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E. G. KOCHLI ET AL

2,461,741

AUTOMATICALLY CONTROLLED SPRAYER FOR CENTRIFUGALS

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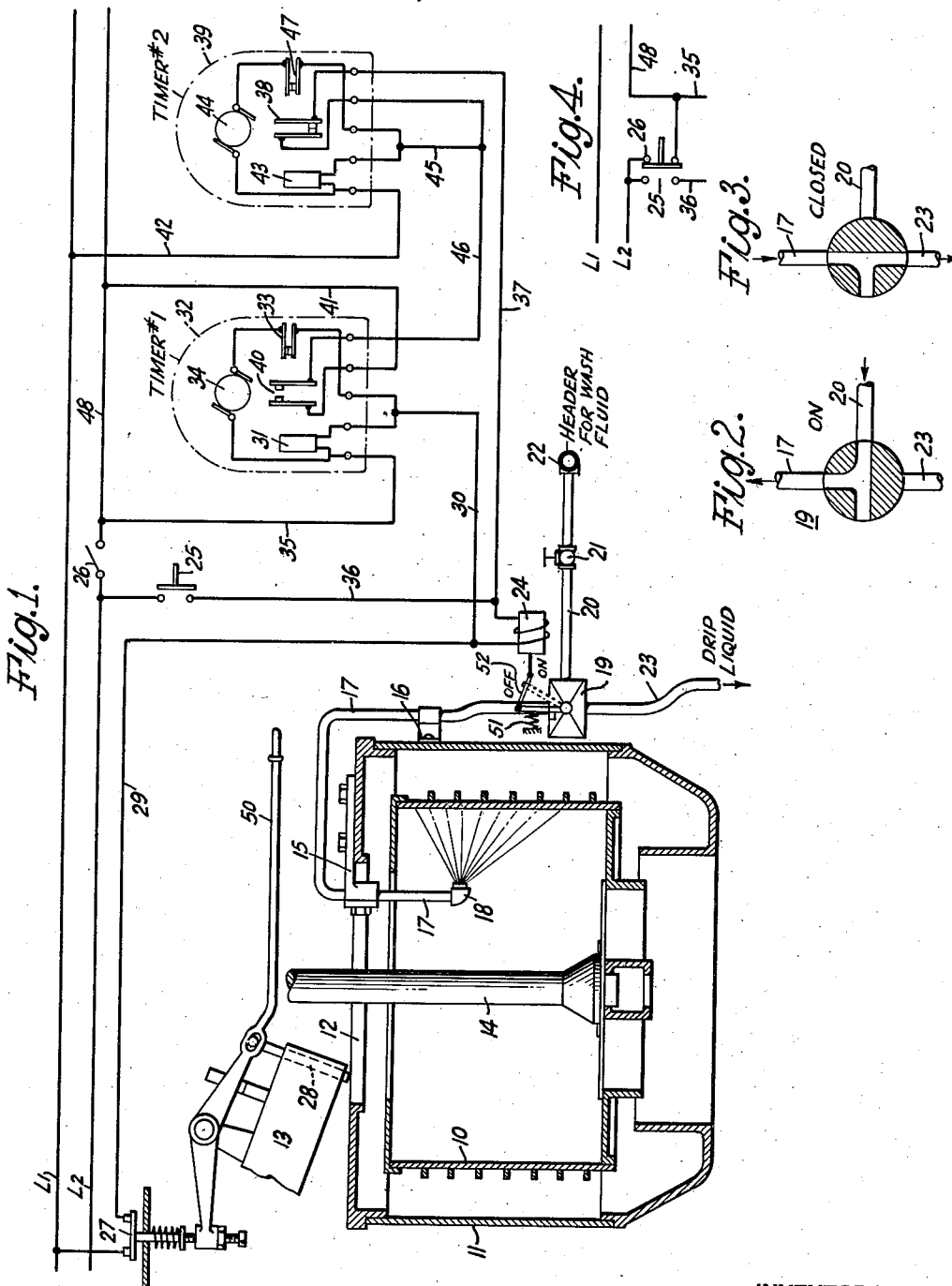


Fig. 4.

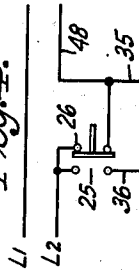


Fig. 3.

