

PATENT SPECIFICATION

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(21) Application No. 2435/72 (22) Filed 18 Jan. 1972

(23) Complete Specification filed 10 Jan. 1973

(44) Complete Specification published 18 Sept. 1974

(51) International Classification C02C 5/12 B01K 3/00

(52) Index at acceptance

C7B A2A2 A2B1 A2C5 A9

C1C 320 420 427

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(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) for the treatment of a liquid such as activated sludge for example, and comprising: a tank equipped with one or more anodes and one or more cathodes in the lower part thereof for the generation of gas bubbles therein by electrolytic action as the liquid to be treated is caused to flow through the tank, 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.

We have found that the performance of flotation apparatus of the kind referred to can be significantly improved by providing means in an upper region of the tank for maintaining the electrical potential at this position at a value below that of the anode or anodes located in the lower region of the tank.

Thus, according to the present invention apparatus of the kind referred to is characterised in that an electrically conducting structure is provided in an upper region of the tank and in that said structure is electrically connected in such a manner as to ensure when the apparatus is in use that its potential is maintained below that of the anode or anodes located in the lower region of the tank.

The invention will be further apparent from the following description with reference to the figures of the accompanying drawing which show, by way of example only, one

form of apparatus of the kind referred to embodying the invention.

Of the drawing:—

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

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

Referring now to the drawing, it will be seen that the apparatus essentially comprises a rectangular tank 10 which may be made of insulating material, through which liquid to be treated is caused to flow, the liquid entering the tank through a feed pipe 11 at one end and being removed from the tank through an outlet pipe 12 at the opposite end. One end wall of the tank 10 terminates at its upper end in an inclined portion 13 which slopes downwardly into the body of the tank across the full width thereof.

Mounted adjacent the base of the tank 10 is a cathode 14, of plate-like form, and spaced above the cathode 14 are a plurality of anodes 15 in the form of parallel transversely extending longitudinally spaced rods.

Means to remove thickened sludge from the surface of the liquid contained within the tank 10 is provided and comprises endless chains 19 supported on sprocket wheels 20 at opposite sides of the tank 10, there being a plurality of spaced transversely extending scraper blades 21 between the two chains 19 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 21 whose lower edges dip into the upper layer of the tank contents are drawn longitudinally of the tank to gather sludge and move it towards the portion 13 of one of the end walls of the tank 10. The sprocket wheels 20 are so disposed that adjacent the end of the tank 10 the blades 21 travel in an inclined direction to draw the collected sludge material over the portion 13 to drop from the end thereof onto suitable collecting means (not shown).

A plurality of parallel transversely spaced

longitudinally extending horizontal conducting bars 16 are disposed in an upper region of the tank and lie at a position below the lower edges of the blades 21. The bars 16 are electrically connected to provide a potential below that of the anodes 15, so as to ensure that there is a falling potential gradient in the tank between the anodes and the surface region.

In use the liquid to be treated is caused to flow through the tank and an electrical potential difference is established between the cathode and anodes. Gas bubbles are generated by electrolytic action and attach themselves to particles of suspended material contained within the liquid being treated and serve to carry them to the surface of the tank to form a sludge layer which is collected by the scraper blades 21.

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.

Thus, the means provided to ensure the falling potential gradient from the anodes to the region of the surface of the contents of the tank may be different. For example, the scraper blades themselves may be made from metal and electrically connected to a suitable potential, or an electrically conducting skirt connected to a suitable potential may be fitted within the tank and arranged to lie around the internal periphery of the tank, such skirt being wholly submerged or arranged to extend downwardly from the liquid surface for a short distance.

The conducting means provided in the upper region of the tank may, in some instances, be electrically connected to the cathode and these parts together may be earthed if desired.

WHAT WE CLAIM IS:—

1. Apparatus of the kind referred to characterised in that an electrically conducting structure is provided in an upper region of the tank and in that said structure is electrically connected in such a manner as to ensure when the apparatus is in use that

its potential is maintained below that of the anode or anodes located in the lower region of the tank.

