

March 18, 1958

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2,827,078

VALVE ACTUATING MECHANISM

Filed Sept. 11, 1952

3 Sheets-Sheet 1

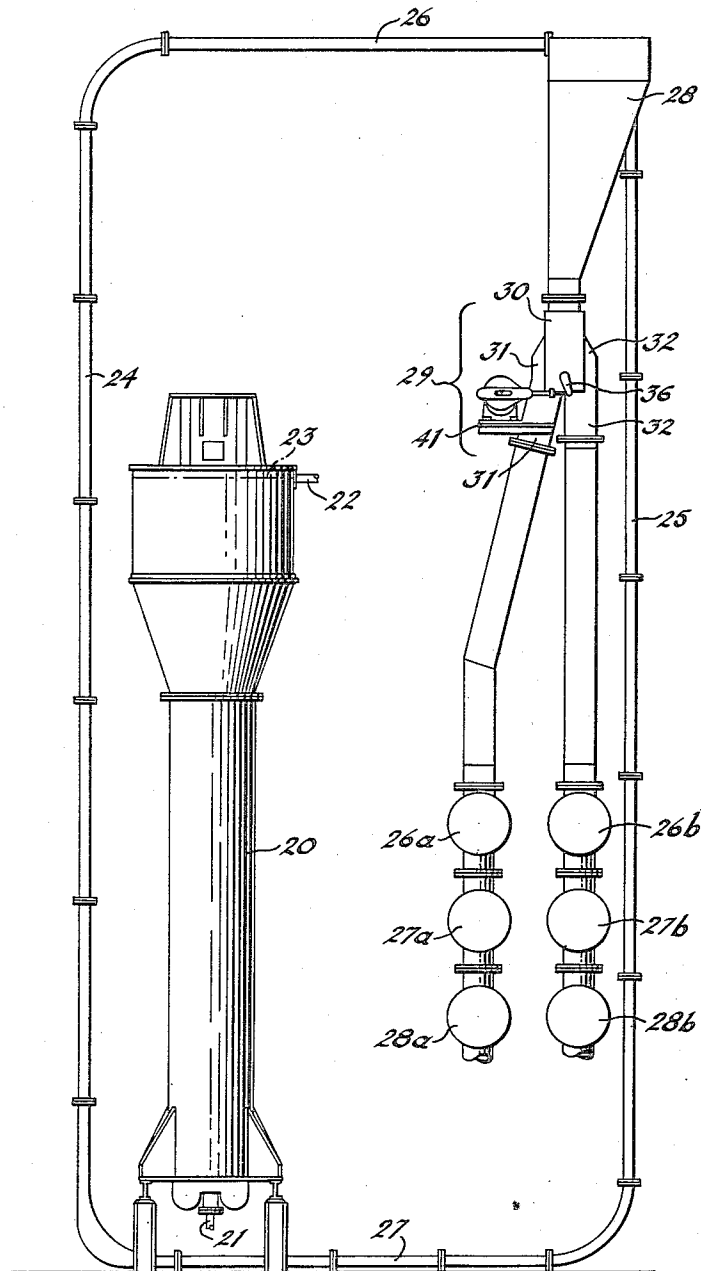


Fig. 1

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3 Sheets-Sheet 2

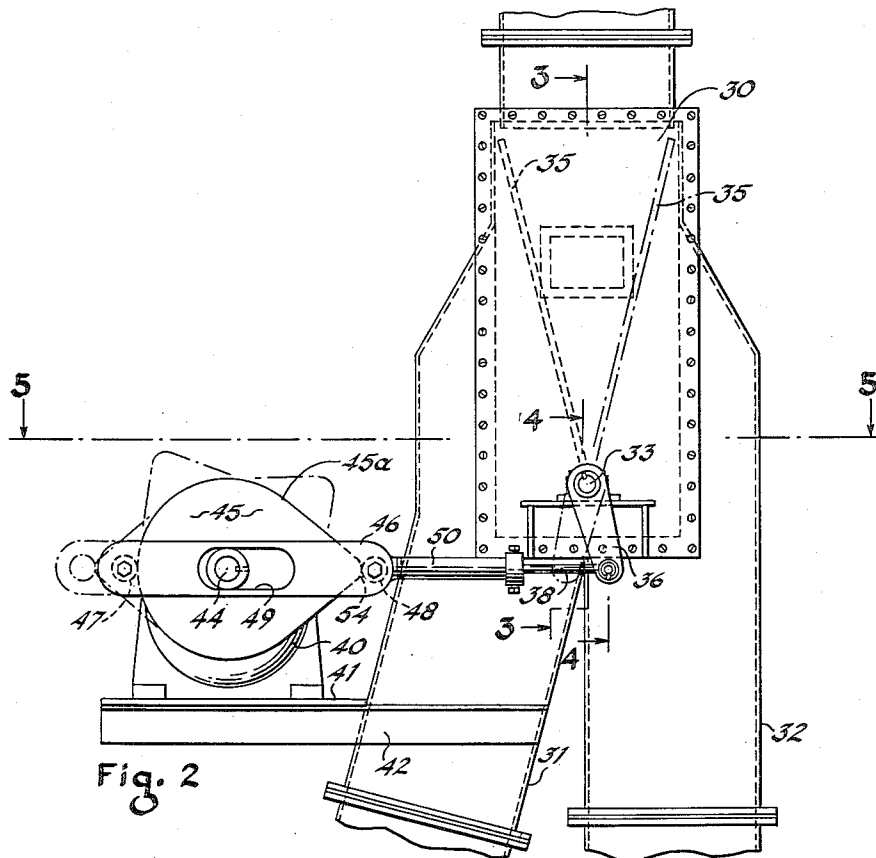


Fig. 2

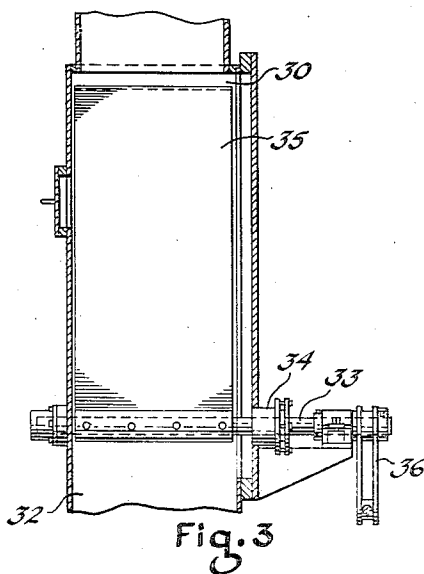


Fig. 3

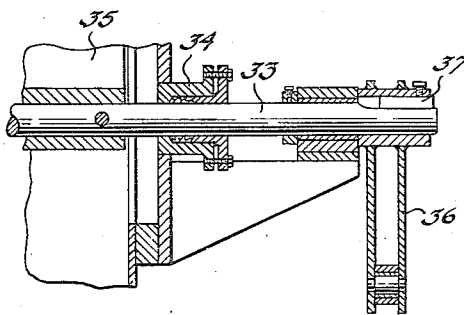


Fig. 4

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3 Sheets-Sheet 3

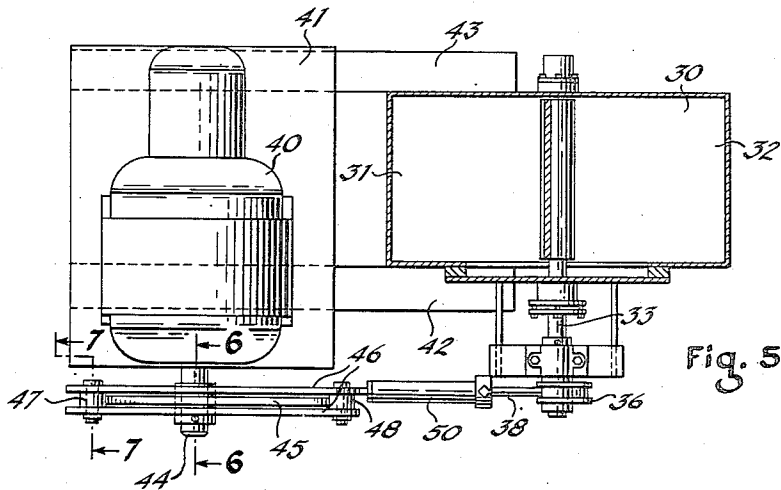


Fig. 5

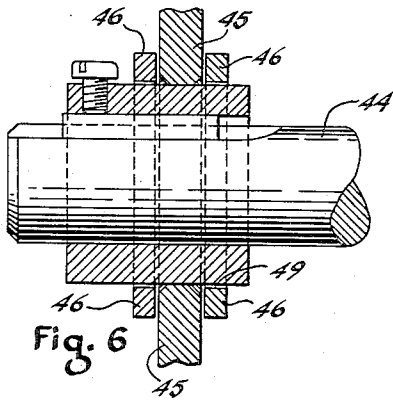


Fig. 6

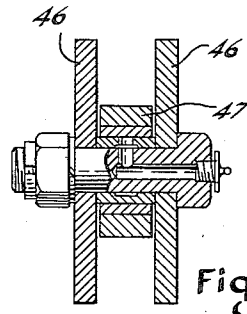


Fig. 7

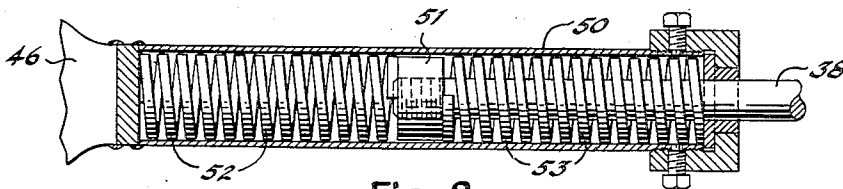


Fig. 8

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VALVE ACTUATING MECHANISM

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Application September 11, 1952, Serial No. 308,965

1 Claim. (Cl. 137—633)

The invention relates to novel and improved valve mechanism for flow control and equal distribution of granular or sludge-like material. One useful embodiment of the invention controls the flow movement of a stream of moist, drained seed or nut meats from which the oil has just been extracted by a solvent extraction process.

