FULLY AUTOMATIC CENTRIFUGAL MACHINE

Fig. 1.

Fig. 2.

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This invention relates to centrifugal machines. More particularly it relates to fully automatic centrifugal machines and control apparatus in which all of the centrifugal operations are continuously and automatically performed so that the centrifugal machine is fully automatic.

Heretofore proposals have been made to perform automatically the operations in connection with the centrifuging of sugar bearing materials in centrifugal machines. Such proposals have in many cases performed only a part of the operations automatically, or required manual re-starting of the centrifugal machine at the end of a cycle, or have failed to provide for properly performing all the operations automatically. Commonly the discharging has been improperly, incompletely or inadequately done in so-called self-discharging baskets or had to be done by mechanical unloaders whose mechanism was expensive and uncertain in operation and often did not completely remove all of the material. In some instances such mechanical unloaders were dangerous or destructive of the centrifugal machine.

It is an object of my invention to provide an improved apparatus for performing automatically, cycle after cycle, all the centrifugal operations without the intervention of human hands.

Another object of the invention is to provide improved means for automatically discharging centrifugal machines which means is capable of use with and is particularly useful in connection with fully automatically-controlled centrifugal apparatus.

Another object is to provide improved means to prevent dropping into the centrifugal of the raw material after the centrifugal has been loaded. A related object is to provide drip-preventing means which will be actuated automatically on closing of the charging gate for the centrifugal and which will be capable of use with and particularly useful in connection with the above-mentioned fully automatic centrifugal control apparatus.

Other objects and advantages of the invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:

Fig. 1 is an elevation view of apparatus embodying the invention.

Fig. 2 is a detailed elevation view of the charging funnel.

Fig. 3 is a top plan view of the thickness gauge.

Fig. 4 is a mid-section view partly broken away taken through the thickness gauge and its mounting on the centrifugal curb.

Fig. 5 is a section view taken along line 5—5 of Fig. 4.

Fig. 6 is a diagram of the circuit connections and elements employed in the apparatus.

Although the apparatus will be described in connection with a centrifugal for processing sugar bearing materials, it will be apparent that the invention is not limited in that respect and can be used with other materials.

Referring to the drawings, a centrifugal machine of the gyratory type has a motor 10 which drives a vertical shaft 12 on the lower end of which is mounted a centrifugal basket 14. The basket is open at its top and bottom and its side walls are cylindrical and are perforated so that material in the basket will wash up against the sides of the basket as it is rotated. The liquid matter is thrown off by centrifugal force in the usual manner.

The basket 14 is located inside a housing or curb 16 which is cylindrical and has a horizontal lip at its top. Its bottom is open but has around its edge one or more syrup gutters 18 as usual from which the liquid thrown off during the centrifuging can be collected.

According to my invention a plurality of vibrating devices 20 are mounted in the walls of the curb near the bottom edge thereof in position to act upon the centrifugal basket while it is at rest as will hereinafter be more fully described.

Material to be centrifuged is held in a reservoir or mixer tank 26. Extending from the bottom of the tank in position to discharge into the centrifugal machine is a spout 28. On the end of the spout there is mounted a sliding gate 30 which is adapted to slide up and down to open and close the opening at the end of the spout.

Pivotedly connected to the gate 30 is the lower end of a link 32 whose upper end is connected with one end of a pivoted arm 34. The other or upper end of the arm 34 is pivotedly mounted on the spout 28. For operating the gate through the link 32 and arm 34, a fixedly mounted pneumatic cylinder 36 is provided from which extends a plunger or piston rod 38 which connects with the arm 34 at a point intermediate its ends so as to cause movement thereof and, hence, upward sliding of the gate. The structure of such gates is per se well-known and its details need not be further illustrated or described.

To operate the gate automatically, through the agency of the pneumatic cylinder 36, a pipe 37 is connected between the top of the cylinder and one part of a three-way valve CV so that when air is admitted to the top of the cylinder, the gate will be closed. Connected between the bottom of the cylinder and the other part of the three-way valve is a pipe 41 so that when air is admitted to the bottom of the cylinder, the gate will be open.

It will be understood that when air is admitted by valve inlet port 43 to one end of the cylinder the valve will connect the other end of the cylinder to an exhaust port 45 as is common in the three-way valve.

