Sept. 8, 1942. A. IBISON 2,295,476

APPARATUS FOR SEPARATING SUSPENDED MATTER FROM LIQUIDS BY MEANS OF ELECTROSTATIC PRECIPITATION

Filed Oct. 24, 1939 2 Sheets-Sheet 1

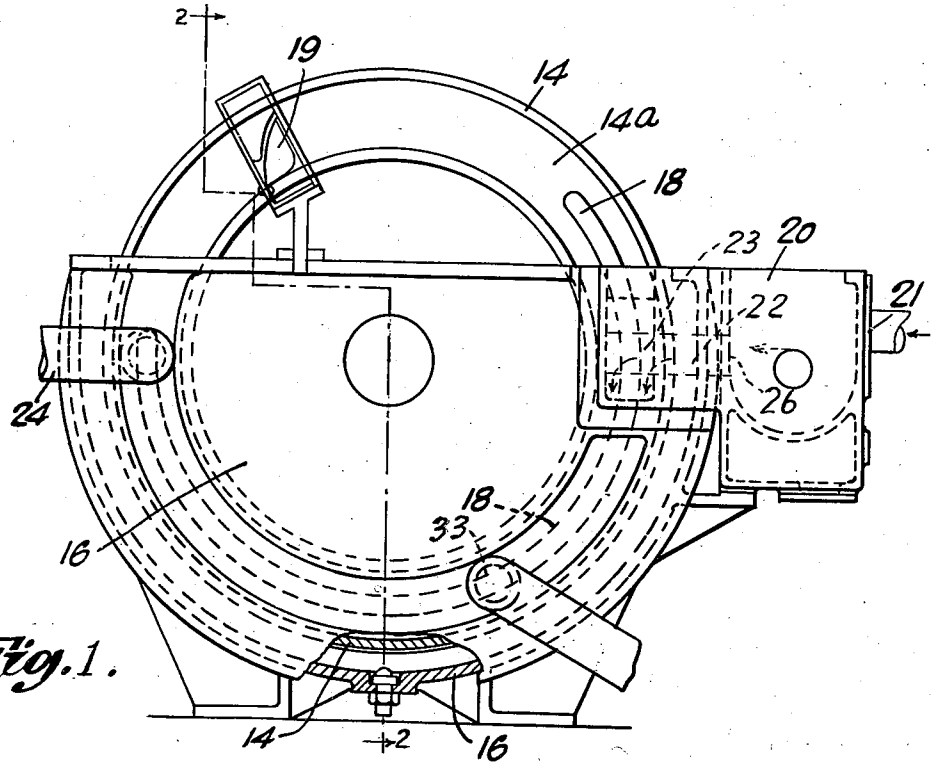


Fig. 1.

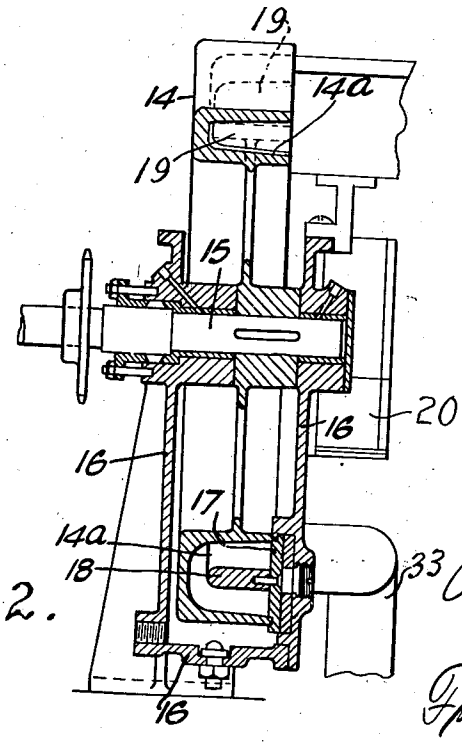


Fig. 2.

