

United States Patent

Rousselet

[15] 3,642,136

[45] Feb. 15, 1972

[54] **AUTOMATIC SELECTOR FOR
VARIOUS EVACUATION CIRCUITS OF
A CENTRIFUGE**

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[22] Filed: Dec. 4, 1969
[21] Appl. No.: 882,077

[30] **Foreign Application Priority Data**

Dec. 4, 1968 France 50702

[52] U.S. Cl. 210/109, 210/375
[51] Int. Cl. B04b 11/06
[58] Field of Search. 210/375, 78, 109, 110, 373,
210/86; 233/4, 6, 10, 19, 22

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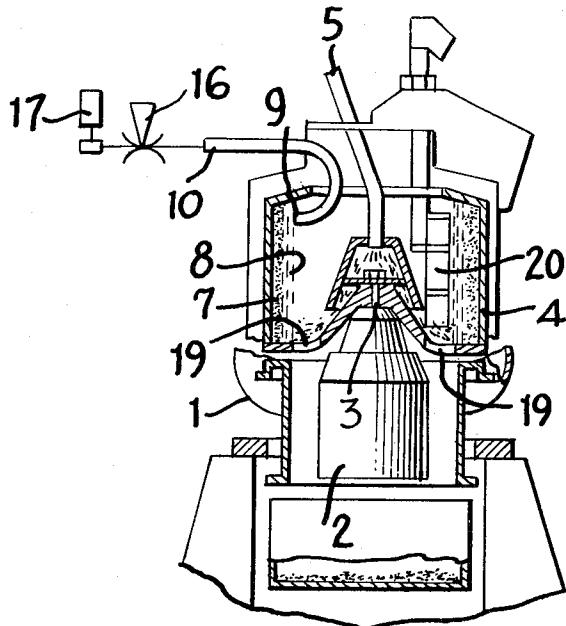
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[57]

ABSTRACT

An automatic selector for various evacuation circuits from a centrifuge is constituted by an adjustable electric, pneumatic or other pressostat, positioned in the outlet pipe of the evacuation nozzle of the centrifuge. The pressostat is adapted to control the opening and closing members of the circuits conducting the liquids and/or sediments to their storage containers, as a function of the pressure in the outlet pipe. The opening and closing members may be automatic valves on branch pipes from the outlet pipe. The sediment branch pipe may be equipped with a bypass valve calibrated and adjustable for automatic operation, the liquid branch pipe having an electrovalve. The pressostat may control a scraper knife removing sediment automatically through the bottom or side of a centrifuge of vertical or horizontal axis respectively.

2 Claims, 5 Drawing Figures



PATENTED FEB 15 1972

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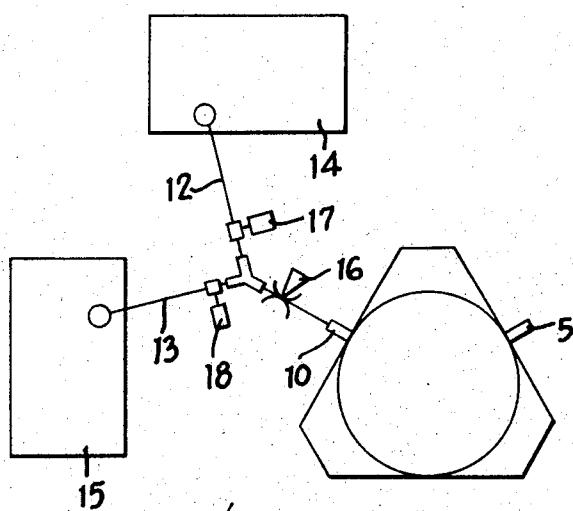