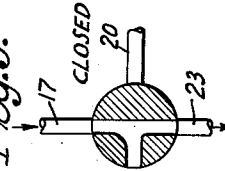
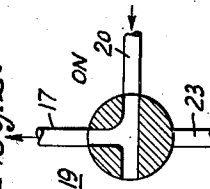


Fig. 2.



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AUTOMATICALLY CONTROLLED SPRAYER
FOR CENTRIFUGALSErnest G. Kochli, Scarsdale, N. Y., and Charles A.
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6 Claims. (Cl. 210-67)

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This application relates to control apparatus for centrifugal machines such as are used in drying and washing sugar and similar solids and more specifically to means for controlling the washing liquid used with said centrifugal machines.

It is an object of this invention to provide improved apparatus for controlling the distribution of liquid used in washing the solid grains in sugar centrifugals.

When sugar or similar material is treated in centrifugal machines, it is customary to spin the wet massecuite to throw off the mother liquor and after this liquor has been spun off and while the machine is still rotating at high speed, it is the practice to spray water or other washing fluid onto the material. In typical apparatus heretofore used, the valve controlling the spray for the washing fluid is mounted on the curb surrounding the centrifugal basket. On one side the valve is connected to the header for the washing fluid and on the other side to the spray nozzle through suitable piping. When the valve is opened the pressure in the header forces the water through the spray nozzle and onto the sugar in the basket. When the valve is closed, the flow of water through the spray nozzle into the basket should cease and, in fact, the forceful spraying does cease. However, an objectionable amount of water dribbles through the spray nozzle onto the dried sugar for two reasons, viz., (1) the nibe between the valve and the spray nozzle is full of water and this water finds its way slowly through the spray nozzle and falls onto the sugar at the time the sugar is still dry and in the process of being discharged from the basket, and (2) the control valve may completely close only when in new condition, and after only a relatively short period of service it usually does not close tight but allows a small amount of water to trickle through and fall onto the sugar in the same manner as the residual water in the pipe leading to the spray nozzle. Because of the fact that the dribble resulting from the outflow of the residual water always occurs, the tendency of the valve to leak slightly is not detected until the flow becomes so great as to attract attention. All of his time, which might be several weeks, the dried sugar receives an objectionable amount of wash water at a time when it would not be spun off. The tendency to leak applies especially to commercial types of solenoid valves frequently used in this service.

It is another object of this invention to provide

control means for the washing fluid which does not have the above-mentioned disadvantages.

In accordance with a specific illustrative embodiment of the invention, there is provided a three-port valve located on the side of the curb at a level lower than that of the spray nozzle. In this valve, the port leading to the spray nozzle is always open and the port connected to the wash fluid header is open when the solenoid controlling the valve is energized and closed when the solenoid is de-energized. The third port, through which the drip water flows, is closed when the solenoid is energized and open when it is de-energized. The manner in which this arrangement accomplishes the result of preventing the drip into the dried sugar is as follows: When the solenoid is energized, either by automatic or manual control means, the drip port is closed and the port to the washing fluid header is open, thus permitting the washing fluid to flow to the spray nozzle and to wash the sugar. When the solenoid is de-energized the washing fluid pressure is cut off and the fluid in the spray pipe forms a siphon which draws the fluid back through the spray pipe away from the spray nozzle and down through the drip pipe instead of allowing it to dribble onto the dried sugar. Furthermore, if the port to the washing fluid header is not closed absolutely tight, any small drip which occurs flows through the drip pipe instead of through the spray nozzle. The control valve therefore does not require servicing when any very small amount of leakage takes place but requires attention only if the leak should develop to such proportions that an objectionable waste of washing fluid occurs. Thus the period between servicings is greatly prolonged and, furthermore, the sugar at all times is kept free of moisture resulting from the drip.

While the solenoid can be manually controlled by a push-button, automatic control means for this solenoid is also provided in accordance with this invention. An exemplary embodiment of this control means comprises a limit switch operated by the movement of the mixer gate, and two electric timers. The limit switch is located at a point where its lever will be moved by the normal movement of the mixer gate used to load the centrifugal. When this gate is opened both timers are de-energized and returned to zero (reset). When the gate is closed the first timer immediately starts running. If the operator decides to put a little more massecuite into the basket and opens the gate to do so, the first timer immediately returns to zero. Thus