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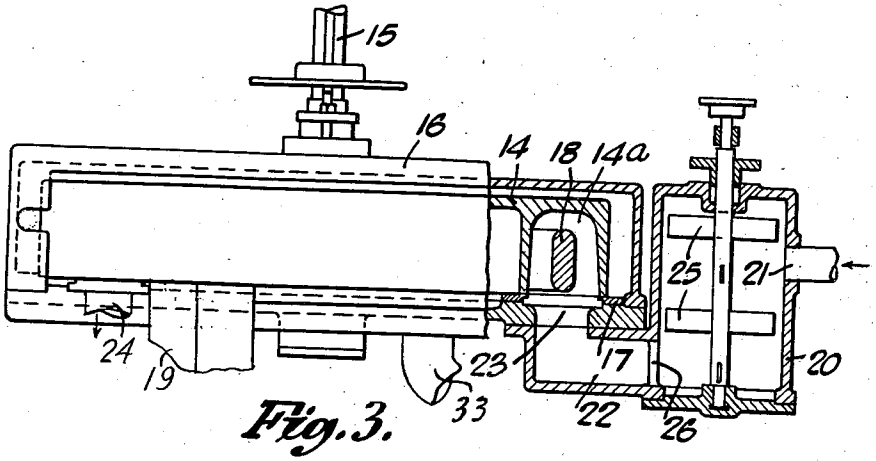


Fig. 3.

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APPARATUS FOR SEPARATING SUSPENDED MATTER FROM LIQUIDS BY MEANS OF ELECTROSTATIC PRECIPITATION

Austin Ibison, New Brighton, England

Application October 24, 1939, Serial No. 301,087
In Great Britain October 15, 1938

9 Claims. (Cl. 204—300)

It is well known to remove suspended matter from gases and vapours by means of an electrostatic discharge and various proposals have been made for applying this method of electrostatic precipitation to the separation of suspended matter from liquids. The object of the present invention is to provide improved apparatus for thus separating suspended matter from liquids by means of electrostatic precipitation.

According to the invention the apparatus is provided with mechanical means for continuously removing from the zone of treatment the matter which is deposited upon the collecting electrode. It is thus possible to carry out the separation as a continuous process, without in any way decreasing the efficiency of separation, thus avoiding the necessity for treating the liquid in batches with periodic interruptions to allow of the removal of the deposited matter.

The continuous mechanical removal of the deposited matter may be effected by giving the collecting electrode the form of a continuously moving rotary member having a continuous groove or channel, only a part of whose collecting surface is in the zone of treatment at any one time. The collecting surface is thus continuously passing out of the zone of treatment (and preferably completely out of the liquid under treatment) carrying with it the matter which has been deposited upon it by the electrostatic discharge. The deposited matter carried by any part of the collecting surface is removed by scrapers or other means before that part of the collecting surface re-enters the zone of treatment.

In order that the invention may be the more clearly understood the apparatus constructed in accordance therewith will now be described, reference being made to the accompanying drawings, wherein:

Fig. 1 is a side elevation of apparatus embodying the invention, partly broken away;

Fig. 2 is a vertical transverse section thereof on the line 2—2 of Fig. 1, and

Fig. 3 is a plan view shown partly in section.

In the embodiment of the invention shown in the drawings, the collecting electrode 14 has the form of a wheel whose rim is of channel section as shown with the opening of the channel directed to one side of the wheel. The wheel 14 is rigidly mounted on a horizontal shaft 15 and is continuously rotated by means of said shaft. The lower part (somewhat more than half) of the wheel 14 is enclosed in a stationary casing 16 provided on one side with an inner surface 17 which is accurately shaped so as to close the mouth of the channel 14a of the wheel 14 as completely as possible and form the treatment chamber, through which the liquid to be cleaned travels in a direction opposite to that in which the wheel rotates. The discharge electrode is formed by a flat strip 18, bent to semicircular form, which is mounted on the surface 17 and projects into the channel 14a in the rim of the wheel 14. Said strip 18 is so disposed that it forms a continuous core extending through the treatment chamber and, as shown, it may project above one end of this chamber into the open portion of the channel 14a. Stationary scrapers 19 indicated conventionally in dotted lines in Fig. 1, engage the channel 14a at one or more points above the casing 16 and remove from it the deposited matter which it continuously carries out of the treatment chamber. This scraper may take a wide variety of different forms, and since its detailed construction is immaterial to the invention, a conventional showing thereof is resorted to.