An object of the invention is to provide intermittently movable control valve means at the discharge end of a material conveyor for causing flow of said material alternately through each of two outlets, in equal amounts to each outlet.

A further object is to provide control means such as defined in the last preceding paragraph wherein positive drive mechanism is provided for effecting intermittent movement of the control means.

A further object is to provide control valve means such as defined in the last two preceding paragraphs, in combination with yieldable lost motion means in the driving mechanism to protect it from damage from unexpected jamming of the control valve by obstructions in the stream of material.

Further objects include the provision of control valve means such as defined in the last three paragraphs and characterized by low first cost, low operating cost, positive operation, ability to operate with sticky material, and ability to distribute equal amounts to each of several outlets.

Other objects and advantages of the invention will be apparent from a study of the following description of one embodiment of the invention which is illustrated in the accompanying drawings in which:

Fig. 1 is a schematic view of some of the main operating elements of a solvent extraction apparatus embodying my invention.

Fig. 2 is a side elevational view, somewhat enlarged, showing in greater detail a portion of the apparatus of Fig. 1.

Figs. 3, 4, and 5 are sectional views, taken respectively on the lines 3—3, 4—4, and 5—5 of Fig. 2, and Figs. 3 and 4 are somewhat enlarged.

Figs. 6 and 7 are sectional views, somewhat enlarged, taken on the lines 6—6 and 7—7 of Fig. 5.

Fig. 8 is a sectional view of the shock absorbing cylinder.

Referring first to Fig. 1, there is shown a solvent extraction unit for the extraction of oil or other liquid from materials bearing the same. One such unit is more fully described in a co-pending application of Raymond T. Anderson, Serial No. 188,472, filed October 4, 1950, for Solvent Extraction Process and Apparatus. Such Anderson application does not disclose the present novel improvement, but many of the main operating elements of the structure are otherwise similar. For convenience a brief description is presented herewith, so that the advantages of the present invention will be better understood.

