July 16, 1968 R. F. SKELTON ETAL 3,393,280

SAFETY SWITCH FOR STOPPING MILL WHEN ONE INGREDIENT SUPPLY IS EXHAUSTED

Filed Jan. 3, 1967

Fig. 3

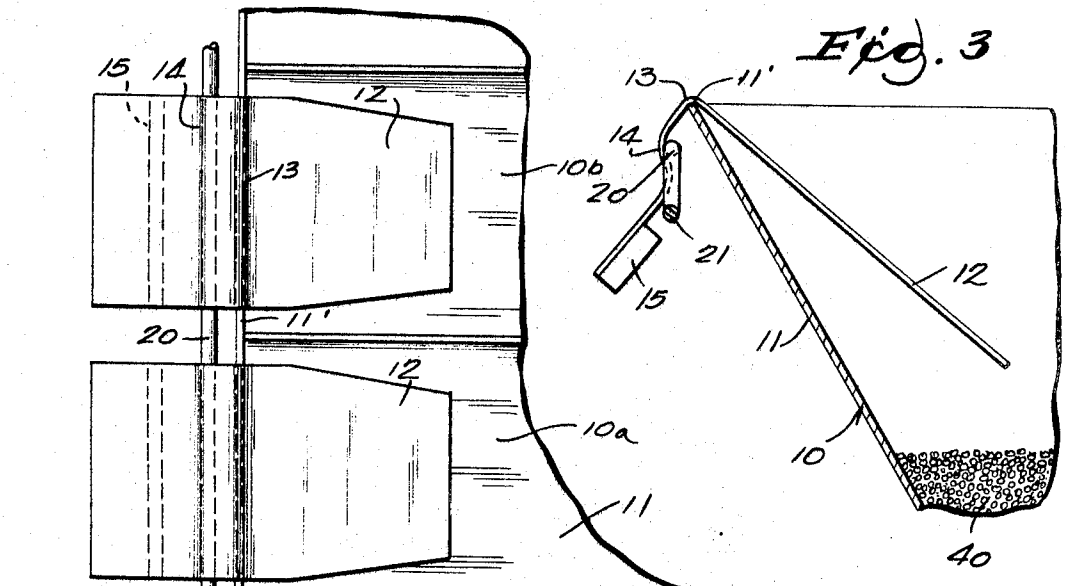


Fig. 1

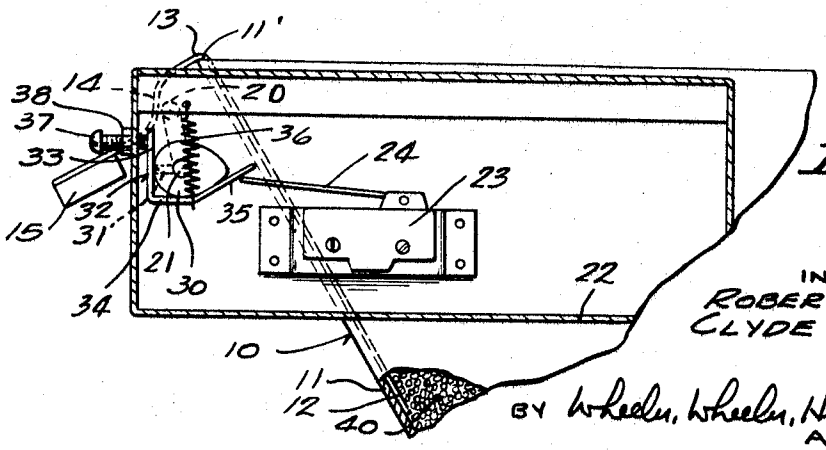


Fig. 2

INVENTORS
ROBERT F. SKELTON
CLYDE R. BARNES

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

United States Patent Office 3,393,280 Patented July 16, 1968

3,393,280

SAFETY SWITCH FOR STOPPING MILL WHEN ONE INGREDIENT SUPPLY IS EXHAUSTED

Robert F. Skelton, Bluffton, and Clyde R. Barnes, Ossian, Ind., assignors to Mix-Mill, Inc., Bluffton, Ind., a corporation of Indiana

