

Sept. 19, 1961

A. MOTOSI

3,000,501

FROTH FLOTATION PROCESS AND MACHINE

Filed June 12, 1959

2 Sheets-Sheet 1

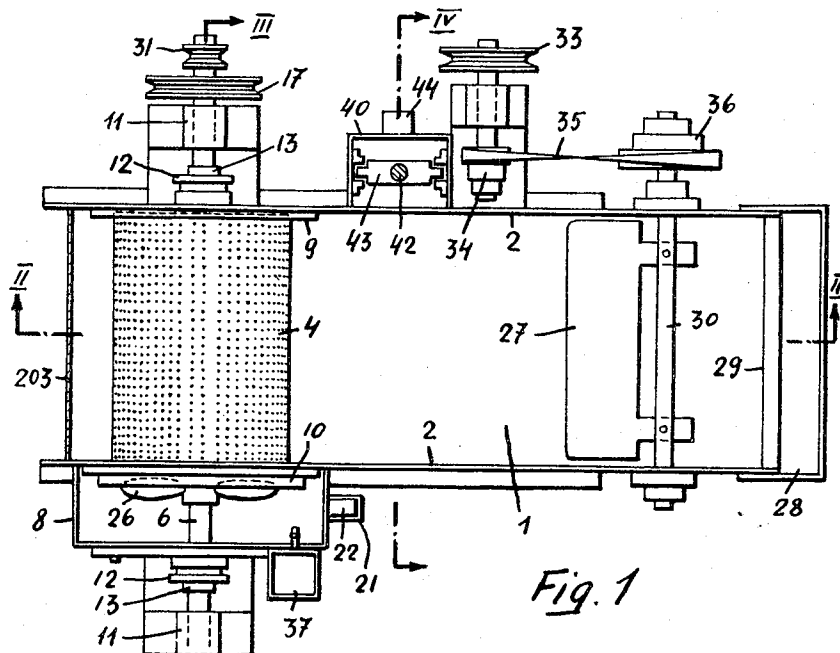


Fig. 1

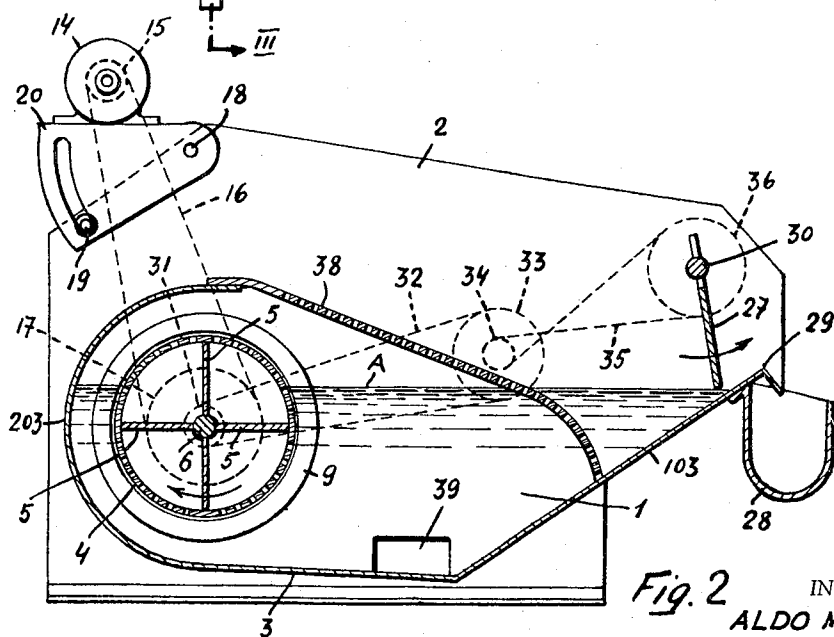


Fig. 2

INVENTOR
ALDO MOTOSI

BY *Toulmin & Toulmin*

ATTORNEYS

Sept. 19, 1961

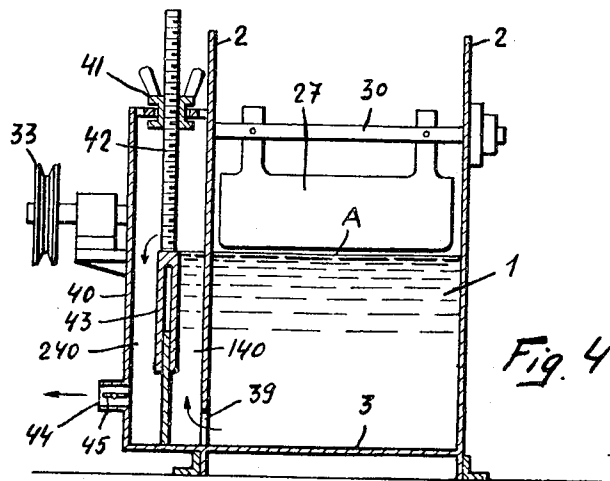
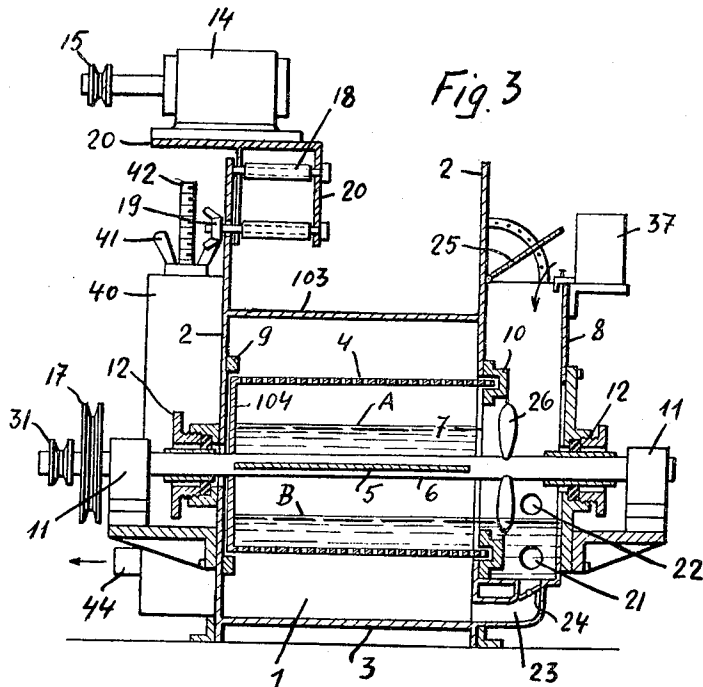
A. MOTOSI

3,000,501

FROTH FLOTATION PROCESS AND MACHINE

Filed June 12, 1959

2 Sheets-Sheet 2



INVENTOR
ALDO MOTOSI

BY *Toulmin & Toulmin*

ATTORNEYS

1

3,000,501

FROTH FLOTATION PROCESS AND MACHINE

Aldo Motosi, 13 Via Dei Mille, La Spezia, Italy

Filed June 12, 1959, Ser. No. 820,016

Claims priority, application Italy June 17, 1958

5 Claims. (Cl. 209—169)

This invention relates to a froth flotation process by which the froth is generated by means of a substantially horizontal drum which revolves in a vat filled in part with a fluid suspension of finely ground minerals to be separated, which is usually called "pulp." According to the invention the air which is necessary for generating the froth is introduced together with the pulp from one end of the said drum and is projected in form of bubbles, together with a part of the pulp, onto the pulp in the vat, preeminently in shower form from a part of the said drum lying above the liquid of said pulp.

In the known flotation process of this kind, the pulp to be treated is introduced directly into the flotation vat outside of the drum from which the frothing air is thrown into the outside pulp and the whole apparatus comes to be considerably bulky.

The main object of the invention is to provide a compact flotation machine, which may be of such dimensions as to be, if necessary, transported directly into the place of extraction of the mineral and coupled directly to a mill which reduces the coarse mineral to a fine slurry or pulp adapted to be fed directly into said flotation apparatus. In fact, it has been found that in many cases, whenever this coupling is rendered possible, the gangue separated from the valuable product may be employed for filling at least in part the excavations of the mine and the transportation of the whole mineral into a surface plant and the carrying away of the gangue are avoided. The flotation machine according to the invention is of the kind in which the pulp to be treated is introduced possibly together with the frothing reagent and air from one end of a revolving perforated drum where the said pulp, reagent and air are energetically mixed together and are expelled in form of froth through the drum perforations.

