Nov. 27, 1934. S. H. HALL 1,982,296

EMERGENCY CONTROL FOR CLOSED CENTRIFUGES

Filed Jan. 5, 1934

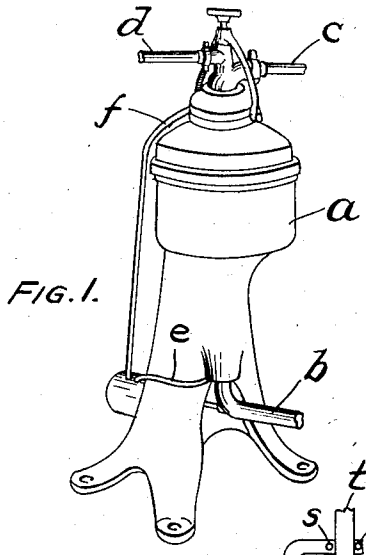


FIG. 1.

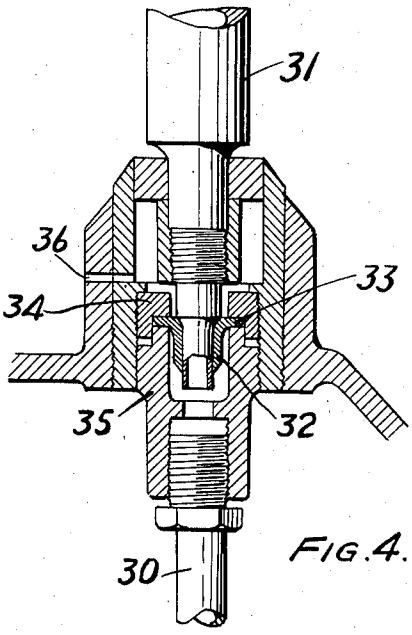


FIG. 4.

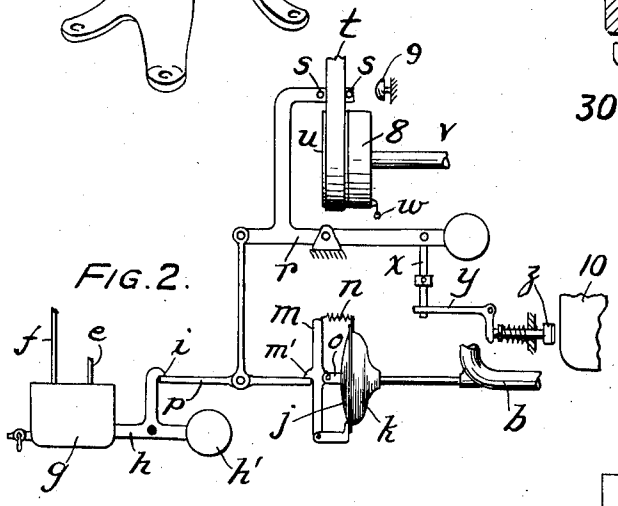


FIG. 2.

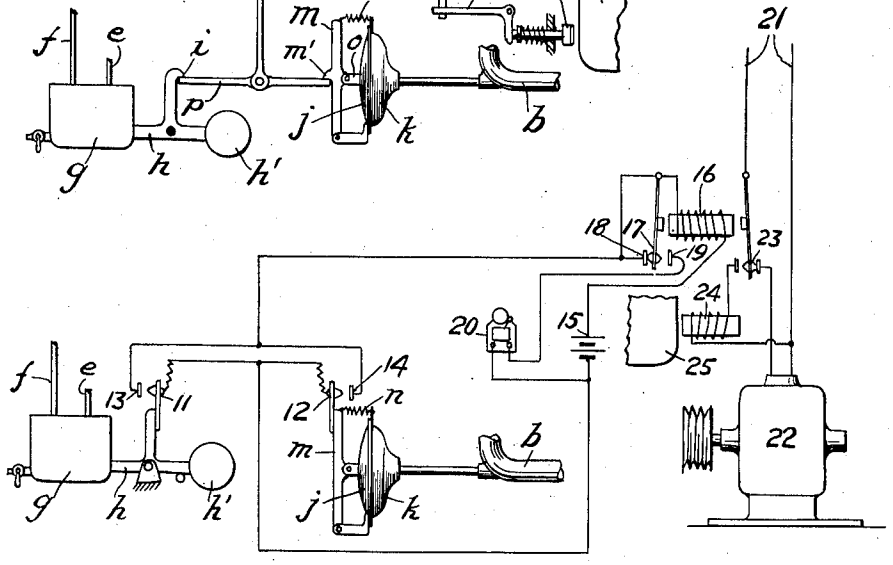


FIG. 3.

