive plate 15 for holding said plate in a projected position away from the mounting plate 11, as illustrated in Figure 3.

A conventional electric switch 27 is contained in the switch housing 18, said switch being of any conventional double throw type of ample capacity and having a sensitive snap action, such as the switch covered by U. S. Patent No. 1,960,020 and which is provided with an actuator arm 28 projecting therefrom and by means of which the switch 27 is actuated. The switch 27 is provided with three electrical connections including an electrical conductor 29 which is adapted to be connected to any suitable source of electric current and with two electrical conductors 30 and 31, one of which is adapted to be connected to the electric motor, not shown, for driving the worm 9 and the other of which is adapted to be connected to an audible or visual signal, not shown, and which are alternately actuated by movement of the switch lever 28.

Figure 3 illustrates the position that the part of the switch actuator 6 will assume when the portion of the hopper or bin 7 in which said actuator is mounted, is otherwise empty. It will thus be seen that the spring 26 will hold the pressure responsive plate 15 away from the mounting plate 11 and will also hold the head 24 away from the switch lever 28, in which position, the circuit to the electric motor, not shown, for driving the worm 9, will be broken to prevent operation of the stoker 8 and the circuit to the audible or visual signal will be energized for indicating that the supply of fuel in the hopper 7 is substantially exhausted and that the stoker has been rendered inoperative.

When the hopper 7 is filled or substantially filled the weight of the fuel, not shown, contained therein will bear against the flexible cover 17 to press it and the pressure responsive plate 15 against the mounting plate 11 causing the pressure responsive plate 15 to project the plunger 23 downwardly against the spring 26 so that the head 24 thereof will engage and rock the switch lever 28 for breaking the circuit to the electric indicator and for closing the circuit to the stoker motor to permit the stoker to operate in a conventional manner. This circuit will be maintained until the supply of fuel falls below the lower end of the plate 15 at which time the spring 26 will expand to project the plunger rod 23 upwardly for returning the plate 15 to its position of Figure 3, to thereby break the circuit to the stoker motor and energize the visual or audible warning device. This will cause the circuit to the motor to be opened before the bottom of the hopper is entirely empty, leaving sufficient fuel to maintain a seal in the worm housing.

Further, it will be readily apparent that the cover 17 merely functions in combination with the plate 11 to form a collapsible housing for the pressure responsive plate 15 to prevent said plate from coming in contact with the fuel and to prevent fuel from lodging beneath the plate 15 and preventing correct operation thereof.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

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I claim as my invention:

1. A pressure responsive switch actuator comprising, in combination with an electric switch having an actuating lever, a mounting plate adapted to be disposed in a hopper, bin or container, an externally threaded tubular extension adapted to extend through an opening in a wall of said container and having one end extending through and detachably connected to the mounting plate, a flexible covering disposed loosely over the side of said mounting plate opposite to that from which the tubular extension projects and having a marginal portion disposed between said plate and said container wall, a lock nut on said tubular extension for engaging the outer side of said container wall for clamping said marginal portion of the flexible covering between the mounting plate and container wall, a pressure responsive plate pivotally mounted on the mounting plate and between it and said flexible covering, and a spring projected plunger slidably disposed in said tubular extension and spring urged against said pressure responsive plate for urging it outwardly of the mounting plate, said flexible covering being adapted to be collapsed against the mounting plate by the pressure of the contents of the container for forcing said pressure plate inwardly or toward the mounting plate for retracting said plunger, and said plunger being constructed and arranged to engage and actuate the switch lever, when retracted.

2. A pressure responsive switch actuator comprising, in combination with an electric switch having an actuating lever, an actuator housing adapted to be disposed in a container and including a substantially rigid wall adapted to be disposed adjacent a wall of the container and an opposite collapsible wall, a tube having one end secured in said rigid wall and opening into said housing and projecting outwardly therefrom and adapted to extend through an opening in the container wall, said tube being externally threaded, a lock nut on the threaded tube for engaging the outer side of the container wall for clamping the actuator housing to the inner side thereof, a pressure responsive plate pivotally mounted on the rigid wall of the housing and between said rigid wall and the collapsible wall, and a spring projected plunger slidably disposed in said tube and spring urged against the pressure responsive plate for urging it toward said collapsible housing wall, said collapsible housing wall being adapted to be collapsed against the rigid housing wall by the pressure of the contents of the container for forcing said pressure responsive plate against the rigid housing wall to retract the spring projected plunger, and said spring projected plunger having an end disposed to engage and actuate the switch lever when retracted.

IRA J. REED.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,892,084	Sprague	Dec. 27, 1932
1,911,530	Raisch et al.	May 30, 1933
1,977,228	Carter	Oct. 16, 1934
2,153,716	Kelly	Apr. 11, 1939