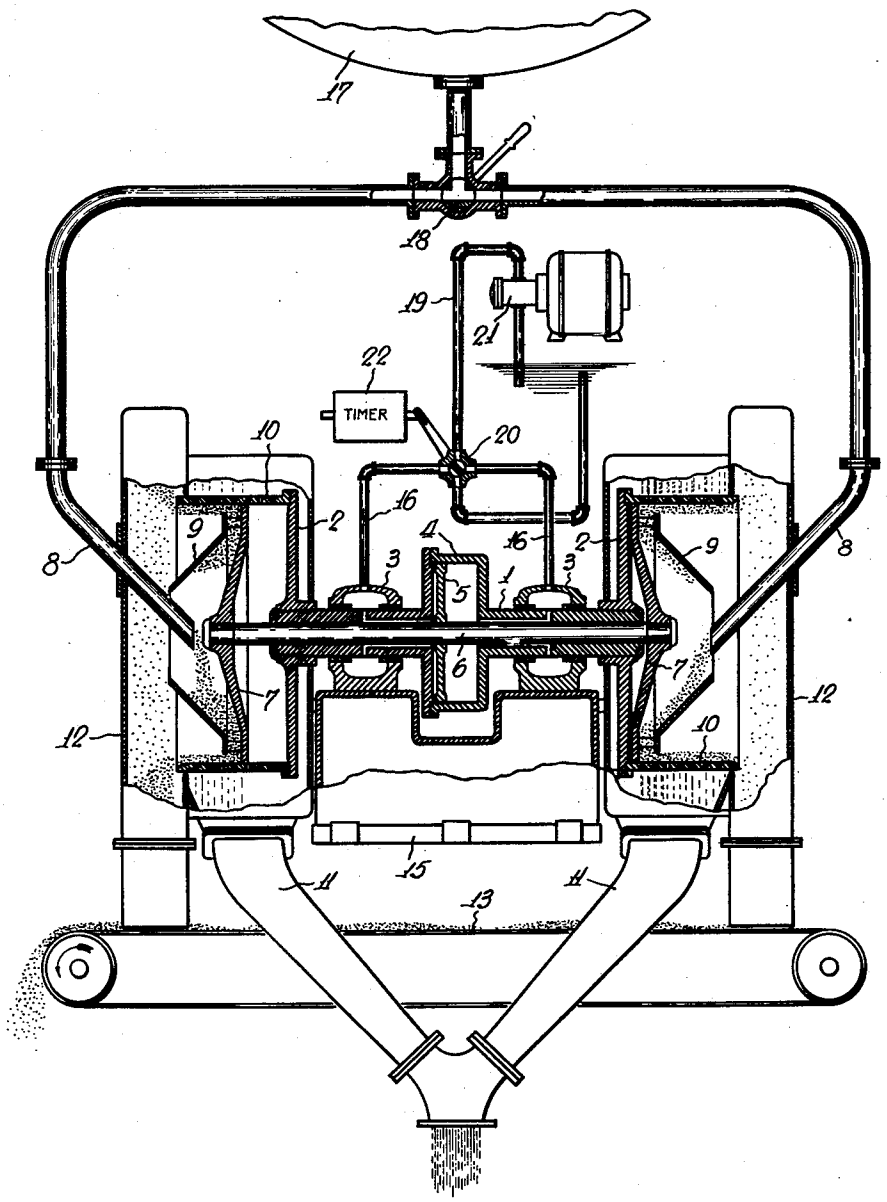
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DOUBLE-DRUM CENTRIFUGAL SEPARATOR

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DOUBLE-DRUM CENTRIFUGAL SEPARATOR

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This invention relates to a centrifugal machine for separating solids from fluid or sludgy material. The purpose of the invention is to create a more efficient machine of greater output, with smoother operation, and a more uniform delivery.

In one type of centrifugal separator designed for continuous operation, the separating drum is equipped with an axially movable end wall which is power operated to move back and forth through a limited range, and thus to expel the accumulated solid matter from the interior of the drum. The pushing of the material from the interior of the drum to the outlet chamber, occurs only when the movable end wall is traveling toward the open end of the drum, but during the time of the reverse stroke, there is no delivery from the drum. This alternate load and no load cycle necessarily causes irregular or pulsating power consumption and is not the most economical and smoothest kind of operation.