the washing cycle does not begin until the gate is closed for the last time. Then the first timer runs for a predetermined time according to its setting, and when it times out energizes the solenoid valve, starting the spraying, and at the same time starts the second timer running. This second timer runs for whatever length of time it is desired to apply the spray and then times out and de-energizes the solenoid, stopping the spray. Both timers remain in a timed-out position while the centrifugal is running to spin off the wash water and during the periods of braking and discharging the basket. When a new cycle of operation starts and the mixer gate is opened, the timers then return to zero and the first timer starts running again only when the mixer gate is closed at the completion of the charging. If for any reason it becomes necessary to load the centrifugal basket and not spin it, or if for any other reason automatic spraying is not to take place, this spraying can be prevented by closing a hand valve between the washing fluid header and the solenoid valve or, alternatively, a cut-off switch placed in the electric circuit leading to the timers can be opened. This switch, if desired, can be positioned so that when it is opened, another switch causing the operation of the solenoid valve independently of the timers is closed.

The invention will be more readily understood by referring to the following description taken in connection with the accompanying drawing forming a part thereof, in which:

Fig. 1 is a schematic diagram of a rotating basket for a centrifugal machine and control means, in accordance with the invention, for washing fluid therefor; and

Figs. 2 and 3 are schematic diagrams used to indicate the positions of the solenoid-controlled three-port valve shown in the arrangement of Fig. 1 when the solenoid is, respectively, energized and de-energized; and

Fig. 4 shows a modification of a portion of the circuit arrangement of Fig. 1.

Referring more specifically to the drawing, Fig. 1 shows, by way of example to illustrate the invention, a basket 10 of a sugar centrifugal and associated apparatus for controlling its loading and rotation and the washing of the massecuite therein at the proper times in each centrifuging cycle. The basket 10 is surrounded by a suitable outer casing 11 which has an opening 12 at the top thereof through which the basket can be loaded with massecuite from the spout 13 of a suitable mixer tank. The basket is supported and rotated by a spindle 14 which is driven by any well-known means such as, for example, an individual electric motor positioned above it. Supported from the outer casing 11, such as by brackets 15 and 16, is a pipe 17 terminating inside the basket at a spray member 18 and at a valve 19 outside the basket.

The valve 19 is positioned at a level below that of the spray member 18 and has three ports, one of them leading to the pipe 17, a second being connected by a pipe 20, having a hand valve 21 therein, to a suitable source of washing fluid, such as a water header 22, and the third one being connected to a drip pipe 23 which may lead to a receptacle (not shown) which can be connected through a pump to the water header. Reference will now be made to Figs. 2 and 3 which represent schematically the "on" and "off" positions of the valve 19. In the "on" position (Fig. 2), washing fluid from the header 22 is applied,

through the open valve 21, the pipe 20, valve 19, pipe 17 and spray 18, to the sugar grains in the basket 10 at the proper time in each centrifuging cycle. When the valve 19 is turned to the "off" (Fig. 3) position, the pipe 20 to the header 22 is blocked and the passage from the pipe 17 to the drip pipe 23 is opened. The liquid in the spray pipe 17 forms a siphon which draws the liquid back through this pipe away from the spray nozzle 18, and down through the drip pipe 23, instead of allowing it to dribble on the sugar which has been dried by the centrifugal action of the rotating basket 10. A further advantage of this valve arrangement is that, even if the port to the header 22 should not be closed absolutely tight, any small drips which occur will flow through the drip pipe 23 instead of through the spray nozzle 18 positioned at a higher level than the valve 19. Thus the control valve 19 requires servicing only if a leak develops to such proportions that an objectionable waste of wash fluid occurs.

The valve 19 can be operated between its "on" and "off" positions at the proper times in each centrifuging cycle by hand but preferably this operation is accomplished by means of a solenoid 24 which is energized either by a manually operated switch 25 or by automatic means to be described below.

Power for operating the solenoid 24 is taken from the conductors L1 and L2. The conductor L2 can have, if desired, a cutout switch 25 therein. Conductor L1 is connected through a switch member 27, the action of which is controlled by the movement of the gate 28 in the mixer spout 13, and through wire 29 to one terminal of the coil of the solenoid 24. This terminal of the coil is also connected by means of wire 30 to one terminal of the solenoid commonly called a clutch coil 31 in electrical timer 32 (sometimes called timer No. 1) and through the limit switch 33 to one terminal of the motor 34 therein. The other terminals of the motor 34 and the clutch coil 31 are connected to the wire lead 48 from switch 26 through a wire 35. The other terminal of the coil of the solenoid 24 is connected (1) by means of the wire 36 and the hand-operated switch 25 to the conductor L2 and to one side of the switch 26 and (2) by means of the wire 37, normally closed contacts 38 of the timer 39 (sometimes called timer No. 2), wire 40, normally open contacts 40 of timer 32 and wire 41 to the wire lead 48. Conductor L1 is connected by means of wire 42 to one terminal of the clutch coil 43 and to one terminal of the motor 44 of timer 39. The other terminal of the clutch coil 43 is connected by means of wires 45 and 46 to the contacts 40 of timer 32 while the other terminal of the motor 44 is connected through the limit switch 47, and wires 45 and 46 to the contacts 40.