Still referring to Fig. 1, I show a vertical elevational

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view, somewhat schematically, of the main operating elements of a solvent extraction unit, refinements of mechanical detail being omitted since not necessary for an understanding of the operation. The apparatus includes an extraction tower 20 of cylindrical character. Solvent liquid is introduced at the bottom, through pipe 21, and withdrawn near the top, through pipe 22, thereby establishing a liquid level at broken line 23. Oil bearing material is introduced at the top of tower 20, and, being normally heavy enough to sink slowly, it proceeds downwardly to the tower bottom. Means (not shown) is provided within the tower to retard the downward travel of the material and afford time for extraction of the oil by means of the solvent liquid. It is obvious, therefore, that the liquid following out at pipe 22 is a mixture of solvent and oil in mutual solution. They are later separated by distillation or otherwise, and the solvent is returned to the tower.

The tower 20 is in communication at its bottom, by means not shown, with two vertical members 24 and 25 of an elevator housing, these members being joined at top and bottom by two horizontal members 26 and 27, so as to form a complete, endless, leak-proof passage within which an endless conveyor travels, in the present instance clockwise. The solid material is transferred, by screw conveyor or other means not shown, from the bottom of tower 20 into the member 27, whence it is carried by the conveyor upward through the elevator member 24, across through member 26, finally being discharged into hopper 28. The empty conveyor, often of continuous bucket chain type, returns downwardly through member 25.

Since the tower 21 is in liquid communication with the elevator, a liquid level will be established in members 24 and 25 at a level approximately the same as in the tower, although varying slightly, depending on factors such as conveyor movement. As the material is carried above the liquid level in member 24 it begins to drain by gravity, for example, through perforations in the buckets. Additional drainage means may be provided, often in the horizontal travel of the material in member 26 or adjacent thereto, so that the material delivered to hopper 28 is usually a sticky sludgy mass.

The hopper 28 is adapted to deliver the material to a series of driers, here shown at 26a, 26b, 27a, 27b, 28a, 28b, etc. In these driers the material is tumbled, in the presence of heat, to drive off the volatile vapors, the material eventually issuing from the last drier in each tandem series in the form of dried meal.

For greater drying efficiency it is desirable to have at least two banks of driers, so as to keep up with the material-delivery capacity of the rest of the unit, one such bank being obviously the driers 26a, 27a, 28a, etc., and the other bank being 26b, 27b, 28b, etc. Means must therefore be provided for distributing the hopper discharge alternately to each bank in any desired proportion, usually in about equal amounts. Previously available distribution means were subject to a number of disadvantages, for the sticky material often choked up the mechanism and effected undesirable stoppages, and mechanisms which were relatively effective were expensive, complicated, and not at all reliable over extended periods.

The distribution mechanism now to be described has been found to be economical, simple and positive in operation, and fully effective through any desired period of continuous operation. It is indicated by the bracket 29 in Fig. 1, and is shown in full detail in Figs. 2 to 8.

At the discharge end of the hopper 28 is a bifurcated fitting indicated by the bracket 29. The housing portion 30 defines an inlet chamber, and housing portions 31 and 32 a pair of outlet chambers, the construction being quite similar to that of a pair of trousers. At the crotch of the

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inverted Y is a shaft 33 rotatable in packed bearings 34 in opposed walls of the chamber in housing 30. The shaft has attached to it, within housing 30, a plate 35 of a shape adequate to close the opening either to leg 31 or leg 32. In the present instance the plate 35 is rectangular, as are chamber 30 and said openings to the legs. The plate 35 is swung back and forth, as will appear, by means of a crank 36 keyed to the outer end of shaft 33 by a key 37. Pivotaly attached to crank 36 is a connecting rod 38 adapted to suitably reciprocate to produce crank movement as desired. The disposition of shaft 33, bushing or bearing 34, and crank 36 is well shown in Fig. 4.