Filed Jan. 3, 1967, Ser. No. 606,654
5 Claims. (Cl. 200—61.21)

ABSTRACT OF THE DISCLOSURE

A group of ingredient bins are provided with a common safety shut-off including a plate which lies flat against the side of each filled bin, which is counterweighted to rise from the side of the empty bin. The counterweight is provided with a cam surface engaging a bell crank extending past all of the bins. The crank turns a cam to actuate a switch through a lever with an adjustable fulcrum, biased against the cam. When any bin is empty the switch is actuated to stop all mechanism dependent on receiving material from the bin.

Background of the invention

A wide array of diaphragm switches, paddle switches, and the like have been tried in an effort to afford a simple and reliable switch which will disable a mechanism when one of a plurality of ingredient hoppers is empty. An example is a farm feed mixing device in which the hoppers are filled from respective storage areas by conveying devices. If the parent supply of any material is exhausted an incorrect mixture will result unless the machine is stopped. Prior art devices for the purpose are complex and are subject to vibration from the machine, which induces false operation or failure of the safety switch. The present mechanism is simple and inexpensive and is not subject to actuation or jamming by vibration. It operates with great precision and is readily adjusted.

Summary of the invention

The invention consists of hanging identical counterweighted plates on the edges of respective ingredient hoppers, the weights being so related to the plates that when the hopper is empty the plate stands at an angle to the side of the hopper, the plate being arranged to lie flat on the wall of the hopper when the ingredient normally contained in the hopper presses against it. The counterweight portion of the plate is provided with a cam surface, and a common bell crank underlies all of said cam surfaces on the respective plates. The bell crank is provided with a cam on its end which is held to the bell crank with a set screw for adjustability. The cam operates a switch actuating lever which is spring biased toward the cam and which has a fulcrum portion resting on a screw for adjustment of the fulcrum point.

Drawings

FIG. 1 is a fragmentary top plan view of a series of storage bins, showing the device of my invention applied thereto.

FIG. 2 is a fragmentary cross-sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 1.

Description of the invention

In the drawings, a series of respective ingredient bins or hoppers designated **10**, **10***a*, **10***b*, etc. Each hopper is provided with at least one sloping wall **11**. A plate **12** is so formed as to lie flat against side **11** and is bent at **13** to provide an apex or pivot which rests on the top

margin of wall **11**. It then is bent at **14** to form a curved ramp or cam surface, after which it extends outwardly to support a counterweight **15**.

Underlying ramp portion **14** of each plate is the offset portion **20** of a bell crank. One end **21** of the bell crank is journaled in a switch box **22** which fully encloses the switch and switch actuating mechanism, to protect them from the dust of the ingredients which are stored in bins or hoppers **10**, **10***a*, etc.

The other end of bell crank **20** is coaxial with end **21** and is merely journaled conventionally in a hole in a bracket (not shown).

Switch box **22** encloses a switch **23** provided with a lever **24** with which it is actuated. It is preferably of the normally closed type and is incorporated in a control circuit which stops the mechanism for withdrawing ingredients from bins **10**, **10***a*, **10***b*, etc., when the switch is actuated. Of course, the switch may also serve to actuate an alarm to warn the operator of the empty bin, and to turn off all associated mechanisms, if desired.

The end **21** of bell crank **20** within box **22** is provided at its end with a cam **30** held with a set screw **31**, so that the position of the high point of the cam may be adjusted. A cam follower arm **32** has a portion **33** which serves as a fulcrum, a central portion **34** at right angles to portion **33**, and a terminal portion **35** which serves to actuate switch arm **24**. A spring **36** biases the cam follower **32** toward the cam **30**, insuring that it will make firm contact with the cam. The two-point contact stabilizes the device. A fulcrum adjusting screw **37** bears on fulcrum portion **33** of the cam follower **32** and is locked in place with a jam nut **38**.