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EMERGENCY CONTROL FOR CLOSED CENTRIFUGES

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Application January 5, 1934, Serial No. 705,323

15 Claims. (Cl. 192—144)

My invention relates to that class of centrifugal separators which are provided with stationary pipe lines, tightly connected to the separator, for the supply and discharge of liquid. Such centrifugal separators are known as "closed" centrifuges.

In Lindgren patent applications Numbers 563,539 and 563,540, both filed September 18, 1931, and in application Number 652,745, filed January 20, 1933, there are shown closed centrifugal machines which, at the inlet and the outlet, are provided with flexible packings made of rubber or similar material. In order to have the needed flexibility these packings are necessarily made thin and will eventually break in use, causing wastage of the material, which may be of considerable value, as when separating rich cream from milk. If an attendant is not at hand to immediately stop the machine, the loss may be serious.

One of the objects of the invention is to automatically stop the feed of liquid being separated in case of leakage from a broken packing.

These packings and the members rotating in contact with them are so small that, if run dry or run without a circulation of liquid through them, they will be quickly overheated and injured or destroyed.

A second object of my invention is to automatically stop the machine in case of cessation of flow of liquid through the machine.

In the accompanying drawing, which illustrates embodiments of my invention:

Figure 1 is a perspective view of a closed separator. Figure 2 is a side elevation, in part diagrammatic, illustrating one type of emergency stop. Figure 3 is a similar view of another type of emergency stop. Both said embodiments of the invention are adapted to accomplish both of the purposes above stated. Figure 4 is a sectional view of a typical packing box for closed centrifuges.

Referring to Figure 1: *a* is a closed centrifugal separator with inlet tube *b* and outlets *c* and *d* for separated heavy and light constituents respectively. In such separators chambers are provided which surround the packing and catch any leakage therefrom. *e* and *f* are drainage tubes from such chambers adjacent to the lower and upper packings respectively.

Referring to Figure 2: *g* is a cup counterbalanced by a weight *h'* on a pivoted lever *h* having a hook *i*. *j* is a diaphragm forming one side of a chamber *k* communicating with the feed pipe *b*. A pivoted lever *m* with a hook *m'* is pulled toward the diaphragm by a spring *n* and, by means of a rod *o*, causes the diaphragm to dish inward unless forced outward by pressure from the pipe *b*.

Resting against the hooks *i* and *m* is a rod *p* the center of which is connected, by a rod *q*, with one end of a pivoted weighted lever *r* carrying, on a vertical arm, two pins *ss* between which runs a belt *t* onto a pulley *u* tight on a shaft *v* from which the separator and its feeding pump are driven. Adjacent to the tight pulley *u* is another pulley 8 loose on the shaft *v*. Loosely attached to the loose pulley 8 is a hammer *w* adapted, on rotation of the pulley, to strike a gong 9.

Attached to the weighted end of lever *r* is a plunger *x* which, through a bellcrank *y*, may force a brake *z* against the side of the centrifugal bowl 10.

The operation of the apparatus shown in Fig. 2 is as follows: In case a packing breaks, the small chamber surrounding the packing quickly fills and liquid flows thence through tube *e* or tube *f* into cup *g*. The weight of cup *g* soon overcomes the counterbalance weight *h*, swinging the lever to move hook *i* to the left and release the left hand end of rod *p*. If, for any reason, the supply of liquid to the machine ceases, the pressure against the diaphragm *j* will reduce and the spring *n* will pull the hook *m'* to the right and release the right hand end of rod *p*. In either case, there being nothing to hold the left hand end of the lever *r* down, it will be forced upward by the weighted end moving down. The vertical arm will move to the right, shifting the belt *t* onto the loose pulley 8. By the final movement of lever *r* brake *z* is applied to the bowl, thereby quickly stopping the machine.