The automatic operation of the arrangement shown in Fig. 1 will now be described. The switch 27 is open whenever the gate 28 (on the spout of the mixer supplying massecuite to the centrifugal basket 10) is raised by pushing the lever 50 upward. The operation of a switch like switch 27 by the movement of a mixer gate is described in detail in C. A. Olcott Patent 2,148,320 issued Feb. 21, 1939, so will not be further described in this application. A timer like timers Nos. 1 and 2 is also described in detail in this Olcott patent. It is sufficient to point out herein that whenever the mixer gate 28 is open, the switch 27 breaks the circuit to timers Nos. 1 and 2 and they are deenergized and returned to zero (reset). When switch 26 and the gate 28 is also

closed, switch 27 is closed and the circuit from L1, switch 27, wire 29, wire 30, limit switch 33, motor 34 and wire 35 to wire lead 48 is closed as is also the circuit energizing the timer clutch coil 31. After a predetermined time interval long enough to permit the sugar grains in the basket to be dried, the contacts 40 are closed by the timer mechanism energizing (1) the circuit from conductor L1 through switch 27, wire 29, solenoid 24, wire 37, contacts 38, wire 46, contacts 40 and wire 41 to wire lead 48 and thence to L2 and (2) the circuit from conductor L2 through switch 26, wire lead 48, wire 41, contacts 40, wire 46, wire 45, contacts 47, motor 44, and wire 42 to the conductor L1. The energization of the first of these two circuits causes the operation of the valve 19 to the "on" position (the position illustrated by Fig. 2) permitting washing fluid to be applied from the source 22 through pipe 20, valve 19, and pipe 17 to the spray member 18. The energization of the second of these circuits starts the motor of timer No. 2 running and at the same time (as the clutch coil is shunted across the motor 44 and the switch 47) the clutch coil 43 is energized. Timer No. 2 runs for a predetermined time period (sufficiently long to spray the sugar grains in the centrifugal basket 10) and then opens the contacts 38 breaking the circuit through the solenoid 24 and permitting the valve 19 to return to its "off" position (see Fig. 3) to which it is biased by any suitable means such as the spring 51 and linkage member 52. In this position, the fluid from the source 22 is prevented from flowing to the spray member 18 and any fluid in the member 18 and the pipe 17 is caused to flow by gravity and by a siphon action to the drip pipe 23. In each timer, the limit switch serves to stop the operation of the motor after a predetermined time beyond that which is necessary for the operation of the contacts. Upon deenergization of the clutch coil in each timer when the gate 28 is opened, the timer resets itself. Thus, if in the operation of the arrangement, the operator decides to put a little more maccuite into the basket and opens the gate 28 to do so, timer No. 1 immediately returns to zero. Thus the washing cycle does not begin until the gate 28 is closed for the last time. At any time that the switch 27 is closed, the solenoid 24 can be energized by closing the switch 25 (which is usually a palm-operated switch).

If for any reason it is necessary to load the basket 10 and not spin it or if for any reason automatic spraying is not to take place, this spraying can be prevented by closing the hand valve 21 or by opening the switch 26 which is normally closed.

The operation of the timers Nos. 1 and 2 can be automatically synchronized with the rotation of the basket 10 in a manner similar to that described in the above-mentioned Olcott patent, and also in Patent 2,244,652 issued June 3, 1941 to E. G. Kochli.

In the modification shown in Fig. 4, the switches 25 and 26 are combined in the form of one double throw push button switch, biased so that switch 26 is normally closed and switch 25 normally open. Thus pressing the button will close switch 25 and apply the manual control of the washing and at the same time open switch 26, cutting out the timers and preventing their starting.