Fig. 2

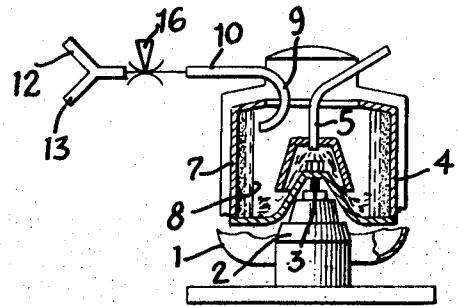


Fig. 1

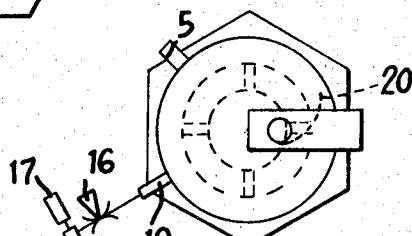


Fig. 4

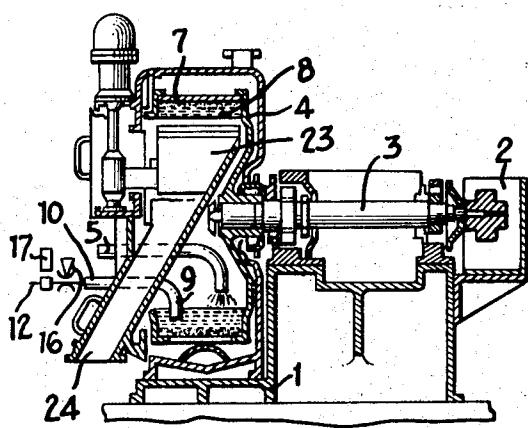


Fig 5

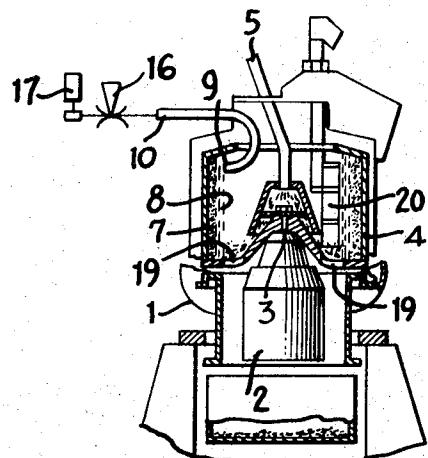


Fig. 3

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AUTOMATIC SELECTOR FOR VARIOUS EVACUATION CIRCUITS OF A CENTRIFUGE

The present invention relates to an automatic selector for various evacuation circuits of a centrifuge.

In the centrifugal separation of liquid and denser solid elements contained in a centrifuge bowl, the liquid is often removed by an aspiration nozzle called a sucette, positioned tangentially inside the bowl and at the circular level of the rotating liquid.

The tangential speed of the bowl, and consequently of the liquid, being high, the nozzle connected to the discharge tube for the liquid is placed tangentially and enables recovery of the clarified liquid at a considerable pressure to be sent into a receiving tank, elevated or not.

If, in this hydraulic circuit comprising the tangential nozzle and piping a manometer is installed, there is noted, after closing of the circuit by a valve, a pressure which is in direct relationship with the tangential speed, the viscosity and the density of the liquid.

If two liquids of different viscosity and density exist in suspension, different pressures are observed. Similarly, in the case of contact of the nozzle with sediment, an even higher pressure is observed.

In considering that the sediment, denser than the one or more liquids, positions itself against the wall of the bowl, as for most products, this sediment occurs in a pasty form and more or less stiff, due to the fact that it is impregnated with a certain moisture content, and as a result of high pressures of the order of several kilos per cm.², of the liquid and of the sediment, it is possible to remove by penetration of the nozzle, the solid which then flows in the form of a firm stiff pudding.

Such a centrifuge which receives a contaminated liquid, for the purpose of purifying and clarifying it, has a continuous and automatic operation until the bowl is filled with a certain amount of sediment.

It is therefore desirable in this separation to remove, on the one hand, a clarified liquid and, on the other hand, consequently, a sediment as dry as possible and freed to the maximum extent from liquid.

