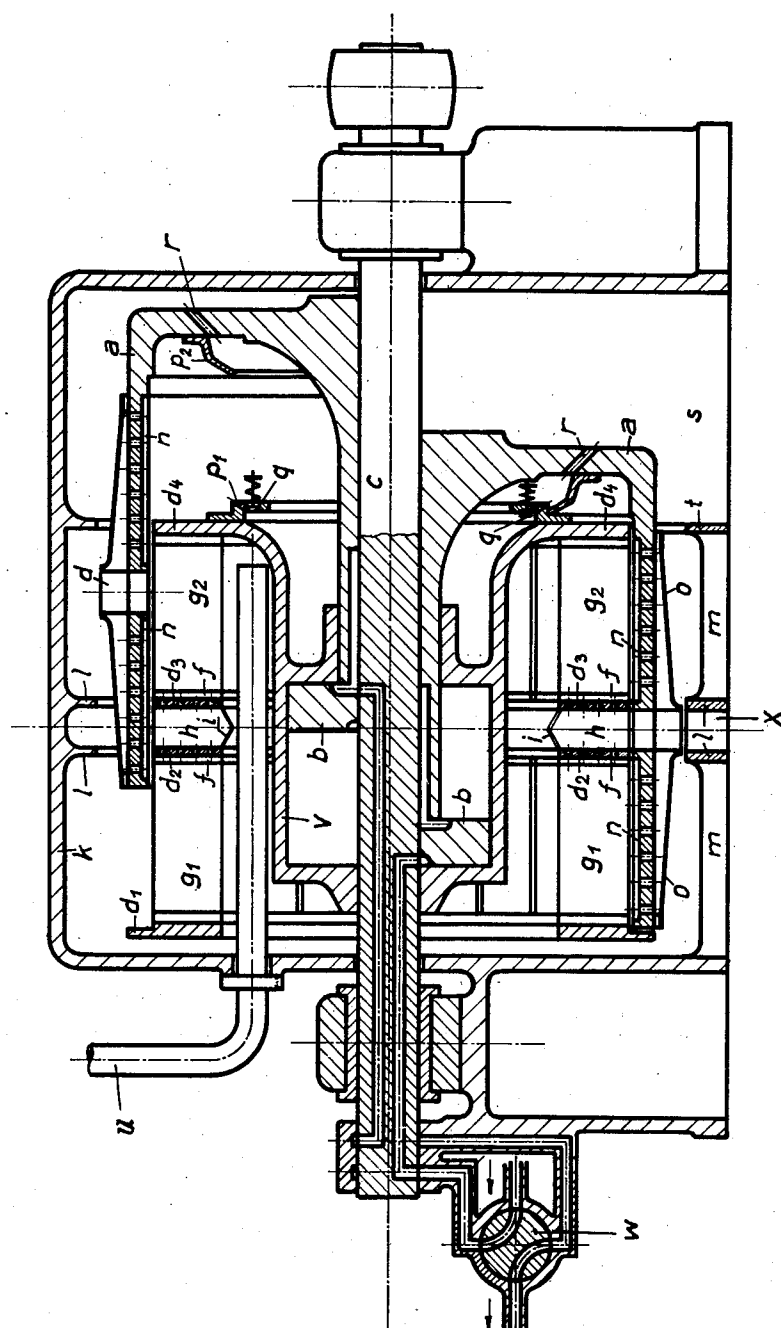


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CENTRIFUGAL MACHINE
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CENTRIFUGAL MACHINE

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This invention relates to centrifugal machines for eliminating one or more of the constituents of fluid or other substances.

Centrifugal machines are known to work continuously in separating solid substances from liquid in such manner, that the automatic discharge of the drum is effected by an axial movement of the peripheral wall of the drum. By this method the peripheral wall of the drum is drawn over an annular wall, whereby the separated solid substances are thrown over the edge of the drum under the action of the centrifugal force. For the axial movement of the peripheral wall of the drum a working cylinder containing a piston is employed, the piston being under the influence of some pressure fluid, such as pressure oil, steam, compressed air etc; this fluid acting alternately on either side of the said piston. This arrangement may be reversed in such manner, that the said annular wall is moved axially in relation to the peripheral wall of the drum.