Although the present invention has been described in terms of a preferred illustrative embodiment, it should be realized that the invention

and its several features are susceptible of embodiment in a wide variety of other forms, hence the invention is to be understood as comprehending such other forms as may fairly come within the spirit and letter of the claims.

What is claimed is:

1. The combination with a centrifugal machine having a basket adapted to be cyclically rotated, of means for effecting the washing of the basket contents, said means comprising a spray member inside the basket, a source of washing fluid outside said basket, a pipe connection between said source and said spray member to supply water to the latter, a portion of said pipe connection being at a lower level than said spray member, a three-port valve in said lower portion of the pipe connection and a downwardly extending drain pipe completely outside said basket and having its upper portion connected to one of the ports of said valve, the other two ports of said valve being connected respectively to said source and to said spray member, said valve being of the type having only two positions and the valve being arranged so that in one of these two positions washing fluid from said source is applied to said spray member and the passage to said drain pipe is closed and in the other of which the spray member is connected to said drain pipe and the passage from said source to said spray member is closed.

2. The combination with a centrifugal machine having a basket adapted to be cyclically rotated, of means for effecting the washing of the basket contents, said means comprising a spray member inside the basket, a source of washing fluid outside said basket, a pipe connection between said source and said spray member to supply water to the latter, a portion of said pipe connection being at a lower level than said spray member, a three-port valve in said lower portion of the pipe connection, a downwardly extending drain pipe completely outside said basket and having its upper portion connected to one of the ports of said valve, the other two ports of said valve being connected respectively to said source and to said spray member, said valve being of the type having only two positions and the valve being arranged so that in one of these two positions washing fluid from said source is applied to said spray member and the passage to said drain pipe is closed and in the other of which the spray member is connected to said drain pipe and the passage from said source to said spray member is closed, a solenoid for operating said valve between its two positions, and means for energizing and deenergizing said solenoid.

3. The combination with a centrifugal machine having a basket adapted to be cyclically rotated, of means for effecting the washing of the basket contents, said means comprising a spray member inside the basket, a source of washing fluid outside said basket, a pipe connection between said source and said spray member to supply water to the latter, a portion of said pipe connection being at a lower level than said spray member, a three-port valve in said lower portion of the pipe connection, a downwardly extending drain pipe completely outside said basket and having its upper portion connected to one of the ports of said valve, the other two ports of said valve being connected respectively to said source and to said spray member, said valve being of the type having only two positions and the valve being arranged so that in one of these two positions washing fluid from said source is applied to said spray member and the passage to said drain pipe is closed and in

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the other of which the spray member is connected to said drain pipe and the passage from said source to said spray member is closed, a solenoid for operating said valve between its two positions, and electrical timer means for energizing and de-energizing said solenoid.

4. The combination with a centrifugal machine having a basket adapted to be cyclically rotated, of means for effecting the washing of the basket contents, said means comprising a spray member inside the basket, a source of washing fluid outside said basket, a pipe connection between said source and said spray member to supply water to the latter, a portion of said pipe connection being at a lower level than said spray member, a three-port valve in said lower portion of the pipe connection, a downwardly extending drain pipe completely outside said basket and having its upper portion connected to one of the ports of said valve, the other two ports of said valve being connected respectively to said source and to said spray member, said valve being of the type having only two positions and the valve being arranged so that in one of these two positions washing fluid from said source is applied to said spray member and the passage to said drain pipe is closed and in the other of which the spray member is connected to said drain pipe and the passage from said source to said spray member is closed, a solenoid for operating said valve between its two positions, and electrical timer means for energizing and de-energizing said solenoid, said electrical timer means comprising a source of power, two electrical timers each including a motor and a set of contacts therein, those in the first timer being normally open and those in the second timer being normally closed and both sets being adapted to have this relationship reversed a predetermined time, which may be different for each timer, after the corresponding motor is started, circuit means for energizing the motor of said

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first timer from said source, additional circuit means actuated by the closing of the contacts in said first timer for energizing said solenoid and for starting the motor of said second timer, and further circuit means initiated by the opening of the contacts in said second timer for de-energizing said solenoid.

5. The combination of elements as in claim 4 in further combination with manually controlled gate means for loading the basket, and contact means operated by the movement of the gate means to the closed position for controlling the operation of said circuit means for energizing the motor of said first timer.

6. The combination of elements as in claim 4 in further combination with manually operated means for controlling the energization of said solenoid from said source of power, and electric circuit means for rendering said timers incapable of operation when said manually operated means is utilized.

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