An object of this invention is to produce a centrifugal separator having a smooth, even, nonpulsating cycle of operation and more uniform power consumption. This is accomplished by mounting two separating drums, one on each end of a hollow rotatable shaft supported in two bearings positioned between the drums, equipping each drum with an axially movable end wall for expelling solid material therefrom, mounting these movable end walls on the ends of a shaft passing through said hollow shaft, and providing a cooperating cylinder and piston, the former on the hollow shaft and the latter on the internal solid shaft, for power actuation of the movable end walls so that these may be axially moved back and forth in a limited path relative to the centrifugal drums in which they are disposed.

By this arrangement of parts, a comparatively short and lightweight centrifugal drum construction is obtained. Furthermore, ready accessibility to all members of the machine may be had. Because the piston and pressure cylinder is disposed between the bearings, it acts as a counter-weight to the rotatably mounted centrifugal drums and this results in a uniform load on the bearings and therefore, quiet operation and a longer life for the machine.

The new construction produces a machine with a power piston working directly on the two movable end walls and so arranged that when one end wall is performing an expulsion or power stroke, the other is on a return or no load stroke and vice versa. The result is that the power piston is always exerting a more or less uniform effort whether moving to right or left and thus consumes power evenly and smoothly, resulting in not only a more efficient operation, but a smoother operation.

The two drums extract twice as much material as one drum of the same dimensions, but the expenditure of power to operate the herein described unit is only about ten per cent more than that required to operate a machine of the single drum type of only half the capacity. The space occupied and the cost of construction of this new machine are only about one-third more than the size and cost of a single drum machine.

A further advantage of this construction is that the delivery from the machine is uniform, and when a conveyor is used to carry away the material discharged, the belt will be uniformly loaded and thus efficiently utilized.

In the drawing, the single figure shows somewhat diagrammatically a vertical longitudinal section through the center of the machine.

A main hollow shaft 1 has mounted on the ends thereof a pair of separating drums 2 and is supported in bearings 3, between which is a cylinder 4 integral with or rigidly connected to the shaft. An internal shaft 6 is preferably connected to the outer shaft 1 by a sliding key or the like so that they will rotate as a unit but the inner one may move axially relative to the other. The inner shaft has a piston 5 in cylinder 4 and each end has a movable end wall 7 for the drums 2. Thus, the end walls rotate with the drums but move axially thereof by the power piston 5 to expel solids from the open ends of the drums. The shafts are not necessarily keyed together because the frictional contact between the movable end walls 7 and the rotating drums 2 and the material within the drums and contacting with said walls will result in rotation of the end walls and shaft 6. The cylinder 4 may be used as a pulley for a drive belt or it may be equipped with teeth for a suitable gear drive.

The drums are provided with any suitable means for filling. As shown, each drum has an inlet pipe 8 and these pipes may be connected to a common source of supply for the material to be processed. The movable end walls 7 are each equipped with a conical distributor 9 adapted to receive the material from the inlet pipes 8 near the axis and deliver it to the drums 2 axially and radially adjacent to the peripheral walls, during which travel it acquires the rotational speed of the drum, as claimed in my co-pending application Serial No. 205,894, filed May 4, 1938. The peripheral wall of each drum is shown as having openings 10 to permit the

separated liquid to pass outward radially to be collected in a suitable casing and then escape through discharge conduits 11. The separated solid expelled from the open ends of the drum by the reciprocating action of the movable end walls 7 is collected in the chambers 12 from which it may be led to a conveyor 13 or other suitable device for removing it. The discharge from the chambers 12 may be connected together into a single discharge and this is advantageous where a conveyor is used, as it provides for a more uniform loading of the latter.

The various parts of the machine are supported on a base 15 upon which are mounted the bearings 3. Each bearing is equipped with a suitable high pressure fluid inlet 16 which communicates through suitable passageways between shafts 1 and 6 with the cylinder 4, so that piston 5 may be moved back and forth by power. This operation is now well known in the art and need not be here further described.

In operation, the material to be processed is introduced through pipes 8 and conducted by the conical distributors 9 to the peripheral wall adjacent to the end wall 7 where it is evenly deposited with a minimum of shock and breakage of crystals or other damage.

