

PATENT SPECIFICATION

(11)

1 374 191

1 374 191

- (21) Application No. 24340/72 (22) Filed 24 May 1972
 (23) Complete Specification filed 10 May 1973
 (44) Complete Specification published 20 Nov. 1974
 (51) International Classification B01K 3/00
 C02C 1/18
 (52) Index at acceptance
 C7B A2B1 A2C2 A2C5 A9
 C1C 20X 320 416 420 427
 (72) Inventor ERIC PAUL AUSTIN



(54) IMPROVEMENTS IN OR RELATING TO ELECTROLYTIC FLOTATION APPARATUS

(71) We, SIMON-HARTLEY LIMITED, a British Company, of Etruria Works, Stoke-on-Trent, Staffordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION concerns flotation apparatus of the kind (hereinafter termed of the kind referred to), wherein a liquid, to be treated, such as activated sludge, for example, is caused to flow through a tank equipped with electrodes comprising a set of cathodes and a set of anodes in the base thereof for the generation of gas bubbles by electrolytic action, one set of electrodes being disposed above the other, whereby suspended materials, usually but not necessarily solids, in the liquid are carried to the surface of the tank by said bubbles to form a layer of thickened material, and including means for removing the thickened material from the surface of the liquid contained within the tank.

One problem with apparatus of the kind referred to is the build-up of deposits on the electrodes, particularly the cathodes during operation. It has been proposed to reverse the polarity of the electrodes from time to time as a means of displacing such deposit. Early experimental work showed that whilst reversal of polarity was at least partially effective in destroying such deposits, the distribution of bubbles rising from the electrode system was unsatisfactory when the cathodes were disposed above the anodes. It will be understood that the majority of useful gas bubbles are hydrogen and are generated at the cathode surfaces which are opposite the anode surfaces. It follows that if the cathodes are above the anodes the hydrogen is generated on the underside of the electrode members and streams upwardly from the

[Price 25p]

edges of the member giving a poor distribution of gas bubbles through the volume of the contents of the tank.

The present invention is based on an appreciation of the possibility of providing apparatus of the kind referred to with means for exchanging the positions of the two sets of electrodes in space whereby polarity can be reversed without the disadvantage referred to above.

According to the present invention flotation apparatus of the kind referred to is characterised in that at least one of the sets of electrodes is mounted for movement whereby it can be positioned either above or below the other set, thereby permitting the polarity of the sets of electrodes to be reversed whilst ensuring that the anodes are always located above the cathodes.

The invention will be further apparent from the following description, with reference to the several figures of the accompanying drawings, which show, by way of example only, one form of apparatus embodying the invention.

Of the drawings:—

Fig. 1 shows a longitudinal cross-section through the apparatus;

Fig. 2 shows a cross-section through the apparatus on the line II-II of Fig. 1;

Fig. 3 shows a detail of the electrode assembly of the apparatus of Fig. 1;

and Fig. 4 shows a detailed cross-section of the electrode assembly on the line IV-IV of Fig. 3.

Referring now to the drawings, it will be seen that the apparatus essentially comprises a tank generally indicated at 10 comprised by side walls 11 and 12, end walls 13 and 14 and a base 15.

An electrode assembly comprising two sets of a plurality of spaced parallel transversely extending conducting bars 16 and 17 respectively is disposed adjacent the base of the tank 10. The bars 16 of one of

the sets have their opposed ends secured to parallel longitudinally extending spaced support beams 18 and 19. The bars 17 of the other set have their opposed ends secured to upstanding portions of parallel longitudinally extending spaced support beams 20 and 21. Transversely extending horizontal shafts 22 and 23 are located within the tank 10 adjacent the end walls 13 and 14 thereof, respectively. The shafts 22 and 23 extend outwardly through the side wall 12 of the tank 10 and carry sprocket wheels 24 on their free ends connected by an endless chain 25. A handle 26 is secured to one of the sprocket wheels 24 whereby the two shafts 22 and 23 may be rotated simultaneously.