In operation, plate **12** hangs by apex **13** on the rim **11'** of each hopper **10**, **10***a*, **10***b*, etc., and is supported by counterweight **15** in a position spaced from wall **11** as shown in FIG. 3 as long as the bin or hopper is empty. When material **40** enters the hopper it pushes plate **12** against wall **11**, and spring **36** and arm **32** pull the bell crank **20** to a position in which switch **23** is not actuated.

Should any one of bins **10**, **10***a*, **10***b*, etc. become empty, the counterweight **15** of the plate **12** in that bin will pull the plate **12** away from wall **11** of the bin. Cam surface **14** will engage bell crank **20** and force it toward the wall **11** of the bin, rotating cam **30**. The rotation of cam **30** moves cam follower **32** away from the end of shaft **21** of the bell crank **20** about screw **32** as a fulcrum. The outer end **35** of cam follower depresses arm **24** of switch **23**, actuating the switch to stop the mechanism associated with the bins or give an alarm or both. If desired, switch **23** may also actuate a device to fill the bin, but it is contemplated that this device will be used in conjunction with other devices which normally maintain the bin in filled condition if there is any supply of the material for filling the particular bin. In that type of mechanism, the fact that the bin is empty indicates that there is no supply of the particular ingredient to enter the bin (or that a malfunction has occurred) and accordingly the circuit is arranged to stop the entire mechanism.

I claim:

1. The combination of a series of bins for retaining separate ingredients, each of said bins being provided with a sloping side having a horizontal upper margin, the upper margins of the respective bins being aligned, with the improvement comprising a bell crank having an end on which the bell crank is journaled and an offset portion extending parallel to said aligned edges of said bins, a switch, switch actuating means on said bell crank, and a series of bell crank actuating members each comprising a plate adapted to lie against said sloping wall of said bin in one position, said plate having a central pivot at the top of said bin, a cam surface on said plate on the other

side of said pivot from the portion of said plate adapted to lie against the wall of the bin, and a counterweight beyond said cam surface from said pivot, each cam surface being adjacent the offset portion of said bell crank, means biasing said bell crank toward a position in which said switch is not actuated by said switch actuating means, the counterweight being at such a distance from said pivot that when said bin is empty said plate is suspended with the portion adapted to lie against the wall of said bin extending at an angle to said wall and said cam displaces said bell crank against said bias to a position in which said switch actuating means actuates said switch, the supplying of material to said bin being effective to displace said plate to lie against the wall of said bin and release said bell crank to move in response to said biasing means to a position in which said switch is not actuated by said switch actuating means.

2. The device of claim **1** in which said switch actuating means includes a cam on the journal end of said bell crank, a cam follower having a switch actuating arm and angularly related portions touching said cam, a fulcrum bearing on the end of one of said angularly related portions, said fulcrum means being adjustable toward and away from said cam.

3. The device of claim **2** in which said biasing means is a spring extending from said cam follower to a fixed part and arranged to exert tension on said cam follower toward said cam and the journal portion of said bell crank.

4. The device of claim **1** in which said pivot comprises a bend in said plate forming an apex, said apex being supported on the margin of the said wall of said bin.

5. The device of claim **1** in which said switch actuating means includes a cam on the journal end of said bell crank, a cam follower having a switch actuating arm and angularly related portions touching said cam, a fulcrum bearing on the end of one of said angularly related portions, said fulcrum means being adjustable toward and away from said cam, said biasing means being a spring extending from said cam follower to a fixed part and arranged to exert tension on said cam follower toward said cam and the journal portion of said bell crank, said pivot comprising a bend in said plate forming an apex, said apex being supported on the margin of the said wall of said bin.

References Cited

UNITED STATES PATENTS

1,608,814 2/1925 Rioux ---------- 200—61.2

BERNARD A. GILHEANY, *Primary Examiner.*

F. BELL, *Assistant Examiner.*