In order to direct and distribute the material issuing from the spout 28 a funnel 42 is provided. The funnel mouth opens vertically upward and the funnel is of suitable size to receive the material flowing from the spout and to direct such material radially outward against the inside wall of the rotating centrifugal basket. The funnel may conveniently be attached rigidly to the top lip 47 of the stationary curb of the centrifugal. A removable shield or deflector 46 may be attached to the upper edge of the funnel as shown in dotted lines in the drawing to keep material from splashing outside the upper margin of the funnel. Preferably the lower end or outlet of the funnel is round in cross-section and cylindrical in shape towards its edge.

In order to prevent material which may drop from the spout and/or which may be in the funnel after charging of the basket is completed, from dropping down into the centrifugal, I provide an inflatable element 44 preferably having a spherical shape when inflated, which in inflated condition will fill completely the area within the end of the spout as illustrated in Fig. 1. The inflatable element 44 is preferably made from rubber or plastic or other suitable material and has a nipple or outlet for connection to the top wall of the funnel and connected to a conduit or tube 48 through which the element may be inflated. The tube 48 is connected with a check valve 49. This check valve is in turn connected to the pipe connection 37 be-
between the top of the gate operating cylinder 36 and the three-way valve CV. Thus when air is admitted to the top of the gate-operating cylinder to close the gate of the system will also be admitted at the same time to the inflatable element.

The provision of the check valve 49 in the air inlet line to the pneumatic element 44 prevents that element from filling up at once upon the inflow of air to the upper end of the gate control cylinder 36. The check valve is arranged to be of conventional bellow type, and may be purchased on the market and have a flap which will permit the immediate exhaustion of air from the inflatable element as soon as the air inlet line is connected to the exhaust port of the three-way valve CV, when that valve is operated to connect the lower end of the cylinder to the air supply. The flap will be drilled with a small hole to permit slow inflow of air to the element when the air inlet supply is connected to the source of compressed air. In this way the slow filling up of the inflatable element will permit the discharge of most of the material in the funnel when the gate closes but will prevent continuous dripping of the material after the centrifugal basket has attained speed in the normal operation of centrifugals.

For controlling the charging and starting of the centrifugal (or after unloading the charging and restarting) a filling gauge is provided (see Figs. 3–5). The filling gauge is arranged to be of conventional bellow type on top of the upper lip of the centrifugal curb 16. The purpose of the gauge is to measure and respond to the depth or thickness of the layer of material deposited on the inside wall of the centrifugal basket and thereby to afford means for controlling that depth or thickness by operating mechanism which opens and closes the gate 30. The

The filling gauge comprises a hollow casing or casting which has on its top surface a cover 51 in which there is a round opening, around the periphery of which a rib or tenon 53 extends up. Fitting on top of the opening is a cap member 55 which is circular and has a circular channel or mortise around its periphery to receive the rib 53. Thus the cap 55 may be rotated upon the cover 51 for adjustment as hereinafter more fully described.

The gauge housing has formed on its bottom a vertical cylindrical boss 52 which receives roller or other bearing 54 which is mounted on a vertical shaft 56. This shaft extends up into the casing of the gauge and has on its upper or inside end a cam member 58 having horizontal cam surfaces 58a and 58b. The surface 58b is lower than the surface 58a. Extending approximately radially from the cam member is an arm 60 to the outer end of which is attached a helical portion 62 whose other end is fastened to the casing of the gauge. The spring is tensioned enough to hold the arm 60 and the shaft 56 in a desired position. Upon the lower end of the shaft 56 is mounted a feeler or finger member 64 which is of such length and shape as to be able to touch and ride on the surface of the wall of material which forms on the inside of the centrifugal basket, and to be moved thereby as the wall thickens. The end of the arm 64 may be curved, if desired, and in position to raise the direction in which the basket rotates so as to keep from digging into or plowing the layer of material and yet be free to skim over the surface of the material as the material fills the basket. As the layer of material increases in thickness, it pushes or rotates the feeler or finger 64 which in turn rotates the shaft 56 upon which it is mounted, and also turns the cam 58 on that shaft.

Resting upon the upper surface 58a of the cam when the basket is being filled is a cam follower. The cam follower comprises a roller 66 mounted upon the end of lever 68 whose other end is pivoted upon a depending portion 70 of the gauge casing cap 55. Connected to the end of the lever is a plunger rod 72 of a solenoid GS, which is mounted upon the top of the cap 55. As the feeler finger 64 is moved outwardly from the full line to the dotted line position by the thickening of the layer of material walling up in the centrifugal basket, the shaft 56 and cam 58 are moved in clockwise direction (referring to Fig. 5). At the end of this movement the cam follower will move down from the high surface 58a to the lower surface 58b thus falling behind the vertical connecting surface 58c between these two surfaces and holding the shaft 56 and its associated parts in the dotted position of Fig. 5. At the end of the cycle of the centrifugal machine, as will have hereinbefore been described, the solenoid GS is energized raising the cam follower 68 to disengage the cam roller 66 from the cam 58 whereupon the spring 62, acting on the arm 60, returns the shaft 56 and associated parts to the full line position of Fig. 5.