As best seen from Figs. 2, 3 and 4, each of the shafts 22 and 23 carries a pair of circular guide members 27 and 28 at each end thereof within the body of the tank 10. The guide members 27 and 28 are eccentrically mounted on the shafts in opposed directions. The support beams 18 and 19 are located at each of their ends by the guides 28, and the beams 20 and 21 are similarly located by the guide members 27.

It will be noted that the bars 17 are shorter than the distance between the beams 18 and 19, and that the indentations in the beams 20 and 21 between adjacent upstanding portions are of sufficient size to accommodate the rods 16, the latter being located in the spaces between the rods 17.

Liquid to be treated is introduced into the tank 10 through a feed pipe 30 and flows out of the tank 10 after treatment through an outlet pipe 31. The two sets of electrodes are connected to a direct current power source in such a manner that the lower set constitute the cathodes of an electrode system. Hydrogen bubbles are generated mainly over the upwardly directed faces of the cathodes and rise upwardly through the liquor content within the tank to carry suspended material therein to the surface.

Means to remove thickened material from the surface of the liquid contained within the tank 10 is provided and comprises endless chains 40 supported on sprocket wheels 41 at opposite sides of the tank 10, there being a plurality of spaced transversely extending scraper blades 42 between the two chains 40 on the opposite sides of the tank.

The chains are adapted to be driven in the direction of the arrow so that the scraper blades 42, whose lower edges dip into the surface of the contents of the tank, are drawn longitudinally of the tank to gather thickened material and move it towards an inclined upper terminal portion 13a of the end wall 13. The sprocket wheels are so disposed that adjacent the

end of the tank 10 the blades 42 travel in an inclined direction to draw the collected sludge material over the portion 13a to drop from the end thereof into suitable collecting means (not shown).

At periodic intervals the electrical connection to the electrode system is adjusted so that the polarity of the electrodes is reversed, that is to say those which were cathodes become anodes and vice versa. Simultaneously, the shafts 22 and 23 are rotated through 180° to move two sets of electrodes through each other whereby the cathodes are always located beneath the anodes. It will be understood that rotation of the shafts 22 and 23 causes the relative levels of the guide members 27 and 28 to be changed and hence the relative levels of the sets of beams, with their associated electrode rods.

It will be appreciated that it is not intended to limit the invention to the above example only, many variations, such as might readily occur to one skilled in the art, being possible without departing from the scope thereof.

WHAT WE CLAIM IS:—

1. Flotation apparatus of the kind referred to characterised in that at least one of the sets of electrodes is mounted for movement whereby it can be positioned either above or below the other set, thereby permitting the polarity of the sets of electrodes to be reversed whilst ensuring that the anodes are always located above the cathodes.

2. Flotation apparatus according to claim 1 wherein each set of electrodes comprises a plurality of spaced transversely extending parallel bars.

3. Flotation apparatus according to claim 2 wherein the bars of one of the sets have their opposed ends secured to parallel longitudinally extending spaced support beams and wherein the bars of the other set are shorter than those of the first set and have their opposed ends secured to upstanding portions of further parallel longitudinally extending spaced support beams, the two sets being arranged in the base of the tank such that the bars of one set lie between those of the other set, the beams supporting the second-mentioned set being located below and inwardly of those supporting the first-mentioned set to permit one set of bars to be located above or below the other set thereof by relative movement in a vertical direction of the beams supporting one set to those supporting the other set.



the sets have their opposed ends secured to parallel longitudinally extending spaced support beams 18 and 19. The bars 17 of the other set have their opposed ends secured to upstanding portions of parallel longitudinally extending spaced support beams 20 and 21. Transversely extending horizontal shafts 22 and 23 are located within the tank 10 adjacent the end walls 13 and 14 thereof, respectively. The shafts 22 and 23 extend outwardly through the side wall 12 of the tank 10 and carry sprocket wheels 24 on their free ends connected by an endless chain 25. A handle 26 is secured to one of the sprocket wheels 24 whereby the two shafts 22 and 23 may be rotated simultaneously.