When the bowl is full of sediment, cleaning of the latter by means of the nozzle is necessary; there is then noted, after having stopped the inflow of the feed liquid, first the removal of the refined liquid and then that of the sediment by penetration of the nozzle into the thickness of the elements to the bottom of the bowl.

It is necessary at the outlet of the piping from the nozzle to provide a connection by a V-tube including a valve at each of the two branch tubes.

When the nozzle serving for the removal of liquid or solid is manually displaced by mechanical means, such as a wheel and screw or other means, it is possible, by a transparent reference mark provided on the outlet pipe and even by the amount of force exerted for the penetration of the nozzle, to observe the passage from the liquid to the solid. In closing the outlet valve, of the liquid and in opening that corresponding to the sediment, the solid can then be emptied into a suitable tank.

When this nozzle is displaced automatically by an electric, hydraulic, pneumatic or other drive, it is necessary to make automatic the opening and the closing of the valves controlling the removal of the liquid and the solid, said valves being arranged on the tubes go to corresponding tanks. It is then possible to determine the exact moment for the opening and the closing of the valves for distribution of the liquids and solids.

It is an object of the invention to provide an automatic selector for various evacuation circuits of a centrifuge which seeks to satisfy the aforesaid requirements.

According to the invention an automatic selector for various evacuation circuits from a centrifuge is constituted by an adjustable, electric, pneumatic or other pressostat which, positioned in the outlet pipe of the nozzle, controls the operation of opening and closing members of the circuits conducting the liquids and/or sediments to their storage containers,

and this as a function of the value of the pressure existing in the aforesaid outlet pipe.

According to another aspect of the invention there is provided an improved centrifuge equipped with such an automatic selector.

In one embodiment of an automatic selector according to the invention, the opening and closing members are constituted by electrovalves mounted on branch pipes coming from the outlet pipe of the nozzle.

Thus, as a function of the pressure, by the opening of one of the electrovalves and closing of one or more of the others, the liquids or solids are directed into appropriate containers.

In one variation of realization, and more particularly in the case of separation of a liquid and sediment, the branch pipe for the sediment is equipped with a calibrated bypass valve and adjustable by automatic operation, and only the branch pipe for the clarified liquid is equipped with an electrovalve.

In the case of separation of two liquids of different densities, it is always possible, according to already known arrangements, to add an auxiliary nozzle on the other side of the separator to collect the light liquid, this nozzle being fixed or slightly adjustable, but provided only for directing lighter liquid into a corresponding receiving tank.

According to a variation and especially in the case where the sediment is too stiff to be evacuated through a tangential nozzle, the pressostat actuates a scraper knife removing the sediment automatically, through the bottom or through the side of the centrifuge, according as the latter has a vertical or horizontal axis.

In this case, after cutting off the supply of the primary liquid, the automatically advancing nozzle removes the liquid first and, after it has come into contact with the sediment, the pressostat, tripped by the increase in pressure, interrupts the automatic advance of the removal nozzle for the liquid and then controls the operation of the automatic advance of the knife, hence the scraping up of the stiff sediment, while the nozzle returns behind.

In order that the invention may be more fully understood several embodiments of a centrifuge equipped with such an automatic selector are described below, purely by way of illustrative but nonlimiting examples, with reference to the accompanying diagrammatic drawing, in which:

FIG. 1 shows a view in vertical section showing diagrammatically one embodiment of a centrifuge according to the invention, with a vertical axis;

FIG. 2 is a plan view of the embodiment of FIG. 1 from above, showing the relative positions of the various elements of the recovery circuits of the liquid and of the sediment;

FIG. 3 and 4 are views similar to those of FIGS. 1 and 2, but showing another embodiment of a centrifuge according to the invention; and

FIG. 5 is a view in longitudinal section of another embodiment showing the application of the selector and of the scraper knife to a centrifuge with a horizontal axis.