When the mixture reaches the drums 2, the centrifugal action causes the liquid to pass through the holes 10 and the solid to remain on the interior of the drum. The end walls 7 move back and forth axially when high pressure fluid is introduced alternately into the ends of cylinder 4. The solid material is pushed along the interior of the drums and out the open ends thereof and the piston moves back and forth. As it moves to the right, as seen in the drawing, the movable end wall in the right-hand drum will expel solids from that drum while, at the same time, the other end wall is moving back toward the inner end of the left drum in a no load or no power stroke. When the piston 5 moves to the left, the action of the end walls is reversed. The result is that piston 5 is always operated upon by a substantially uniform pressure, first in one direction and then in the other, and when the one drum is unloading, the other is not, so that the net result is a more or less constant delivery of pressure fluid and application of power to the end walls and a constant delivery from the discharge outlet of the machine.

As shown, the two inlet pipes 8 are connected to the supply tank 17 through a three-way valve 18 and the two pressure fluid supply pipes 16 are connected to a supply pipe 19 through a valve 20 such that when the pressure fluid is delivered through the pipe 19 by a rotary pump or the like 21 to one side of the piston, the liquid at the other side may escape to the source of pressure liquid supply. The two valves 18 and 20 may be interconnected so as to be operated simultaneously by any suitable timer mechanism 22. Thus, there will be a continuous supply of material to the machine, a continuous discharge of the separated solids, and a continuous supply of pressure fluid.

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

1. A centrifugal separating machine including a pair of rotatable separating drums, each having an axially facing open end and an axially movable end wall for discharging solids therefrom, said open ends facing away from each other in opposite directions, and said walls being connected to move as a unit relatively to said drums, and means for moving said end walls axially of said drums to expel solids from said drums alternately and from the open ends thereof.

2. A centrifugal separating machine including a pair of rotatable separating drums in axial alignment and held against axial movement, one of said drums having an axially facing discharge opening at one end and the other having an axially facing discharge opening at the other end, a drive shaft for both drums, a separate axially movable end wall for each drum, means for connecting said end walls against relative axial movement, and means for moving said end walls back and forth axially of said drums to expel the solids from said drums alternately through said discharge openings.

3. A centrifugal separating machine including a pair of rotatable separating drums, a drive shaft connecting said drums and upon which they are mounted, an axially movable end wall for each chamber, a shaft connecting said end walls and upon which they are supported, and power means for axially moving said end walls back and forth through a limited path in relation to said drums to axially expel the solids collected in the interior of said drums alternately.

4. A centrifugal separating machine including a pair of rotatable separating drums having discharge openings facing away from each other in opposite directions, a common drive shaft therefor, a pair of substantially parallel transversely disposed end walls one in each drum, and each axially movable toward and from the discharge opening of its respective basket, a common shaft for said end walls, and power means for moving said end walls back and forth in said drums and through a limited path to move solids axially of first one drum and then the other to expel them from said drums.

5. A centrifugal separating machine including a pair of rotatable separating drums mounted on the ends of a hollow shaft, axially movable end walls for said drums mounted on the ends of a shaft passing through said hollow shaft and adapted to move axially relative thereto, and power means for reciprocating said walls through a limited path to expel solids from the interior of said drums.

6. A centrifugal machine including a pair of rotatable separating drums, a hollow shaft having its ends connected to said drums, an axially movable end wall for each drum, a second shaft in said hollow shaft and having its ends connected to said walls, a piston on said second mentioned shaft, a cylinder attached to said hollow shaft, and means for introducing high pressure fluid on either side of said piston to cause said end walls to move axially of said drum to expel solids from said drums alternately.

7. A centrifugal machine including a pair of rotatable separating drums, a hollow shaft having its ends connected to said drums and provided with a cylinder intermediate of its ends, a pair of axially movable end walls for said drums, a shaft in said hollow shaft and having its ends connected to said end walls and provided with a piston in said cylinder whereby upon the introduction of high pressure fluid on alternate sides of said piston, said movable walls will reciprocate axially to expel solids from said drums alternately.

8. A centrifuging machine having a drum mounted for rotation about a horizontal axis, a

hollow shaft having one end secured to said drum for supporting the latter, and having a power cylinder connected at one end to the opposite end of said shaft, separate pistons in said drum and said cylinder, a connecting rod between said pistons, and extending through said hollow shaft, a bearing for said shaft between said cylinder and said drum, a shaft secured to the other end of said power cylinder, a bearing for said latter shaft, and conduit means in one of said bearings for delivering power fluid to said cylinder.

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