Dec. 5, 1961 R. J. HUSER 3,011,641

OVERRIDING LOADING CONTROL FOR CENTRIFUGAL MACHINES

Filed Oct. 28, 1957 2 Sheets-Sheet 1

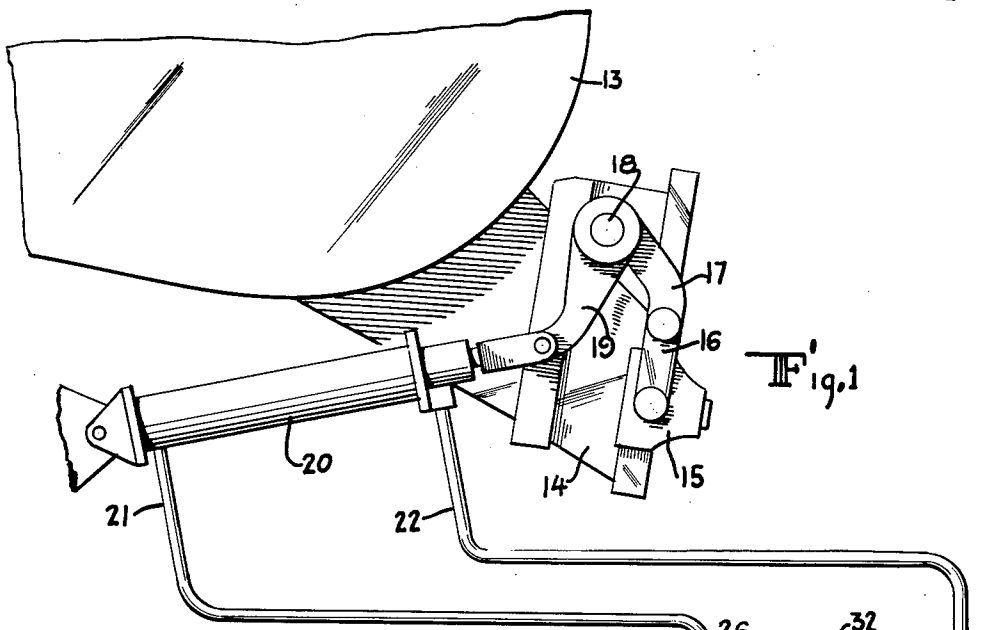


Fig. 1

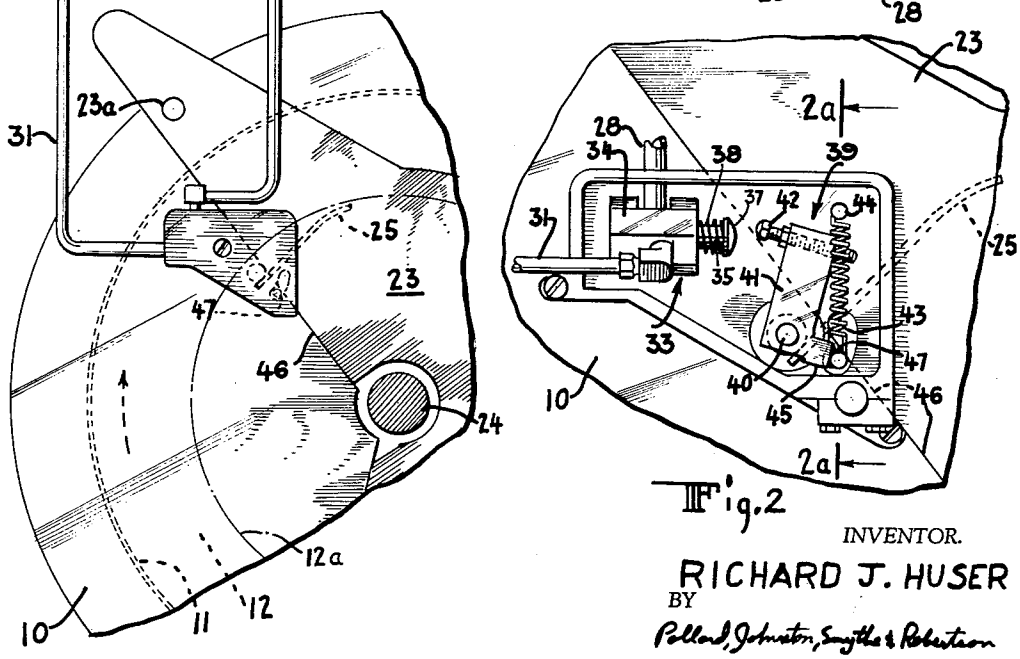


Fig. 2

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Fig. 3

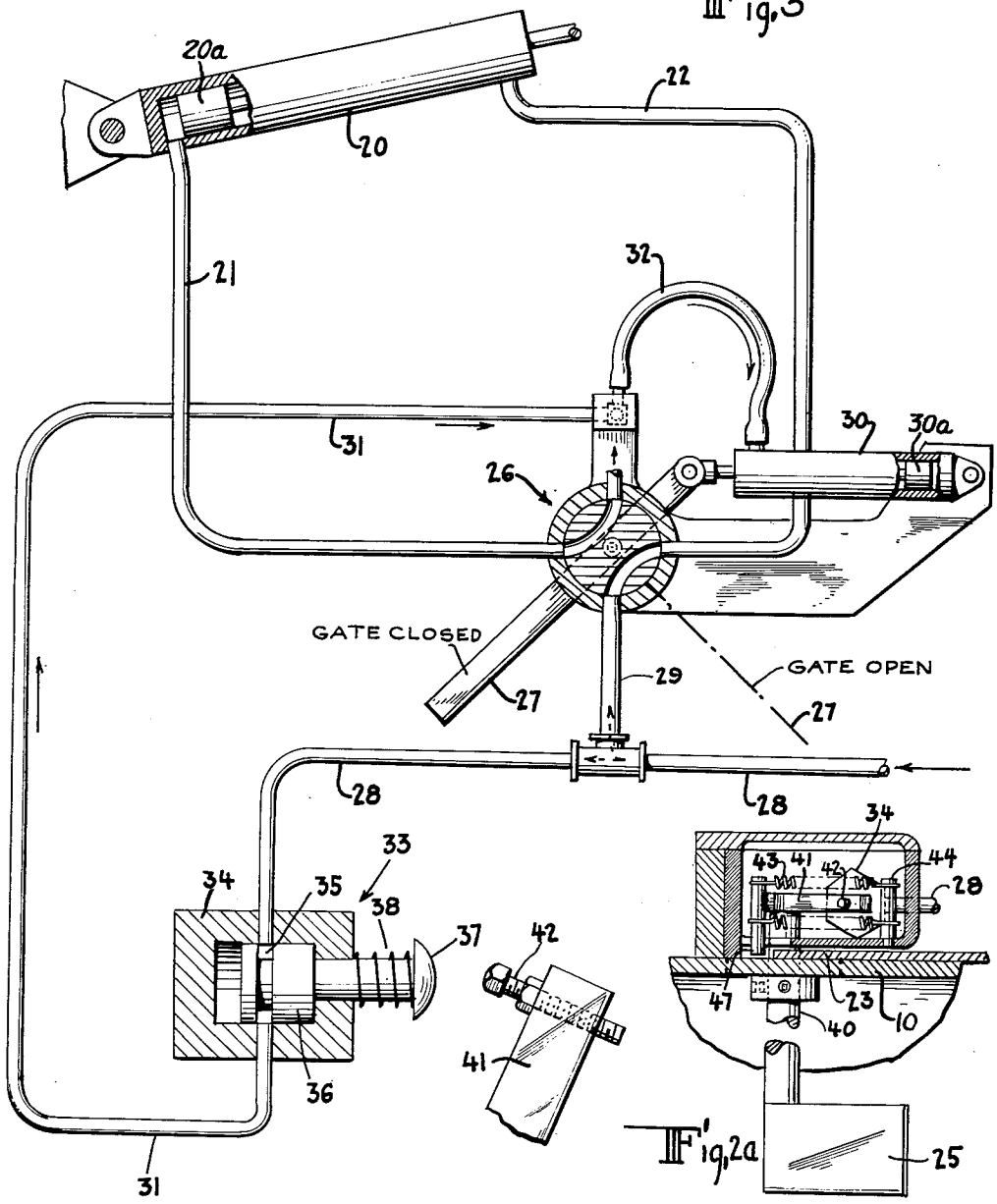


Fig. 2a

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United States Patent Office 3,011,641 Patented Dec. 5, 1961

3,011,641

OVERRIDING LOADING CONTROL FOR CENTRIFUGAL MACHINES

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Filed Oct. 28, 1957, Ser. No. 692,609
5 Claims. (Cl. 210—97)

This invention relates to a new and improved overriding loading control mechanism useful especially for regulating the introduction of charge materials into heavy cyclical centrifugal machines of the type used in the manufacture and the refining of sugar.

Inaccurate loading of the centrifugal basket is a costly fault in sugar centrifugal work, and especially so where the loading is controlled manually by the attendant of the centrifugal machines. The basket should be loaded to full capacity in order to obtain maximum efficiency, but the attendant's effort to achieve a full load often results in overloading with consequent loss of charge material containing crystallized sugar into the channels provided for collecting relatively impure syrup or molasses.