In order to provide an adjustment of the position of the cam follower relative to the cam, the cap 55 can be rotated upon its mounting upon the cover 51 so that the cam follower will fall from the high to the low surface at the desired point in the rotation of the feeler member 64. That will be when the material in the basket has walled up to the desired thickness.

To maintain the cap 55 in adjusted position upon the cover 51, a retractable pin 55p located radially and mounted upon the cap 55 is adapted to enter one or another of a series of spaced drill holes or recesses in the exterior periphery of rib 53 of the cover 51.

Carrying upon the top of this rib are a magnet GS and insulated in any suitable manner therefrom is a bridging contact member 76 which engages with a pair of fixed contacts 78 mounted in conventionally insulated relation upon the cap member 55. When the cam follower is on the high point 58a of the cam, the movable contacts will be in engagement with the fixed contacts. When the cam follower falls on to the lower surface 58b, the movable contacts will separate from the fixed contacts thus breaking the circuit in which they are connected. As will hereinafter appear, the opening and closing of these contacts controls the operation of the charging gate. When the feeler finger 64 has moved the shaft 56 and cam 58 to the desired position, the circuit of the solenoid of the valve CV which controls the charging gate will be deenergized to cause the charging gate to close; and this circuit condition will continue until the closing of these contacts energizes the cam follower to release the cam and shaft 56 to return to the full line position of Fig. 5.

After charging, the machine may continue to run through the usual cycle. The cycle may include purging, washing, all automatically timed according to known means including electric timers and mechanical cam and valves. Alternatively, one or more of the steps may be omitted. Since the automatic timing and performance of these operations and steps are known, it will be assumed that those skilled in the art are familiar with them and I shall refer to the running period as including such of those operations as are desired. The timing of the period of running of the centrifugal motor is controlled by a conventional electric timer TR3 (see diagram of Fig. 6) of the type which, when energized, starts to run for the period for which it is set and then "times out," opening (or closing as the case may be) a pair of normally closed (or open) contacts and maintaining them in that condition so long as the timer remains energized. In order to provide automatic discharging of the centrifugal material at the end of the cycle, the bottom 17 of the centrifugal basket is made conical at an angle to the hori-
highly polished in order that the centrifuged material may slide freely over it. This high polish and smooth surface also tend to keep the material to remain walled up against the cylindrical side walls during the centrifuging operation and to keep the material away from the conical wall. Thus the liquid matter can be thrown off entirely from all of the material in the basket.

So-called self-discharging baskets have hereafter not been satisfactory at many stages of centrifugal treatment for many sugar bearing materials. Instead of discharging when the machine came to rest, the material would be so hard and compact—especially in present day high-speed centrifugals—that the material would not fall down and discharge itself as was intended. It had to be plowed out with a mechanical discharger or manually removed with a scoop. These difficulties have led the industry away from self-discharging baskets in many instances.

In order to insure that the material will separate from the side wall of the basket, I provide two or more vibrators 20 spaced around the centrifugal curb 16 and mounted in the bottom thereof. Each vibrator 20 comprises a cylindrical housing 80 in which is located a solenoid coil 82 having a hollow core. The outer end 84 of the vibrator casing is, or may be, semi-circular and have a resilient bumper or stop member 85 in axial alignment with the core of the vibrator so that a free core movement 86 may move with a vibratory action rapidly. This vibratory action is caused by energization of the solenoid from a separate source or circuit providing current and voltage of the proper intensity and frequency. The vibratory movement of the armature 86 is transmitted to a freely-moving plunger 87 coaxial with the armature at the inner end of the vibrator, this plunger being in position to strike against the outside wall of the conical bottom surface of the centrifugal basket. With two or more of these vibrators placed diametrically opposite or at any desired spaced positions, a vibratory action is created against the centrifugal basket which loosens the material and causes it to discharge itself through the open bottom of the centrifugal basket in a manner similar to the so-called self-discharging baskets.

In order to bring the machine to rest after the end of the running cycle or centrifuging operation a friction brake 22 of conventional construction is provided, the details of which form no part of this invention.