The mixing of the pulp with the air and chemicals is promoted or accelerated by providing at the interior of the drum mixing blades and/or separating partitions which subdivide the interior of the drum into a number of sector-shaped chambers. Furthermore the drum is provided with numerous small perforations or slits, instead of the wide slots of the conventional devices of this kind (for ex., the known K. & K. machine) and, as the drum is immersed in and filled with the pulp in part only, and the mixture of pulp and air formed inside the drum is projected for the most part by centrifugal force through the upper part of the drum and is showered onto the liquid lying outside the drum, without traversing a liquid containing much of the gangue.

Other characteristic features of the invention will be apparent from the following specification of an embodiment of the invention, taken in conjunction with the attached drawings in which:

FIGURE 1 is a plan view of a flotation machine constructed according to the invention; and

FIGURES 2, 3 and 4 are vertical sections on lines II—II, III—III and IV—IV of FIGURE 1; respectively.

In the embodiment as shown, the flotation machine comprises a flotation vat 1 having a pair of side walls 2 and a bottom wall 3 connected at its front side to an inclined wall 103 and at its rear side to an upwardly extending cylindrical section 203. In the rear part of the flotation vat, substantially co-axially of said cylindrical wall section 203, a hollow drum 4 is rotatably mounted. This drum is open at one end and closed by an

2

unperforated bottom 104 at its opposite end and its cylindrical part is made of sheet metal provided with small perforations or slits and is fastened on a shaft 6 by means of radial partitions 5 which divide the interior of the drum into a number of compartments.

The wall 2 on the side of the open end of the drum 4 is provided with a lower aperture 7 which opens at the bottom of a feed container 8 fastened to said wall. The drum bottom 104 revolves within a projecting ring 9 and the opposite drum edge revolves within a groove formed in a ring 10 fastened to the corresponding vat wall 2 and forming together with the said drum edge a kind of labyrinth joint between drum 4 and vat 1.

The shaft 6 is mounted on ball bearings 11, conventional stuffing boxes 12 and wear bushings 13 being provided at the points in which it traverses one of the walls 2 and the feed container wall. The shaft 6 is driven by motor 14 through belt drives 15, 16 and 17. The motor, which is shown as an electric motor, is preferably mounted on a platform 20 adapted to be rocked on pivot 18 and to be fastened in belt-tightening position by a fastening bolt 19.

In the bottom part of the feed container 8 there is a feed pipe 21 through which the fresh prepared pulp is fed and, possibly but not necessarily, a second feed pipe 22 for the partly exhausted pulp discharged by the same or other flotation machines. The container 8 is provided at its top with an adjustable lid 25 permitting the entry of more or less air and is provided at its bottom with a duct 23 establishing with the bottom part of the vat 1, a communication which may be regulated by a valve 24. A doser 37 is also provided for allowing the frothing reagent or collector to be fed in controlled amounts into the container 8.

In operation, the pulp is fed continuously into the container 8, where it receives the frothing agents, flows together with the air into said drum through its open end where a violent agitation takes place, whereafter the mixture of pulp and air is thrown through the drum perforations into the upper part of the flotation vat, in which, due to the aspiration of air and its mixing with the pulp, the liquid level A rises well above the liquid level in the feed container 8.

The suction and mixing of air and pulp may be enhanced by fitting on the shaft 6, in front of the aperture 7, a screw impeller 26 and the mixing and centrifugal action on the fluids in the drum may be promoted by the provision of said partitions 5, which also prevent that a whirling motion be imparted to the fluid pulp within the drum.