Rotation of the loose pulley 8 will cause the loosely attached hammer *w* to fly out and strike the adjacent gong 9, thus notifying the attendant that the machine has been stopped. He will then empty the cup *g* and either replace a broken gasket, or refill the supply tank, dependent on what is found to be the cause of stoppage. Then, by pulling down on rod *q*, the machine and pump are started. The hooks *i* and *m'* will resume their normal positions and the rod *p* can be again placed against and held by them.

The apparatus shown in Fig. 3 differs from that shown in Fig. 2 in that the stoppage of the bowl and pump is controlled electrically instead of mechanically. The elements *b*, *e*, *f*, *g*, *h*, *j*, *k*, *o*, *m* and *n* are the same as in Fig. 2 (except that levers *h* and *m* are not provided with hooks) and are indicated by the same reference letters.

11 and 12 are movable terminals (on levers *h*

and *m* respectively), and 13 and 14 stationary terminals, of an electric circuit from a battery or other source of current 15. In this circuit is a magnet 16, normally demagnetized, and another movable terminal 17, normally in contact with a stationary terminal 18, but which, when the magnet 16 is energized, will move into contact with another stationary contact 19 in a branch circuit containing an electric bell 20.

21 is an electric power circuit supplying current to the motor 22 for driving the separator and its feeding pump. In this circuit is a switch 23 normally closed through the driving motor but which, when magnet 16 is energized, will open the circuit through the driving motor and close it through a coil 24 around a magnetic brake adjacent to the separator bowl 25.

The operation of the apparatus shown in Fig. 3 is as follows: If a gasket breaks, liquid will flow through pipe *e* or *f* and fill cup *g*, forcing it down and causing the movable terminal 11 to contact with the stationary terminal 13. If, because the supply tank is emptied or for any other reason, the feed stops, the pressure on the diaphragm *j* will reduce and the spring *n* will pull the lever and the movable terminal 12 to the right into contact with the stationary terminal 14. In either case the circuit through the battery and magnet 16 will be closed and the magnet energized, shifting the switch 23 to open the power circuit to the driving motor 22 and close it through magnet 24, thus applying the brake to stop the machine. At the same time terminal 17 is swung from contact 18 to contact 19, closing the battery circuit through bell 20 and causing it to ring and give an alarm.

The attendant can then correct the trouble, reset the emergency stop, and start the machine in the usual way.

Under special conditions making such action desirable, the drive-stopping means may act on either the separator drive or the pump drive without operating on the other; and where the claims refer broadly to driving means or stoppage means, they are intended to cover the means for driving or stopping either the separator or the pump or both.

While the destructible packing and the means for carrying away liquid leaking therethrough may be of any suitable type, one such arrangement is shown in Fig. 4. The packing box is postioned between a pipe 30 (which may be for supplying liquid to, and discharging liquid from, the separator) and the lower part of a hollow shaft 31 rotating with the bowl and communicating with its interior. The packing box comprises an elastic collar having a tube-shaped part 32 pressed by the liquid against shaft 31 and a disc-shaped part 33 locked to the packing box by nuts 34 and 35. While this packing is particularly adapted to minimize or prevent leakage while it remains in good condition, any leakage that may occur will flow into the chamber around shaft 31 and escape through opening 36, with which tube *e*, for example, may be assumed to be connected.

What I claim and desire to protect by Letters Patent is:

1. In a centrifuge of the closed type, the combination with a rotary bowl, driving means, liquid flow channels communicating with the bowl, and packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, and mechanism, whose operation is controlled by such escaping liquid, adapted to render said driving means inoperative.

2. In a centrifuge of the closed type, the combination with a rotary bowl, means to supply liquid under pressure to the bowl driving means, liquid flow channels communicating with the bowl, packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of said pressure, and mechanism, operable by the operation of said pressure device and also by such escaping liquid, to render said driving means inoperative.

3. In a centrifuge of the closed type, the combination with a rotary bowl, bowl driving means, bowl stoppage means, liquid flow channels communicating with the bowl and packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, and mechanism, whose operation is controlled by such escaping liquid, adapted to render said bowl driving means inoperative and said bowl stoppage means operative.