For operating the brake, a pneumatic cylinder 24 is provided from which a piston rod 25 extends and connects with the brake 22 to actuate the same. An electric solenoid 83 is provided for operating an air valve BSV which is connected to the cylinder 24 in the usual manner so that as air pressure is applied, the brake will be put on and when the air pressure is released by a spring (not shown) within the pneumatic cylinder, or elsewhere, will automatically release the brake and cause venting of the air from the cylinder. The solenoid BSV is controlled by the timer TR3 as hereinafter described.

In Fig. 6 I have illustrated diagrammatically the circuit connections for the above described apparatus as connected to conventional timers and electro-magnetic contactors. Insofar as it is necessary the structure and function of the elements will be described as the operation of the system proceeds.

Discharging.—Assuming the basket to have just come to rest and referring to Fig. 6, a centrifugally operated switch HGS closes the circuit between power lines L1 and L2A. That switch may be a mercury switch or any other suitable centrifugally operated switch and may be mounted on the centrifugal shaft or on the motor shaft with its leads connected to a two-ring commutator on the same shaft. Stationary carbon brushes (not shown) mounted on brush holders attached to the casing enclosing the assembly, provide electrical connections from the moving switch to the stationary circuit connections.

The closing of the switch HGS energizes the line L2A which operates electromatic contactor CS whose solenoid is across lines L' and L. Contactor CS has a set of contacts connected to a two-way valve SV and the solenoid BVS of the brake valve which in turn is in series with one set NS' of auxiliary normally closed contacts (of a master or motor control switch MS) the whole series being across lines L' and L2A. The operation of CS opens contacts denuding valve brake solenoid BVS opening the brake valve BV and releasing the brake. At the same time a second set of contacts C' of contactor CS (which are normally open) are closed. These contacts are connected to line L' on one side, and on the other to both timers TR1 and TR2. Timers TR1 and TR2 are also connected to line L2A and thus, through CS are across lines L' and L2A. Hence closing of contactor CS does three things:

a. It releases the brake.

b. It starts the vibrator 20. It does that by starting timer TR1. This timer has a set of contacts 90 which close instantaneously when the timer starts and open when it times out. They are connected to the supplementary power supply of proper intensity and frequency and to the vibrator solenoid KS. Thus the vibrator starts with TR1 and stops when TR1 times out.

c. It starts timer TR2. This timer has a set of normally open contacts 92. Timer TR2 times out after TR1 to prevent restarting before discharging can be completed.

Restarting.—When TR2 times out, it closes normally open contacts 92. These contacts are connected to contacts C' on one side and on the other to the solenoid of an electro-magnetic contactor AS for automatically restarting the centrifugal on a new cycle, all being in series across L', L2A.

Auto starter AS has two sets of normally open contacts C'1, C'2. Closing of C'1, which is in series with the solenoid of the motor starter MS across L'—L2A, causes the motor starter to close and the motor to start to accelerate the centrifugal. Cycle timer TR3 is in shunt with motor switch solenoid MS and hence starts to run when the motor switch closes. Closing of the contacts C'2, which are in series with the solenoid of material-thickness-gauge solenoid GS across L', L2A, energizes that solenoid and elevates the electromagnet plunger 72 thereby disengaging the cam follower 68 from the low level of cam 58 and elevating it to the high level on which it rides. That raises the finger to function as described. Simultaneously the contacts 76 are closed by the rising of the plunger. These contacts are in series with timer TR4 and start that timer when they close. TR4 has normally open contacts 94 connected to the solenoid CVS of the three-way valve CV which operates the charging gate; and CVS is connected in turn to line L'. TR4 has a short setting and is provided to allow the centrifugal to start rotating before the charging gate opens, so that when the material flows in there will be enough centrifugal force to cause the material to wall up.

Charging.—When timer TR4 times out, it closes contacts 94 and energizes CVS, opening the charging gate. At about this time the speed of the machine will have caused the centrifugal switch HGS to open deenergizing L2A and devices fed therefrom i. e. CS, TR2, TR1, AS and GS. When enough material in the centrifugal has walled up to move gauge finger 64 and with it sufficiently to let the cam follower 68 drop to the lower surface of the cam, [AS now being deenergized] contacts 76, 78 will open. That deenergizes timer TR4 whereupon contacts 94 return to their normally open condition, deenergizing charging valve solenoid CVS, thereby operating charging gate valve CV and in turn closing the gate and also to insulat element 44.