The drum, which, as said, is not completely immersed in the pulp, is rotated preferably so that its upper non-immersed part revolves away from the cylindrical wall section 203 so that the pulp mixed with air and frothing agents is thrown through the perforations of the non-immersed part of the drum in shower form into the front part of the vat 1. The cylindrical wall section 203 serves as baffle plate. Thus a good frothing is generated, whereby the froth to which the valuable product is attached is skimmed at the front end 29 of the vat by means of a conventional revolving skimming blade 27, which is driven by the same drum shaft 6 through pulley and belt drive 31, 32, 33, 34, 35 and 36 and skims the froth and discharges same into a collection channel 28 from which it flows into the conventional tanks or other containers (not shown). Between the edge of the wall 203 and the front part of the vat 1 a perforated plate 38 is removably fitted, which serves for avoiding the formation of disturbing waves and currents.

The gangue is maintained in suspension in the agitated liquid and is discharged through an outlet 39 provided at the bottom of one of the vat side walls 2 and passes

3

into an outlet box 40 which is divided into two chambers 140 and 240 by an overflow sluice 43 whose overflow height is adjustable by means of a screw spindle and nut control 42, 41, which thus permits of regulating the liquid level A in the vat 1.

The outer chamber 240 is provided with discharge port 44 provided with valve 45. By closing this valve 45 and opening valve 24 of the bottom duct 23, the partly exhausted pulp can be returned into the feed container 3 and subjected again to flotation.

Due to the just described direct projection of the formed froth by the revolving perforated drum above the liquid level, and due to the possibility of multiple adjustment of the device by accurately sizing the perforations of the drum and by adjusting the liquid level in the flotation vat by adjusting the overflow sluice 43, the efficiency of the device is greatly improved over existing devices of like types. Furthermore, as the froth to which the valuable product is attached is not compelled to traverse a body of pulp, but is directly thrown to the surface of the liquid in the vat 1, the obtained product is purer than that obtained by conventional flotation machines, in which the bubbles are compelled to traverse a body of pulp containing a large quantity of gangue in suspension, a part of which may be entrained by the rising bubbles.

I claim:

1. In a flotation machine having a vat, a horizontal metallic drum perforated at its periphery, closed at one end and open at its opposite end rotatably mounted in said vat; means for rapidly rotating said drum; means at the open drum end for creating a suction in the direction of said drum, when the drum is rotated; means for feeding an aqueous suspension of comminuted solids and air into said vat, from the open side of said drum; said vat being provided with a substantially cylindrical baffle at its rear end and a gently sloping bottom at its opposite end, whereby said drum is mounted in said vat substantially concentrically to said cylindrical baffle, means for keeping the liquid level at the interior of said vat below the upper periphery of said drum, the said drum being

4

revolved at such a speed as to cause the sucked fluids to be thoroughly mixed at the drum interior and then expelled through the perforations into the said vat, above the liquid level in the form of a froth-bearing liquid and means for skimming the froth and discharging same at the front end of the said vat and for discharging the exhausted pulp from an outlet provided near the bottom of said vat.

2. A flotation machine according to claim 1, in which the open drum side opens in a pulp-feed chamber which is in communication at its top end with the outside air, and having a doser being provided for introducing a frothing agent into the liquid flowing into said chamber.

3. A flotation machine according to claim 1, in which the drum is provided at its interior with partitions and the drum shaft carries a screw impeller at the open drum end.

4. A flotation machine according to claim 1, in which the outlet of the vat opens at the bottom of one of the compartments of an open-top chamber divided into two compartments by an adjustable overflow valve, the other compartment of said chamber being provided with a discharge port, whereby by adjusting the height of said overflow valve the height of the liquid level within the said vat is regulated.

5. A flotation machine according to claim 1, in which the feed chamber is directly connected with the part of the said vat underneath the said drum by means of a duct which may be intercepted by a valve and the discharged port of the exhausted pulp is also intercepted by a valve, whereby by opening the first-named valve and closing the valve at the discharge port a re-cycling of the pulp is effected.

References Cited in the file of this patent

UNITED STATES PATENTS

1,250,938	Allen	Dec. 25, 1917
1,480,884	Dolbear	Jan. 15, 1924
1,521,277	Christensen	Dec. 30, 1924