In FIG. 1, 1 denotes the base supporting the vertical ball bearing, 2, 3 the rotary shaft on which is fixed a bowl 4 in which terminates a pipe 5 bringing in the liquid to be purified. On rotation of the bowl 4, the sediment 7 is first deposited against the wall of the latter, while the liquid 8 is supported on this sediment, as shown in FIG. 1. The centrifuge comprises also a removal nozzle 9, or sucette, connected by piping 10 to branch pipes 12 and 13 carrying the liquid and the solid, respectively, to tanks 14 and 15.

According to the invention, on the removal pipe 10 is arranged a pressostat 16 controlling the operation of electrovalves 17 and 18 positioned on each of the pipes 12 and 13, as shown in FIG. 2.

Thus, when the nozzle 9 penetrates into the sediment, the latter is removed through pipe 10 which is then the site of higher pressure than when it is traversed by liquid; this increase in pressure, detected by the pressostat 16, triggers the operation of the latter and actuates the closing of the electrovalve 17 and the opening of the electrovalve 18. As a result

the sediment is sent directly from the inside of the bowl 4 to its receiving tank 15.

Of course, when the removal is finished pressostat 16 actuates the closing of the electrovalve 18 and the opening of that 17 for the next removal of the liquid.

In a variation of realization, the electrovalve 18 positioned on the tubing 13 is replaced by a bypass valve opening automatically beyond a certain pressure.

FIGS. 3 and 4 show a centrifuge in which the evacuation of stiff, pasty sediment is effected through openings 19 provided in the bottom. To this end, it comprises a vertical scraper knife 20 whose movement is controlled by the pressostat 16. The outlet pipe 10 extending the nozzle 9 has no branch and ends at the tank 14 for the purified liquid. This pipe bears the electrovalve 17 and the pressostat 16.

In this centrifuge, the nozzle 9 ensures the removal of clarified liquid 8 and as soon as it comes into contact with the sediment 7, the pressostat 16 actuates the closing of the electrovalve 17, the placing in motion of the scraper knife 20, and the immediate withdrawal of the nozzle 9.

In FIG. 5, showing the application of this selector to a centrifuge with horizontal axis, common elements of the various figures bear the same reference numerals. Thus, there again are found shaft 3, bowl 4, the inlet pipe 5 for the liquid to be purified, the nozzle 9, the single removal pipe 10, the pressostat 16 and the electrovalve 17. Only the evacuation of the sediment 7 removed from the bowl by the scraper knife 23 is effected through the side of the apparatus, that is to say through the base. This stiff sediment is removed through the pipe 24, as soon as the pressostat has actuated the closing of the electrovalve 17 and the displacement of the scraper knife

23.

I claim:

1. In a centrifuge having a selector for the selective evacuation of liquids and sediment, wherein said centrifuge includes an evacuation nozzle with an outlet pipe for said evacuated liquids and sediment; said selector comprising a pressure-sensitive switch positioned in said outlet pipe, valve means in said outlet pipe, said switch controlling opening and closing of said valve means so as to alternatively permit and restrict flow of said evacuated liquids and sediment through said outlet pipe in response to said switch sensing the pressure in the outlet pipe, said centrifuge being rotatable about a generally vertical axis; and a scraper knife for automatically removing sediment accumulated on the side of said centrifuge, said scraper knife being actuatable in response to said pressure-sensitive switch.

2. In a centrifuge having a selector for the selective evacuation of liquids and sediment, wherein said centrifuge includes an evacuation nozzle with an outlet pipe for said evacuated liquids and sediment; said selector comprising a pressure-sensitive switch positioned in said outlet pipe, valve means in said outlet pipe, said switch controlling opening and closing of said valve means so as to alternatively permit and restrict flow of said evacuated liquids and sediment through said outlet pipe in response to said switch sensing the pressure in said outlet pipe, said centrifuge being rotatable about a generally horizontal axis; and a scraper knife for automatically removing sediment accumulated on the bottom of said centrifuge, said scraper knife being actuatable in response to said pressure-sensitive switch.

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