

PATENT SPECIFICATION

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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,
 England, 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 de-
 scribed in and by the following statement:—

This invention concerns flotation ap-
 paratus 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
 and subjected to treatment by gas bubbles
 generated therein 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.

According to the present invention
 flotation apparatus of the kind referred to is
 characterised in that at least one elongated
 tube of conducting material which con-
 stitutes a cathode with respect to an anode
 mounted within said tube and which extends
 substantially over the length thereof, is
 provided for the introduction of the liquid
 into the tank.

The invention will be further apparent
 from the following description with
 reference to the several figures of the ac-
 companying 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 transverse cross-section
 through the apparatus, on the line I—I of
 Fig. 2.

Fig. 2 shows a partially sectioned side
 elevation of the apparatus seen in the direc-
 tion of the arrow A on Fig. 1; and

Fig. 3 shows a fragmentary cross-section
 on an enlarged scale on the line III—III of
 Fig. 1.

Referring now to the drawing, it will be
 seen that the apparatus essentially com-
 prises a tank, generally indicated at 10,
 comprised by side walls 11 and 12, end walls
 13 and 14 and a base 15. The side wall 11 is
 of substantially greater height than the side
 wall 12 whereby the base 15 is inclined and
 rises from the bottom of the wall 11 to the
 bottom of the wall 12. Entering the tank 10
 at the base of the wall 11 are a plurality of
 spaced parallel electrode assemblies, gener-
 ally indicated at 16. As best seen from Fig. 3,
 each of the electrode assemblies 16 is essen-
 tially comprised by an outer tube 17 formed
 from an electrically conducting material and
 having an electrically conducting rod 18
 concentrically mounted therein by means of
 insulating support members 19. The tubes 17
 forming part of the electrode assemblies 16
 extend substantially over the width of the
 inclined base 15 of the tank and terminate
 with their open ends in the vicinity of the
 side wall 12. As can best be seen from Fig. 1,
 the rods 18 extend substantially over the
 length of the tubes 17, and the lower ends of
 the tubes 17 are closed but communicate
 with feed pipes 20 whereby the liquid to be
 treated can be introduced into the tank 10
 by flow through the annular spaces formed
 between the rods 18 and tubes 17. The feed
 pipes 20 are fed from a common manifold
 20a.

The tubes 17 and rods 18 are connected to
 a source of electrical supply whereby they
 constitute cathodes and anodes, respec-
 tively.

Mounted above and between each ad-
 jacent pair of electrode assemblies 16 by
 means of insulating supports 21, and ex-
 tending parallel therewith is a further rod 22
 of electrically conducting material. The rods

[Price 25p]

Price 75p

22 are connected to an electrical source so as to constitute with the tubes 17 a further electrode system, the rods 22 forming anodes and the tubes 17 forming cathodes.

5 In use, as the liquid to be treated flows through the tubes 17, suspended materials therein are caused to flocculate under the influence of the electric field which exists between the rods 18 and tubes 17. Gas
10 bubbles are generated within the tubes 17 by electrolytic action and tend to attach themselves to the flocculated material with the result that as the liquid being processed emerges into the tank 10 at the open ends of
15 the tubes 17 much of the flocculated material rises to the surface of the tank carried by the gas bubbles. Additional gas bubbles are generated in the base of the tank by electrolytic action at the electrode system constituted by the tubes 17 and rods
20 22, and attach themselves to suspended materials which would otherwise tend to remain in the body of the tank 10 and thereby carry additional material to the surface.
25 Furthermore, the electrode system constituted by the tubes 17 and rods 22 provides a continuous supply of gas bubbles substantially over the whole cross-section of the tank to maintain the material which has
30 floated to the surface at this location. The liquid leaves the tank 10 through an outlet pipe 40.

Means to remove thickened material from the surface of the liquid contained within
35 the tank 10 is provided and comprises endless chains 30 supported on sprocket wheels 31 at opposite sides of the tank 10, there being a plurality of spaced transversely extending scraper blades 32 between
40 the two chains 30 on the opposite sides of the tank.

The chains are adapted to be driven in the direction of the arrows so that the scraper
45 blades 32 whose lower edges dip into the upper layer of the tank contents are drawn longitudinally of the tank to gather thickened material and move it towards an inclined upper terminal portion 33 of one of
50 the end walls, 13. The sprocket wheels 31 are so disposed that adjacent the end of the tank 10 the blades 32 travel in an inclined direction to draw the collected sludge material over the portion 33 to drop from
55 the end thereof into suitable collecting means 34.

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

Thus, for example, the tank 10 need not have an inclined bottom and the open ends
65 of the tubes 17 may communicate with the interior of the tank at any suitable position.

Preferably the tubes 17 are mounted in an inclined direction so as to prevent the accumulation of large pockets of gas in the upper region of their cross-section.

The tubes 17 need not be located within
70 the body of the tank and may merely communicate with the interior of the tank at their open ends in which case, means in the tank for generating gas bubbles electrolytically would need to comprise an electrode system consisting of both anodes and a
75 cathode or cathodes not constituted by the tubes 17.

Again, for example, the means for
80 generating gas bubbles within the body of the tank need not be comprised by an electrode system but may consist of an air diffusing arrangement or other known equipment.