The principal object of this invention is to provide a control mechanism for preventing the overloading of the basket of a heavy cyclical centrifugal machine having a manually controlled loading gate.

Another object of the invention is to provide commercially practical mechanisms which free the attendants of centrifugal machines from a portion of the physical strain and mental concentration attendant to loading operations, and which prevent the overloading of the centrifugal basket irrespective of the attentiveness and skill of the attendant.

Another object of the invention is to provide mechanisms which attain the foregoing objects and also prevent the release of charge material from the mixer tank by inadvertent action of the attendant when the curb top cover is in closed position over the basket.

A further object of this invention is to provide an overriding loading control for centrifugal machines which can be applied to the manually operated loading control mechanisms of existing heavy centrifugal installations with little mechanical alteration thereof.

According to this invention, the loading gate serving a centrifugal machine is provided with a gate operating motor energizable in opposite directions to open and to close the gate through the action of a control device which normally is movable to either a gate opening position or a gate closing position by hand operated actuating means, and power operated means are provided in association with said control device for moving the same forcibly to gate closing position and at the same time rendering the actuating means manually inoperative to move the control device to gate opening position at appropriate stages in the cyclical operations of the machine.

In one advantageous embodiment, the actuating means includes a hand lever arranged to operate an air valve or other power-switching control device for energizing the gate motor, and the power operated means, for example, a fluid pressure operated cylinder and piston unit, is connected with the hand lever and adapted when activated to move this lever and thus the gate motor control to gate closing position with a force sufficient to overpower an attendant's hand holding the lever.

In one important aspect of the invention, the power operated means is activated so as to bring the gate motor control to gate closing position by the action of a charge measuring device within the basket, which is positioned according to the amount of charge material delivered into the basket in the course of each loading operation, and means are provided for energizing the power operated

means in response to charge-induced movement of the charge measuring device to a predetermined position. In a further aspect of the invention, means are provided for activating the power operated means in response to the movement of the curb top cover of the centrifugal machine to its closed position, so as to prevent the manual opening of the loading gate when the cover is closed.

The foregoing and other objects, features and advantages hereof will become apparent from the following detailed description of an illustrative embodiment, while the new features of construction and operation which I claim as my invention will be set forth more particularly in the appended claims. The detailed description refers to the accompanying drawings which form a part hereof and in which:

FIG. 1 is a diagrammatic assembly view of a cyclical centrifugal installation provided with a loading control mechanism according to a preferred embodiment of the invention;

FIG. 2 is a detailed view of the actuating mechanism for the overriding loading control;

FIG. 2*a* is a cross-sectional view taken along the line 2*a*—2*a* of FIG. 2 looking in the direction of the arrows; and

FIG. 3 is an enlarged schematic view of the conduits and connections of the air pressure system.

Referring first to FIG. 1, this diagram is a composite of elements shown in plan view at the bottom of the figure and other elements shown in elevation at the top of the figure. At the bottom, **10** denotes the curb top of a centrifugal machine of the type used in the processing of sugar. A portion of the side wall of the basket which rotates within the curb is indicated at **11**, and a portion of an annular basket charge, say of sugar, or other granular solids, is indicated at **12**. The inner surface of a completed charge is indicated by the broken line **12***a*.

At the top of FIG. 1 is shown a portion of a tank **13** for holding charge material which is delivered into the centrifugal basket **11** through loading spout **14** when loading gate **15**, of any suitable construction, is moved from its spout closing position. Gate **15** is connected by suitable linkage, including link **16**, arm **17**, gate operating shaft **18** and arm **19**, with the reciprocatory piston **20***a* of an air cylinder **20** which serves as a motor both for opening and for closing the loading gate.

It will be evident that when air under suitable pressure is admitted into the left-hand part of cylinder **20** through conduit **21**, conduit **22** then being suitably vented, the arms **17** and **19** on shaft **18** are rocked counterclockwise so as to lift gate **15** to an open position, thereby permitting charge material in tank **13** to flow under gravity through spout **14** into basket **11**; while admission of air through conduit **22** into the right-hand part of cylinder **20**, conduit **21** then being suitably vented, brings about a closing movement of the loading gate.

The curb top cover **10** includes a portion **23** which is pivoted on stud **23***a* so that it can be swung away from the basket spindle **24** to provide an opening in the curb top through which the charge material may enter the basket.