In centrifugal machines of this type the length of the working cylinder, in which the piston, connected rigidly either with the peripheral wall or the discharging wall of the drum is moved to and fro by means of a suitable pressure fluid, depends on the length of the drum. In centrifugal machines of high capacity the dimensions of the working cylinder turn out very large and the amount of pressure fluid will be correspondingly big to work the machine. In order to deal with and store such large quantities of pressure fluid, for instance pressure oil, an extensive oil control plant, such as large efficient pumps, tanks etc. will be necessary. Such requirements make the whole machine more expensive also the working costs and frequently tend to render the employment of this class of machines uneconomical.

It is the object of the present invention to remove these drawbacks. The invention consists mainly of the fact, that the drum is subdivided in several, at least in two separating chambers by the insertion of circular division walls, which are arranged in such manner that a chamber is interposed between each pair of such walls and it consists further of certain discharge openings or ports, situated in the peripheral wall of the drum and in line with the said interposed chamber, so that the separated solid substances, which are accumulating in the one separating chamber are thrown out by centrifugal force over the edge of the drum, whilst those solid substances in the other separating chamber or chambers can be discharged through the discharge openings or ports. This improvement permits, that the stroke of the piston in the working cylinder during the emptying or discharging of the drum needs to be only as long as one single separating chamber instead of the aggregate length of all the chambers provided in the machine. As the quantity of pres-

sure fluid and the dimensions of the working cylinder, the pressure fluid tanks etc. are defined by the length of the stroke, which is necessary for the axial movement of the peripheral wall or the dividing walls of the drum, all these details will therefore be correspondingly smaller and for the same reason also the power consumption. It follows therefore, that a centrifugal machine, which is built to embody this invention, will give considerably better results in comparison with machines of the previous design and similar dimensions, from the point of view of first cost, efficiency, floor space required as well as of power consumption.

Further features of the invention will be apparent from the following description, which is taken in conjunction with the accompanying drawing, which illustrates a centrifugal machine in accordance with my invention in a central vertical section taken longitudinally.

In this illustration *a* represents a separating drum rigidly connected with the pressure piston *b*, the drum *a* being perforated and able to rotate on the shaft *c* and having discharge openings or ports on its circumference. Within the separating drum is provided a member, consisting of several circular plates or walls *d1*, *d2*, *d3* and *d4* and being cast integral with the working cylinder *v*, in relation to which the peripheral wall of the drum *a* can be moved axially. The imperforate plate *d1* serves for closing the drum. The perforated circular plates *d2* and *d3*, which are covered with slot strainers *f*, form an interposed space *h*, by means of which the separating chambers *g1*, *g2* are kept separated. During the period of centrifuging this interposed space is opposite the discharge openings *d* of the drum as shown in the lower half of the sectional drawing. The material to be treated is supplied to the two separating chambers *g1*, *g2* by means of the pipe *u*. In order to prevent any material, which is to be treated, from entering the interposed space *h* during the supplying period, this interposed space *h* is closed by means of a hood *i* in the direction of the drum shaft. During the period of separating the liquid from the solid substances the interposed space *h* is exactly opposite the discharge openings *d* of the drum *a* as mentioned already. Whilst this condition prevails any liquid escaping laterally from the chambers *g1*, *g2* enters the interposed space *h* and hence flows through the openings *d* towards the wall *k* of the casing under the influence of the centrifugal force, where it is restrained between the ribs *l*. As soon as the liquid has been separated from the solid substances the peripheral wall *a* of the drum is moved laterally in relation to the circular plates *d1*, *d2*, *d3*, *d4*. The edge of the peripheral wall *a* of the drum moves away from the circular end plate *d1* and simultaneously the discharge

openings *d* pass along the chamber *g2*. In this manner the solid substances contained in chamber *g1* are thrown over the edge of the peripheral wall of the drum and the solid substances in chamber *g2* are thrown through the openings *d* as they pass along the chamber *g2*. The movement of the peripheral wall of the drum is effected through the piston *b*, which works in the cylinder *v*. The piston itself is actuated by means of a suitable pressure fluid, for instance pressure oil, which enters the cylinder *v* alternately in front and behind the piston through conduits, which are drilled in the shaft *c* of the centrifugal machine. The alternate admission and action of the pressure oil is controlled by an automatic change-over valve of known design. The length of stroke of the pressure piston *b* corresponds with the length of one separating chamber.

In order to prevent during the centrifuging process any liquid, which escapes through the perforated surface of the peripheral wall of the drum and through the slot strainers thereon, from entering collecting space *m* for the dried material, a collecting ring *o*, tapering towards both ends is fitted round the separating chambers *g1*, *g2*. This collecting ring is tapered, so that the liquid, which is thrown on it, will run to the trough *x* of the drum casing *k*.