WHAT WE CLAIM IS:—

85 1. Flotation apparatus of the kind referred to characterised in that at least one elongated tube of conducting material which constitutes a cathode with respect to an
90 anode mounted within said tube and which extends substantially over the length thereof, is provided for the introduction of the liquid into the tank.

2. Flotation apparatus according to Claim
95 1 wherein a plurality of elongated tubes, each constituting a cathode with respect to an anode mounted within the tube and extending substantially over the length
100 thereof, are provided for the introduction of the liquid into the tank.

3. Flotation apparatus according to either
105 Claim 1 or Claim 2 wherein the or each said elongated tube is mounted in an inclined direction such that its open end through which liquid emerges into the tank, is at a
110 higher level than the other end thereof.

4. Flotation apparatus according to Claim
115 3 wherein the or each elongated tube extends within the tank and lies above and parallel with a sloping base of the tank.

5. Flotation apparatus according to any
120 preceding claim wherein the or each elongated tube forms a cathode with respect to an anode mounted above same and externally thereof for the generation of gas
125 bubbles by electrolytic action within the body of the tank.

6. Flotation apparatus according to any
125 preceding claim wherein said means for removing thickened material from the surface of the liquid contained within the tank comprises a plurality of transversely
130 extending scraper blades which in operation are arranged with their lower edges dipping into the surface of the contents of the tank and adapted to be driven longitudinally
135 thereof.

7. Flotation apparatus substantially as described herein with reference to, and as



22 are connected to an electrical source so as to constitute with the tubes 17 a further electrode system, the rods 22 forming anodes and the tubes 17 forming cathodes.

5 In use, as the liquid to be treated flows through the tubes 17, suspended materials therein are caused to flocculate under the influence of the electric field which exists between the rods 18 and tubes 17. Gas
10 bubbles are generated within the tubes 17 by electrolytic action and tend to attach themselves to the flocculated material with the result that as the liquid being processed emerges into the tank 10 at the open ends of
15 the tubes 17 much of the flocculated material rises to the surface of the tank carried by the gas bubbles. Additional gas bubbles are generated in the base of the tank by electrolytic action at the electrode system constituted by the tubes 17 and rods
20 22, and attach themselves to suspended materials which would otherwise tend to remain in the body of the tank 10 and thereby carry additional material to the surface. Furthermore, the electrode system constituted by the tubes 17 and rods 22 provides
25 a continuous supply of gas bubbles substantially over the whole cross-section of the tank to maintain the material which has floated to the surface at this location. The liquid leaves the tank 10 through an outlet pipe 40.

Means to remove thickened material from the surface of the liquid contained within
35 the tank 10 is provided and comprises endless chains 30 supported on sprocket wheels 31 at opposite sides of the tank 10, there being a plurality of spaced transversely extending scraper blades 32 between the two chains 30 on the opposite sides of the tank.

The chains are adapted to be driven in the direction of the arrows so that the scraper blades 32 whose lower edges dip into the
45 upper layer of the tank contents are drawn longitudinally of the tank to gather thickened material and move it towards an inclined upper terminal portion 33 of one of the end walls, 13. The sprocket wheels 31 are
50 so disposed that adjacent the end of the tank 10 the blades 32 travel in an inclined direction to draw the collected sludge material over the portion 33 to drop from the end thereof into suitable collecting
55 means 34.

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

Thus, for example, the tank 10 need not have an inclined bottom and the open ends of the tubes 17 may communicate with the
65 interior of the tank at any suitable position.

Preferably the tubes 17 are mounted in an inclined direction so as to prevent the accumulation of large pockets of gas in the upper region of their cross-section.

The tubes 17 need not be located within the body of the tank and may merely communicate with the interior of the tank at their open ends in which case, means in the tank for generating gas bubbles electrolytically would need to comprise an electrode system consisting of both anodes and a cathode or cathodes not constituted by the tubes 17.

Again, for example, the means for generating gas bubbles within the body of the tank need not be comprised by an electrode system but may consist of an air diffusing arrangement or other known equipment.

WHAT WE CLAIM IS:—

1. Flotation apparatus of the kind referred to characterised in that at least one elongated tube of conducting material which constitutes a cathode with respect to an anode mounted within said tube and which extends substantially over the length thereof, is provided for the introduction of the liquid into the tank.

2. Flotation apparatus according to Claim 1 wherein a plurality of elongated tubes, each constituting a cathode with respect to an anode mounted within the tube and extending substantially over the length thereof, are provided for the introduction of the liquid into the tank.

3. Flotation apparatus according to either Claim 1 or Claim 2 wherein the or each said elongated tube is mounted in an inclined direction such that its open end through which liquid emerges into the tank, is at a higher level than the other end thereof.

4. Flotation apparatus according to Claim 3 wherein the or each elongated tube extends within the tank and lies above and parallel with a sloping base of the tank.

5. Flotation apparatus according to any preceding claim wherein the or each elongated tube forms a cathode with respect to an anode mounted above same and externally thereof for the generation of gas bubbles by electrolytic action within the body of the tank.

6. Flotation apparatus according to any preceding claim wherein said means for removing thickened material from the surface of the liquid contained within the tank comprises a plurality of transversely extending scraper blades which in operation are arranged with their lower edges dipping into the surface of the contents of the tank and adapted to be driven longitudinally thereof.

7. Flotation 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.

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