An air valve **26** operated by a hand lever **27** is provided for directing the flow of air under pressure to air cylinder **20**. A conventional diagrammatic illustration of the working of valve **26** is given in FIG. 3, as any suitable valve construction may be used. Air under pressure is supplied to this valve from a supply conduit **28** through a branch conduit **29**. When the hand lever **27** is in its solid line position, as shown in FIGS. 1 and 3, the valve directs the flow of air under pressure through conduit **22** to the right-hand side of air cylinder **20**. As described above, the entry of air into this side of cylinder

20 will result in movement of the piston 20*a* and the closing of gate 15. Movement of the handle 27 to its dotted line position directs air under pressure through conduit 21 into the left-hand side of the cylinder, thus opening gate 15 to permit the flow of charge material into basket 11.

In order to avoid the waste of charge material, the amount of charge material delivered into the basket in the course of each loading operation should be such as to form an annular charge of not more than a predetermined thickness. A suitable final charge thickness is indicated, for example, at 12*a* in FIG. 1. As the charge material flows into the basket there is a gradual build-up of the annular charge. A convenient way of measuring this progressive build-up is by the use of a charge feeler, such as that illustrated at 25, which rides on the inner surface of the charge and is moved inwardly toward the spindle 24 as the charge becomes thicker. The overriding loading control mechanism of the invention responds to the charge induced movement of feeler 25 to the predetermined position 12*a* so as to move the handle 27 and the valve 26 to their gate closing position independent of the attendant, overpowering him if necessary, and thereafter prevents movement of the handle by the attendant to its gate opening position until the machine is in a condition suitable for another unloading operation.

The "overriding" control mechanism includes an air cylinder 30 having a piston 30*a* connected to handle 27 and movable by fluid under pressure in only one direction so as to move the handle from its gate opening position to its gate closing position. Thus, when air under pressure is supplied to the left-hand end (as seen in FIGS. 1 and 3) of cylinder 30 through conduit 31 and flexible hose 32 the piston 30*a* acts to move handle or lever 27 from its gate opening position to its gate closing position with a force sufficient to overpower the attendant, if such force is necessary.

Air is supplied to conduit 31 and thus to air cylinder 30 from supply conduit 28 through a valve 33. This valve includes a plunger 35 movable in a casing 34. The casing 34 has an air port connected to supply line 28 and another port connected to output line 31. An enlargement 36 of the plunger 35 engages the interior walls of casing 34 in an air tight manner. Compression spring 38 surrounds the portion of the plunger 35 which extends to the exterior of casing 34. This spring engages the end of casing 34 and the underside of a head 37 formed on the outermost end of plunger 35, and urges plunger 35 to the right, as seen in FIG. 3, holding enlargement 36 away from the openings in casing 34, so as to permit air under pressure to flow from supply line 28 to conduit 31 and thence to cylinder 30 and piston 30*a* and move handle or lever 27 to its gate closing position. Thus, when valve 33 is in its normal position, handle 27 cannot be moved manually by the attendant and the loading gate 15 cannot be opened.

In order to permit handle 27 to be manually movable a pivoted assembly designated generally at 39 is normally biased to a position where it engages head 37 to keep the air passage through valve 33 closed by the enlargement 36 of plunger 35. This assembly includes a rotatable shaft 40 which extends vertically above and below curb top cover 10. Charge feeler 25 is connected to the portion of shaft 40 which is below curb top cover 10 and within the basket 11, so that the charge induced inward movement of feeler 25 will rotate shaft 40 in a clockwise direction. An arm 41 is connected to the portion of shaft 40 above the curb top cover for rotation therewith. Adjustably secured in the free end of this arm is a headed screw 42 positioned to engage head 37 and move it inwardly when arm 41 is rotated counterclockwise. Tension springs 43 anchored to pin 44 have their free ends acting on an arm 45 extending from arm 41 so as normally to bias assembly 39 in a counterclockwise direction and, through the engagement of screw 42 with head 37, depress the plunger 35 to the left (FIGS. 2 and 3) with a force overcoming the force of spring 38.

In that position of the mechanism, enlargement 36 blocks the air flow to conduit 31; no air is supplied to cylinder 30; the hand lever 27 is freely movable by the attendant of the machine to control the opening or closing of the loading gate; and the feeler 25 on shaft 40 is positioned outwardly toward the basket wall at a location where it will be engaged and from which it will be moved inwardly by the inner surface of an annular charge building up in the basket.