4. In a centrifuge of the closed type, the combination with a rotary bowl, means to supply liquid under pressure to the bowl, bowl driving means, bowl stoppage means, liquid flow channels communicating with the bowl, and packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of such pressure, and mechanism, operable by such escaping liquid or by the operation of said pressure device, to render said bowl driving means inoperative and said bowl stoppage means operative.

5. In a centrifuge of the closed type, the combination with a rotary bowl, bowl driving means, bowl stoppage means, means to supply liquid under pressure to the bowl, liquid flow channels communicating with the bowl, one of the channels being rotatable and the other relatively stationary, bearings, between said channels, injurable by operation without liquid flow therethrough, of a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of said pressure, and mechanism, operable by the operation of said pressure device, to render said bowl driving means inoperative and said bowl stoppage means operative.

6. In a centrifuge of the closed type, the combination with a rotary bowl, driving means, liquid flow channels communicating with the bowl, and packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, a vessel adapted to receive liquid from the drain channel, and mechanism, operable by the weight of liquid received in said vessel, to render said driving means inoperative.

7. In a centrifuge of the closed type, the combination with a rotary bowl, driving means, liquid flow channels communicating with the bowl, and packing between said channels, mechanism adapted to render said driving means inoperative, weight-operated means adapted to actuate said mechanism, and a trip, operable by liquid leaking through said packing, to release said weight-operated means.

8. In a centrifuge of the closed type, the combination with a rotary bowl, driving means, liquid flow channels communicating with the bowl, and packing between said channels, of a drain chan-

nel adapted to receive liquid escaping through said packing, an electric circuit, driving means in said circuit, and mechanism, whose operation is controlled by said escaping liquid, adapted to open said circuit.

9. In a centrifuge of the closed type, the combination with a rotary bowl, means to supply liquid under pressure to the bowl driving means, liquid flow channels communicating with the bowl, packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of said pressure, an electric circuit, driving means included in said circuit, and mechanism, whose operation is controlled by said pressure device and also by such escaping liquid, adapted to open said circuit.

10. In a centrifuge of the closed type, the combination with a rotary bowl, driving means, liquid flow channels communicating with the bowl, and packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, an alarm, and mechanism, whose operation is controlled by such escaping liquid, adapted to render said driving means inoperative and actuate said alarm.

11. In a centrifuge of the closed type, the combination with a rotary bowl, means to supply liquid under pressure to the bowl, driving means, liquid flow channels communicating with the bowl, packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of said pressure, an alarm, and mechanism, operable by the operation of said pressure device and also by such escaping liquid, to render said driving means inoperative and actuate said alarm.

12. In a centrifuge of the closed type, the combination with a rotary bowl, driving means, liquid flow channels communicating with the bowl, and packing between said channels, a device subject to the pressure of the supply liquid, mechanism adapted to render said driving means inoperative, and a trip, operable by said pressure device upon a given reduction in said pressure, to render said mechanism operative.

13. In a centrifuge of the closed type, the combination with a rotary bowl, bowl driving means, bowl stoppage means, means to supply liquid under pressure to the bowl, liquid flow channels communicating with the bowl, one of the channels being rotatable and the other relatively stationary, bearings, between said channels, injurable by operation without liquid flow therethrough, of an alarm, a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of said pressure, and mechanism, operable by the operation of said pressure controlled device, to render said bowl driving means inoperative and said bowl stoppage means operative and actuate said alarm.

14. In a centrifuge of the closed type, the combination with a rotary bowl, bowl driving means, bowl stoppage means, liquid flow channels communicating with the bowl, and packing between said channels, a device subject to the pressure of the supply liquid, mechanism adapted to render said driving means inoperative and stoppage means operative, and a trip, operable by said pressure device upon a given reduction in said pressure, to render said mechanism operative.

15. In a centrifuge of the closed type, the combination with a rotary bowl, means to supply liquid under pressure to the bowl, driving means, liquid flow channels communicating with the bowl, packing between said channels, of a drain channel adapted to receive liquid escaping through said packing, a device subject to the pressure of the supply liquid, means to operate said device upon a given reduction of said pressure, an alarm, and mechanism, operable by the operation of said pressure device and also by such escaping liquid, to actuate said alarm.

SELDEN H. HALL.