The power source for operation of plate 35 comprises a motor and gear reduction assembly 40 carried on a shelf 41 attached to leg 31 by bracket arms 42, 43. Attached to the motor shaft 44 is a cam 45 rotatable within a box-type link 46 which has rollers 47 and 48 at its respectively opposed ends, as well shown in Fig. 5. The link arms are slotted as at 49 (Fig. 2) to permit reciprocation of the link when the cam rise alternately contacts rollers 47 and 48. Attached to link 46 is a cylinder 50 into which the end of connecting rod 38 extends, the rod having a piston-like block 51 attached to it within the cylinder (Fig. 8.) The piston 51 is disposed between helical compression springs 52, 53 which are balanced as to biasing force and permit a certain amount of piston travel under variations of resistance encountered in the operation of plate 35.

The operation of the material distributing apparatus just described is as follows.

Assuming the parts to be in the position shown in Fig. 2, the cam rise 54 is in contact with roller 48, and cylinder 50 is in its extreme right position. Crank arm 36 has been swung counterclockwise to the right, rotating shaft 33 and swinging plate 35 to the left, or dotted line position. Material delivered from the hopper to chamber 30 is being routed to leg 32 and to driers 26b, 27b, 28b. As the cam rotates, for example counterclockwise, contact of roller 47 with the circular portion of the cam track has no effect on either cylinder 50 or any of the succeeding elements responsive thereto, so that the plate 35 temporarily retains its position. As soon as the initial point 45a of the cam track rise rotates to contact with roller 47, link 46 and cylinder 50 will begin to be drawn to the left (Figs. 2 and 8.) The first increments of cylinder motion compresses spring 53 and places spring 52 under tension. As soon as these compression and tension forces (which are effective in the same direction on piston 51) become strong enough to overcome the inertia and work-resisting forces tending to retain plate 35 on the left hand side, it snaps over to the right hand side and the material begins to descend in leg 31. This status is maintained until cam location 45a rotates to contact with roller 48, at which time the above described cycle is initiated to eventually snap plate 35 back to the left side again.

The length of each cycle obviously depends on the rate of cam rotation, and may be varied to suit.

If the cylinder 50 is made long enough, it is obviously

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possible to have some obstruction block plate 35, whereupon the cam can continue to rotate and the springs 52, 53 will yield sufficiently to permit a complete cam rotation without any portion of the drawing mechanism being damaged.

The action of my material distributing mechanism is responsive to a positive drive, which readily overcomes the resistance of passage of sticky material which may vary considerably in viscosity. As can readily be seen, the whole assembly can be constructed, assembled, operated, and serviced without special tools and by relatively unskilled operators. It will operate continuously without attention for extended periods of time. It is meeting with success in commercial installations.

In the appended claim the term "fluent material" comprehends liquids, sludges, comminuted or granular solids, or other material capable of traveling in a stream, since my invention is adapted for use with all such material. The term "receptacle" means any enclosure capable of receiving and retaining material, not necessarily closed on all sides. The term "port" means any opening in a wall of said receptacle capable of permitting flow of said material therethrough.

What I claim is:

Power application means for operating a swinging valve plate for alternately controlling one of two outlets to respective passages, said power application means comprising a power source including a motor, a cam rotatable responsive to energization of said motor, a shaft fixed with respect to said passages, a crank arm on said shaft, means fixedly connecting said valve plate to said crank arm, a connecting rod pivotally connected to said crank arm, a cylinder reciprocable axially responsive to rotation of said cam, said connecting rod having an end extending into said cylinder and having abutment means thereon, and a pair of springs in said cylinder, one on each side of said abutment means and biasing said abutment means away from its respective cylinder end, whereby rotation of said cam causes reciprocation of said cylinder first in one direction and then in the other direction so as to transmit cushioned driving motion to said connecting rod, and thence to said crank arm, said cam having a continuous portion of its track, at least 180 degrees in peripheral extent, concentric with its center of rotation.

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