As can be readily seen, the increasing thickness of a charge forming in the basket moves the charge feeler 25 inwardly toward spindle 24 and thus turns assembly 39 in a clockwise direction. When the charge reaches the predetermined thickness indicated at 12*a*, the valve plunger 35, which follows assembly 39 under the action of spring 38, reaches a position where it interconnects conduits 28 and 31 through the valve casing 34, as shown schematically in FIG. 3. This results in the flow of air under pressure from conduit 28 to conduit 31 and thence into cylinder 30. The piston 30*a* of cylinder 30 then moves lever 27 from its gate opening position to its gate closing position with sufficient force to overpower the the attendant's hand on lever 27, and thus the gate valve 26 energizes piston 20*a* in air cylinder 20 in the direction to close the loading gate. By virtue of the overriding action of cylinder 30, the gate is closed before the basket becomes overloaded even though the attendant neglects to move the handle to its gate closing position.

The opening of gate 15 is also prevented by the overriding control mechanism when the pivoted portion 23 of curb top cover 10 is in its closed position, shown in FIGS. 1 and 2. This is accomplished by the interaction between edge 46 of portion 23 and a pin 47 extending downwardly from arm 45. When cover portion 23 is rotated in a clockwise direction to its closed position, edge 46 engages pin 47 and rotates arm 45, shaft 40 and arm 41 in a clockwise direction away from head 37. Air pressure is then supplied through valve 34 and conduit 31 to the cylinder 30 to keep the gate closed. As long as cover portion 23 stays closed, the assembly 39 cannot rotate and the valve 34 continues to supply air under pressure to cylinder 30, thereby preventing the manual movement of lever 27 from its gate closing position to its gate opening position.

The described mechanism forceably closes the gate when the basket charge reaches a predetermined thickness and prevents the opening of the gate both when the charge is at this predetermined thickness or higher, and when the movable portion of the curb top cover is closed.

It will be understood that the foregoing detailed description and the accompanying drawings are intended to exemplify the invention, and that the new parts, improvements and combinations herein disclosed may be embodies in various other forms and apparatus without departing from the substance of the disclosure or the intended scope of the appended claims.

I claim:

1. In a loading control mechanism for a cyclical centrifugal installation having a rotary basket, the combination of a loading gate for delivering charge material into the basket, a gate operating motor energizable in opposite directions to open and to close the gate, a gate motor control movable to one position to energize said motor in gate opening direction and to another position to energize said motor in gate closing direction, actuating means connected with said control and normally movable by hand to move said control to either of said positions, and power operated means for moving said control to gate closing position and rendering said actuating means manually inoperative to move said control to gate opening position.

2. In a loading control mechanism for a cyclical cen-

trifugal installation having a rotary basket, the combination of a loading gate for delivering charge material into the basket, a gate operating motor energizable in opposite directions to open and close the gate, a gate motor control movable to one position to energize said motor in gate opening direction and to another position to energize said motor in gate closing direction, a lever connected with said control and normally movable by hand to move said control to either of said positions, and power operated means connected to said lever to move it and said control to gate closing position with a force sufficient to overpower an attendant's hand holding said lever.

3. In a loading control mechanism for a cyclical centrifugal installation having a rotary basket, the combination of a loading gate for delivering charge material into the basket, an air operated gate motor energizable in opposite directions to open and to close the gate, an air valve movable to one position to energize said motor in gate opening direction and to another position to energize said motor in gate closing direction, a lever connected with said valve and normally movable by hand to move said valve to either of said positions, and an air cylinder and piston unit connected with said lever and energizable in one direction to move said lever and said valve to gate closing position with a force sufficient to overpower an attendant's hand holding said lever, and a control independent of said valve movable to one position to energize said air cylinder and piston unit and to another position to de-energize said air cylinder and piston unit.

4. In a loading control mechanism for a cyclical centrifugal installation having a rotary basket, the combination of a loading gate for delivering charge material into the basket, a gate operating motor energizable in opposite directions to open and to close the gate, a gate motor control movable to one position to energize said motor in gate opening direction and to another position to energize said motor in gate closing direction, actuating means connected with said control and normally movable by hand

to move said control to either of said positions, power operated means for moving said control to gate closing position and rendering said actuating means manually inoperative to move said control to gate opening position, a charge measuring device positionable by charge material in the basket, and means responsive to charge induced movement of said device to a predetermined position for energizing said power operated means.

5. In a loading control mechanism for a cyclical centrifugal installation having a rotary basket, the combination of a loading gate for delivering charge material into the basket, a gate operating motor energizable in opposite directions to open and to close the gate, a gate motor control movable to one position to energize said motor in gate opening direction and to another position to energize said motor in gate closing direction, actuating means connected with said control and normally movable by hand to move said control to either of said positions, power operated means for moving said control to gate closing position and rendering said actuating means manually inoperative to move said control to gate opening position, a movable curb top cover which overlies said basket when in closed position, and means operated in response to movement of said curb top cover to closed position for energizing said power operated means.

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