Running.—Cycle timer TR3 has a set of contacts 96 which close instantaneously when the timer starts to run;
7 and they open when it times out at the end of the running period.

When CS was deenergized by centrifugal switch HGS opening and deenergizing L2, the solenoid MS is no longer fed from power line L2A. It is fed from L2 through holding contacts MS2 of the motor starter, contacts 96 of timer TRS. (Connection of MS to line L' is as before.) Hence when TR3 times out the solenoid MS is deenergized and the motor switch contacts MS1, MS2, MS3 open deenergizing the motor. Opening of the motor switch causes reclosing of its normally closed contacts MS energizing the solenoid BVS of the brake valve BV to put on the brake for more rapidly decelerating the machine. When the machine stops, the operations just described are ready to be repeated automatically by switch HGS energizing again line L2A and the solenoid of controller CS.

Manual operation.—On some occasions, manual charging and manual starting may be desired or necessary. This is provided for by a transfer switch 100, a manually operated push button starting switch 101 and a push button charging switch 102.

The transfer switch is a conventional double throw switch having its blade connected to line L2 and one pole 100a connected to the connection leading to centrifugally operated switch HGS. The other pole is connected to conventional push button starting switch 101 which in turn is connected to the solenoid MS. When the transfer switch blade is switched from its normal connection (to the line L', pole 100a and switch HGS, for automatic operation) to pole 100m, closing of the push button 101 manually will energize MS and TR3 to start the machine and keep it running until TR3 times out—as in automatic operation.

Conventional charging push button 102 is in shunt connection with time operated contacts 94 of TR4. Manual pushing of 102 energizes solenoid CVS of charging valve CV and opens the charging gate. It stays open only while push button 102 is pressed.

Emergency stopping can be obtained by interposing an emergency push button switch 103 between motor switch solenoid MS and L' when desired.

From the foregoing, it may be observed that I have provided a fully automatic centrifuging apparatus which is useful for centrifuging sugar-bearing and other materials. Certain features of the apparatus such as the means to prevent dripping of material into the centrifugal basket from the charging spout are novel in themselves and can be used with centrifugal apparatus that is not fully automatic. However, the operation of this element is tied into and contributes to the continuous automatic operation of the whole centrifugal apparatus in a novel manner.

Similarly the vibrating means for causing discharging of the centrifuged material is also novel in its combination with the centrifugal. Although it may be used in connection with centrifugal apparatus that is not fully automatic it forms an important part of the present invention because it assures discharging of the sugar without the intervention of human hands or known types of plows and mechanical dischargers; and it combines in a novel manner with other elements of the system to produce a fully automatic centrifugal.

Although I have mentioned the two foregoing elements as novel per se, it will be understood that other elements may be used in centrifugal apparatus not fully automatic even though they find particular use and advantage in the combination of the present invention.

Although I have illustrated a preferred form of electric vibrator, pneumatic vibrators may also be used in which case a conventional solenoid operated air control valve will be employed operated by the switch 90 of TR1.

Many modifications within the scope of the invention will occur to those skilled in the art. Therefore I do not limit the invention to the specific form and detail as illustrated and described.

I claim:

1. In combination with a centrifugal machine having a rotating basket, a curb around said basket, funnelling means immovably mounted on said curb to direct material to be centrifuged against the wall of the basket, gate means to admit said material to said funnelling means, said funnelling means having a portion extending into the basket and having an opening facing an interior wall of the basket, and valve means in the funnelling means controlling the flow through said opening to prevent said drippings from leaving the funnelling means and entering the centrifugal machine.

2. A apparatus as claimed in claim 1 wherein the means to prevent drippings leaving the funnelling means comprises an inflatable element in the funnel.

3. Apparatus as claimed in claim 1 wherein the means to prevent drippings leaving the funnelling means comprises an inflatable element in the funnel and means to inflate said element concurrently with closing the gate means.

4. Apparatus as claimed in claim 1 wherein the means to prevent drippings leaving the funnelling means comprises an inflatable element in the funnel, means to open and close said gate means, and means to deflate and inflate said element concurrently with opening and closing said gate means.

5. Apparatus as claimed in claim 1 where the means to prevent drippings leaving the funnelling means comprises an inflatable element in the funnel and means to inflate said element concurrently with closing the gate means, and means to retard inflation of said element as said gate means closes.

6. Apparatus as claimed in claim 1 wherein the means to prevent drippings leaving the funnelling means comprises an inflatable element in the funnel and means to inflate said element concurrently with closing the gate means, and means to retard inflation of said element as said gate means closes, said retarding means being ineffective during deflation of said element.