As best seen from Figs. 2, 3 and 4, each of the shafts 22 and 23 carries a pair of circular guide members 27 and 28 at each end thereof within the body of the tank 10. The guide members 27 and 28 are eccentrically mounted on the shafts in opposed directions. The support beams 18 and 19 are located at each of their ends by the guides 28, and the beams 20 and 21 are similarly located by the guide members 27.

It will be noted that the bars 17 are shorter than the distance between the beams 18 and 19, and that the indentations in the beams 20 and 21 between adjacent upstanding portions are of sufficient size to accommodate the rods 16, the latter being located in the spaces between the rods 17.

Liquid to be treated is introduced into the tank 10 through a feed pipe 30 and flows out of the tank 10 after treatment through an outlet pipe 31. The two sets of electrodes are connected to a direct current power source in such a manner that the lower set constitute the cathodes of an electrode system. Hydrogen bubbles are generated mainly over the upwardly directed faces of the cathodes and rise upwardly through the liquor content within the tank to carry suspended material therein to the surface.

Means to remove thickened material from the surface of the liquid contained within the tank 10 is provided and comprises endless chains 40 supported on sprocket wheels 41 at opposite sides of the tank 10, there being a plurality of spaced transversely extending scraper blades 42 between the two chains 40 on the opposite sides of the tank.

The chains are adapted to be driven in the direction of the arrow so that the scraper blades 42, whose lower edges dip into the surface of the contents of the tank, are drawn longitudinally of the tank to gather thickened material and move it towards an inclined upper terminal portion 13a of the end wall 13. The sprocket wheels are so disposed that adjacent the

end of the tank 10 the blades 42 travel in an inclined direction to draw the collected sludge material over the portion 13a to drop from the end thereof into suitable collecting means (not shown).

At periodic intervals the electrical connection to the electrode system is adjusted so that the polarity of the electrodes is reversed, that is to say those which were cathodes become anodes and vice versa. Simultaneously, the shafts 22 and 23 are rotated through 180° to move two sets of electrodes through each other whereby the cathodes are always located beneath the anodes. It will be understood that rotation of the shafts 22 and 23 causes the relative levels of the guide members 27 and 28 to be changed and hence the relative levels of the sets of beams, with their associated electrode rods.

It will be appreciated that it is not intended to limit the invention to the above example only, many variations, such as might readily occur to one skilled in the art, being possible without departing from the scope thereof.

WHAT WE CLAIM IS:—

1. Flotation apparatus of the kind referred to characterised in that at least one of the sets of electrodes is mounted for movement whereby it can be positioned either above or below the other set, thereby permitting the polarity of the sets of electrodes to be reversed whilst ensuring that the anodes are always located above the cathodes.

2. Flotation apparatus according to claim 1 wherein each set of electrodes comprises a plurality of spaced transversely extending parallel bars.

3. Flotation apparatus according to claim 2 wherein the bars of one of the sets have their opposed ends secured to parallel longitudinally extending spaced support beams and wherein the bars of the other set are shorter than those of the first set and have their opposed ends secured to upstanding portions of further parallel longitudinally extending spaced support beams, the two sets being arranged in the base of the tank such that the bars of one set lie between those of the other set, the beams supporting the second-mentioned set being located below and inwardly of those supporting the first-mentioned set to permit one set of bars to be located above or below the other set thereof by relative movement in a vertical direction of the beams supporting one set to those supporting the other set.

4. Flotation apparatus according to claim 3 wherein said beams are supported on cam members which can be rotated to effect said relative movement. described herein with reference to and as illustrated by the figures of the accompanying drawings.

5. Flotation apparatus substantially as J. G. LAWRENCE,
Chartered Patent Agent.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1974.
Furnished at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