The invention provides further, that no leaking fluid, which may escape from the working cylinder *v*, can enter the spaces where separating is in progress. For this purpose annular dishes *p1*, *p2* are provided. The annular dish *p1* is fitted to the circular wall *d4*, whilst the annular dish *p2* is fitted to the end plate of the drum. The annular dish *p1* has springloaded valves *q*, which open only during the normal position of the drum, whilst the springs thereon close them during the period of discharging. When the drum is closed the second annular dish *p2* comes to rest in close contact with the dish *p1*, so that any leaking oil can flow through the open valves *q* from dish *p1* into dish *p2* and hence through the openings *r* in the drum end to the space *s* of the machine casing. The space *s* is separated by means of the web *t* from the collecting space *m*, into which the separating chamber *g2* discharges the dried material through the openings *d*.

It is obvious, that the invention is not restricted to the manner above described. Modifications may be made without difficulties. For instance, the axial movement may be imparted to the member carrying the circular walls *d1*, *d2*, *d3*, *d4* in a like manner instead of to the peripheral wall *a*. It is also possible to employ in the place of the working cylinder with piston some other device for the axial movement of the peripheral wall or the ring wall member, be it electrical, pneumatic, mechanical or otherwise.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:—

1. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall provided with a discharge opening intermediate the ends thereof, a plurality of circular walls encircled by said peripheral wall, means for supporting said circular walls transversely to the axis of the drum and in spaced relationship to form with said peripheral wall a pair of separating chambers and an intermediate space, and means for supplying material to be treated to said chambers, said circular walls and said peripheral wall being relatively axially shift-

able to centrifugal separating position, with said peripheral wall forming a closure for the outer peripheries of said chambers, and with said opening opposite said space or to discharging position, with the periphery of one of said chambers uncovered and said discharge opening registering with the other chamber.

2. A centrifugal machine for separating solid substances from liquid, including a drum open at one end and having a perforated peripheral wall and a discharge outlet intermediate the ends of said wall, a plurality of circular plates, means for supporting said plates within said drum in planes substantially at right angles to the axis of the latter and in spaced relationship to form a pair of separating chambers and an interposed space, means for supplying material to be treated to said chambers, the periphery of said drum during normal centrifugal separating action forming perforated closures for the outer peripheries of said chambers, with said outlet opposite said space, and means for effecting relative axial movement of said plates and said drum to uncover the outer periphery of one of said chambers and position the discharge outlet opposite the other chamber, whereby the separated solids from said chambers will be discharged under centrifugal action.

3. A centrifugal machine for separating solid substances from liquid, including a drum having a discharge opening in the periphery, a plurality of circular plates, means for supporting said plates within said drum and in spaced relationship with their outer edges adjacent to said drum to form a pair of separating chambers and an interposed space, the plates forming the opposite walls of said space being perforated to permit the passage of liquid therethrough from the separating chambers, means for supplying material to be treated to said chambers, the periphery of said drum during normal centrifugal separating action forming a closure for the outer peripheries of said chambers, with said opening registering with said space, and means for effecting relative axial movement of said drum and said plates to uncover the outer periphery of one of said chambers and position said discharge opening in registry with the other chamber, whereby the separated solids from said chambers will be discharged under centrifugal action.

4. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall provided with a discharge opening intermediate of the ends thereof, a plurality of plates, means for supporting said plates within said drum and transversely with respect to the axis thereof and in spaced relationship to form a pair of separating chambers and an intermediate space, said peripheral wall during normal centrifugal separating action forming a closure for the outer peripheries of said chambers, with said opening opposite said space, the width of said space being substantially equal to the width of said discharge opening, and means for effecting relative axial movement of said peripheral wall and said plates to uncover the outer periphery of one of said chambers and position the discharge opening opposite the other chamber, whereby the separated solids from said chambers will be discharged under centrifugal action.

5. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall with a discharge opening for solids in said wall intermediate the ends thereof, a cylinder, a plurality of circular plates within

said drum and connected to said cylinder and extending transversely with respect to the axis of the drum and in spaced relationship to form a pair of separating chambers and an interposed space, said peripheral wall during normal centrifugal separating action forming a closure for the outer peripheries of said chambers, with said opening opposite said space, a piston in said cylinder and connected to said peripheral wall, means for supplying motive fluid selectively to either side of said piston to effect relative axial movement of said wall and said plates, to uncover the outer periphery of one of said chambers and position the discharge opening opposite the other chamber.

6. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall provided with a discharge opening in said wall intermediate the ends thereof, a cylinder mounted coaxially with said drum, a plurality of circular plates within said drum, connected to said cylinder, extending transversely with respect to the axis of the drum, and in spaced relationship to form a pair of separating chambers and an intermediate space, said peripheral wall during normal centrifugal separating action forming a closure for the outer peripheries of said chambers, with said opening opposite said space, a piston in said cylinder connected to said peripheral wall, and means for supplying motive fluid selectively to either side of said piston to move said piston in said cylinder, and move said peripheral wall to uncover the outer periphery of one of said chambers and position the discharge opening opposite the other chamber, whereby the separated solids from said chambers will be discharged under centrifugal action.

7. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall provided with a discharge opening intermediate the ends thereof, means within said drum forming a pair of spaced annular chambers encircling the axis of said drum, and encircled by said drum, and including perforated wall members defining a space between said chambers, and a casing encircling said drum and having radially inwardly extending webs forming a trough opposite said discharge opening.

8. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall, means including circular plates for forming annular separating chambers coaxial with said drum and closed on the outer periphery by said peripheral wall of said drum, means for effecting relative axial movement of said peripheral wall and said circular plates, and including a cylinder mounted concentrically with said drum, and a reciprocating piston in said cylinder, and means for preventing any fluid which may escape from said cylinder from flowing into said separating chambers.

9. A centrifugal machine for separating solid substances from liquid, including a rotatable drum having a peripheral wall with a discharge outlet intermediate the ends thereof, a plurality of circular, axially spaced, transversely disposed plates encircled by said peripheral wall, and rotatable therewith, said plates and said peripheral wall defining a pair of separating chambers and an intermediate annular space, the plates forming the opposite walls of said space being perforated to permit the passage of liquid therethrough from the separating chambers, and means for

closing the inner periphery of said space, said circular plates and said peripheral wall being relatively shiftable axially to centrifugal separating position with said peripheral wall forming a closure for the outer peripheries of said chambers, and with said outlet opposite said space or to discharging position, with the periphery of one of said chambers uncovered and said discharge outlet registering with the other chamber.

10. A centrifugal machine for separating solid substances from liquid, including a drum having a peripheral wall with a discharge outlet for solids in said wall intermediate the ends thereof, a plurality of circular walls encircled by said peripheral wall, means for supporting said circular walls transversely to the axis of the drum and in spaced relationship to form with said peripheral wall a pair of separating chambers and an intermediate space, said peripheral wall forming a closure for the outer peripheries of said chambers during centrifugal separating action, and means including a cylinder coaxial with said drum, and a piston in said cylinder for effecting relative axial movement of said circular walls and said drum to uncover the outer periphery of one of said chambers and position the discharge outlet opposite the other chamber.

11. A centrifugal machine for separating solid substances from liquid, including a drum open at one end and having a perforated cylindrical peripheral wall and a discharge outlet intermediate the ends of said wall, a plurality of circular plates, means for supporting said plates within said drum transversely with respect to the axis of said drum and in spaced relationship to form a pair of separating chambers and an interposed space, said peripheral wall during centrifugal separating action forming perforated closures for the outer peripheries of said chambers with said outlet opposite said space, a collecting ring connected to said peripheral wall, encircling the same and flaring from the ends thereof towards its intermediate section, said collecting ring having a discharge opening opposite said discharge outlet, and means for effecting relative axial movement of said plates and said drum to uncover the outer periphery of one of said chambers and position the discharge outlet opposite the other chamber.

12. A centrifugal machine for separating solid substances from liquid, including a drum open at one end and having a perforated cylindrical peripheral wall and a discharge outlet intermediate the ends of said wall, a plurality of circular plates, means for supporting said plates within said drum transversely with respect to the axis of said drum and in spaced relationship to form a pair of separating chambers and an interposed space, said peripheral wall during centrifugal separating action forming perforated closures for the outer peripheries of said chambers with said outlet opposite said space, a collecting ring connected to said peripheral wall, encircling the same and flaring radially outwardly from the ends thereof towards its intermediate section, said ring having a discharge opening at said section opposite said discharge outlet, a casing encircling said collecting ring and forming a trough opposite said discharge opening, and means for effecting relative axial movement of said plates and said drum to uncover the outer periphery of one of said chambers and position the discharge outlet opposite the other chamber.