7. An automatic centrifugal apparatus comprising a centrifugal machine, a brake, means automatically to disengage said brake, means to apply a dynamic force automatically to the basket to loosen and discharge the material from the machine while at rest, means automatically to start and stop said discharging means, means automatically to start the machine, a gate controlling admission of material to be centrifuged; and means to open and close said gate automatically, means to limit admission to the machine of a measured amount of material and to prevent dripping of additional material from the gate into the machine including an inflatable element, and means to inflate said element as said gate closes and deflate it as the gate opens, and means to automatically apply the brake and stop the machine, all said automatic means operating in sequence to continue said apparatus in operation cycle after cycle.

8. Apparatus as claimed in claim 7 wherein the means to cause inflation and deflation of said element and the means to cause opening and closing of the gate comprise a single automatic valve operable after discharging and controlled by the wall-thickness of the material in the basket.

9. Automatic centrifugal apparatus comprising a centrifugal machine starting and stopping means, a brake, a gate controlling admission of material to be centrifuged, means operable while the machine is at rest to apply a dynamic force to discharge the material from the machine; in combination with means to control the duration of running of the machine and to cause application of the brake, means independent of the centrifuged material and responsive to cessation of substantially all centrifugal force to release the brake and to cause said discharging means to be operated and to enable said starting
means and said charging gate subsequently to be operated, and timing means to start the machine automatically after discharging.

10. Apparatus as claimed in claim 9 having timing means controlled by said centrifugally responsive means to start said discharging means and to stop it at an interval thereafter.

11. Apparatus as claimed in claim 10 having timing means to delay opening of said gate until after the machine has started to pick up speed.

12. Apparatus as claimed in claim 9 having timing means to delay the opening of the gate until after the machine has started to pick up speed.

13. Apparatus as claimed in claim 9 wherein the discharging means is power-operated and positively acts to discharge the material.

14. Apparatus as claimed in claim 13 wherein the machine comprises a basket with a conical open bottom rotating within a curb, and said positively acting power-operated discharging means comprises vibrating means fixedly mounted on the curb and impinging on the conical bottom of the basket.

15. Apparatus as claimed in claim 14 wherein the vibrating means includes an electric solenoid, an armature within and vibrated by said solenoid, resilient means impinged upon by one side of said armature, and a plunger struck by the other side of said armature, said plunger impinging upon said bottom of the basket.

16. Apparatus as claimed in claim 9 having funnelling means cooperating with said gate to direct incoming material against the wall of the centrifugal machine, said funnelling means receiving drippings from said gate means, and valve means for the funnelling means to prevent said drippings from leaving the funnelling means and entering the centrifugal machine.

17. Apparatus as claimed in claim 9 having funnelling means cooperating with said gate to direct incoming material against the wall of the centrifugal, and means comprising an inflatable element in the funnelling means to prevent said dripping from entering the centrifugal machine, means to cause inflation of said element automatically concurrently with opening of said gate.

18. Apparatus as claimed in claim 9 having funnelling means cooperating with said gate to direct incoming material against the wall of the centrifugal, and means comprising an inflatable element in the funnelling means to prevent said dripping from entering the centrifugal machine, automatically operated pneumatic means to open and close said gate, and means to cause inflation and deflation of said element concurrently with the closing and opening of said gate.

19. Automatic centrifugal apparatus comprising a centrifugal machine, starting and stopping means, a brake, a gate controlling admission of material to be centrifuged, power-operated means positively acting to discharge the material from the machine, in combination with means to control the duration of running of the machine and to cause application of the brake, means responsive to cessation of substantially all centrifugal force to release the brake and to cause said discharging means to be operated and to enable said starting means and said charging gate subsequently to be operated, and timing means to delay restarting of the machine until the discharge means has operated for a discharging period and then to restart the machine automatically.

20. Automatic centrifugal apparatus comprising a centrifugal machine starting and stopping means, a brake, a gate controlling admission of material to be centrifuged, power-operated means operable while the machine is at rest positively acting to discharge the material from the machine; in combination with means to control the duration of running of the machine and to cause application of the brake, means independent of the centrifuged material and responsive to cessation of substantially all centrifugal force to release the brake and to enable said discharging means to be operated and to enable said starting means and said charging gate subsequently to be operated, and timing means to delay restarting of the machine until the discharge means has operated for a discharging period and then to restart the machine automatically.

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