2. Apparatus according to claim 1 wherein said structure is provided at a position where it is completely submerged by the liquid contained within the tank when the apparatus is in use.

3. Apparatus according to claim 2 wherein said electrically conducting structure is comprised by a plurality of bars extending in spaced relationship in a horizontal plane.

4. Apparatus according to claim 1 wherein said electrically conducting structure is provided at a position where it extends through the liquid contained within the tank so as to be partially submerged when the apparatus is in use.

5. Apparatus according to either claim 2 or claim 4 wherein said electrically conducting structure comprises a skirt fitted within the tank and extending around the internal periphery thereof.

6. Apparatus according to claim 4 wherein said means for removing the thickened material from the surface of the liquid contained within the tank comprises scraper blades whose lower edges dip into the liquid content of the tank when the apparatus is in use and which are arranged to be drawn through the surface of the liquid in the tank to gather thickened material from said surface, characterised in that said blades are made from an electrically conducting material and constitute said electrically conducting structure.

7. Apparatus according to any preceding claim wherein said electrically conducting structure is connected electrically with the cathode or cathodes located in the lower region of the tank.

8. Apparatus according to any preceding claim wherein said electrically conducting structure is earthed.

9. Apparatus substantially as described herein with reference to and as illustrated by the figures of the accompanying drawing.

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Chartered Patent Agent.

longitudinally extending horizontal conducting bars 16 are disposed in an upper region of the tank and lie at a position below the lower edges of the blades 21. The bars 16 are electrically connected to provide a potential below that of the anodes 15, so as to ensure that there is a falling potential gradient in the tank between the anodes and the surface region.

In use the liquid to be treated is caused to flow through the tank and an electrical potential difference is established between the cathode and anodes. Gas bubbles are generated by electrolytic action and attach themselves to particles of suspended material contained within the liquid being treated and serve to carry them to the surface of the tank to form a sludge layer which is collected by the scraper blades 21.

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.

Thus, the means provided to ensure the falling potential gradient from the anodes to the region of the surface of the contents of the tank may be different. For example, the scraper blades themselves may be made from metal and electrically connected to a suitable potential, or an electrically conducting skirt connected to a suitable potential may be fitted within the tank and arranged to lie around the internal periphery of the tank, such skirt being wholly submerged or arranged to extend downwardly from the liquid surface for a short distance.

The conducting means provided in the upper region of the tank may, in some instances, be electrically connected to the cathode and these parts together may be earthed if desired.

WHAT WE CLAIM IS:—

1. Apparatus of the kind referred to characterised in that an electrically conducting structure is provided in an upper region of the tank and in that said structure is electrically connected in such a manner as to ensure when the apparatus is in use that

its potential is maintained below that of the anode or anodes located in the lower region of the tank.

2. Apparatus according to claim 1 wherein said structure is provided at a position where it is completely submerged by the liquid contained within the tank when the apparatus is in use.

3. Apparatus according to claim 2 wherein said electrically conducting structure is comprised by a plurality of bars extending in spaced relationship in a horizontal plane.

4. Apparatus according to claim 1 wherein said electrically conducting structure is provided at a position where it extends through the liquid contained within the tank so as to be partially submerged when the apparatus is in use.

5. Apparatus according to either claim 2 or claim 4 wherein said electrically conducting structure comprises a skirt fitted within the tank and extending around the internal periphery thereof.

6. Apparatus according to claim 4 wherein said means for removing the thickened material from the surface of the liquid contained within the tank comprises scraper blades whose lower edges dip into the liquid content of the tank when the apparatus is in use and which are arranged to be drawn through the surface of the liquid in the tank to gather thickened material from said surface, characterised in that said blades are made from an electrically conducting material and constitute said electrically conducting structure.

7. Apparatus according to any preceding claim wherein said electrically conducting structure is connected electrically with the cathode or cathodes located in the lower region of the tank.

8. Apparatus according to any preceding claim wherein said electrically conducting structure is earthed.

9. Apparatus substantially as described herein with reference to and as illustrated by the figures of the accompanying drawing.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1974.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.



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