Located at one side of the casing 16 is a small tank 20 into which the liquid to be treated is fed at 21. This tank communicates, by way of a conduit 22 and a port 23 in the surface 17, with the interior of the treatment chamber. The outlet from said treatment chamber is by way of an outlet pipe 24 which communicates with the other end of the treatment chamber by way of another similar port through said surface 17. The tank 20 accommodates a steam coil 25 for raising the temperature (and thus lowering the viscosity) of the liquid under treatment. The oil can flow from the tank 20 to the treatment chamber only when the tank is substantially full, a weir 26 being provided between said tank and the conduit 22 leading to the treatment chamber to ensure this. The casing 16 serves to collect any liquid escaping from the treatment chamber and thus forms a bath preventing further leakage from that chamber.

In an alternative arrangement a counterflow method of working may be adopted, a solvent for the liquid under treatment being supplied to that end of the treatment chamber at which the collecting electrode passes out of the chamber say through the inlet 21, while the liquid under treatment (together with further solvent if necessary) is introduced at an intermediate point through a pipe indicated in chain dotted lines at 33 and a port through the surface 17 similar to the port 23, the whole passing out through the pipe 24. In this manner losses of the liquid

under treatment are reduced to a minimum since the matter deposited on the collecting electrode, before leaving the treatment chamber, will be washed by the solvent comparatively clear of the liquid under treatment and thus little of said liquid under treatment will be lost in the sludge afterwards scraped away from the collecting electrode.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and a rotary portion in spaced relation thereto and rotatable about a substantially horizontal axis, a seal between them whereby the container is rendered liquid tight, said rotary portion constituting an electrode having a surface for the deposit of matter thereon, a second electrode carried by the stationary portion of said container, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said surface of the rotary portion, the said surface being adapted to pass during rotation out of the liquid, and means for removing the matter deposited on said surface while it is out of the liquid.

2. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and a rotary portion in spaced relation thereto and rotatable about a substantially horizontal axis, a seal between them whereby the container is rendered liquid tight, said rotary portion constituting an electrode having a surface for the deposit of matter thereon, a second electrode carried by the stationary portion of said container, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said surface of the rotary portion, the said surface being adapted to pass during rotation out of the liquid, and means for removing the matter deposited on said surface while it is out of the liquid, said surface comprising, during its passage beneath the liquid, the bottom surface of the container.

3. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and an annular rotary portion rotatable about a horizontal axis in spaced relation to, and extending above, said stationary portion, a seal between co-operating parts of said contained portions whereby the container is rendered liquid tight, said rotary portion constituting an electrode having a surface for the deposit of matter thereon, a second electrode carried by the stationary portion of said container, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said surface of the rotary portion, and means positioned above the stationary portion of the container for removing the matter deposited on said surface.

4. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and an annular rotary portion rotatable about a horizontal axis, said rotary portion being formed with a groove presented toward said stationary portion and concentric with said axis and the stationary portion closing the contiguous portion of said groove and thereby forming an enclosed passage constituting the container, said rotary portion constituting an electrode having a surface for the deposit of matter thereon, a second electrode carried by the stationary portion of said container, projecting into but spaced from the walls of said groove, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said surface of said rotary portion, and means positioned above the stationary portion of the container for removing the matter deposited on said surface.

5. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and an annular rotary portion rotatable about a horizontal axis, said rotary portion being formed with a groove presented toward said stationary portion and concentric with said axis and the stationary portion closing the contiguous portion of said groove and thereby forming an enclosed passage constituting the container, said rotary portion constituting an electrode having surfaces within said groove upon which matter precipitated from the liquid being treated is deposited, a segmental electrode carried by said stationary portion, projecting into but spaced from the walls of said groove, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said surface of said rotary portion, and means positioned above the stationary portion of said container for removing the matter deposited on said surface.

6. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and an annular rotary portion rotatable about a horizontal axis, said rotary portion being formed with an annular groove concentric with said axis and facing axially to one side and toward said stationary portion, means carried by said stationary portion closing the lower part of said groove and thereby forming an enclosed passage constituting the treatment container, said rotary portion constituting an electrode having surfaces within said groove upon which matter precipitated from the liquid being treated is deposited, a segmental electrode carried by said stationary portion, projecting into but spaced from the walls of said groove, said electrode extending from adjacent one end of said enclosed passage to a point projecting beyond the other end thereof, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said surface of said groove, and means positioned above the stationary portion of said container for removing said matter while said surface is out of the liquid.

7. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary casing and an annular rotary portion rotatable about a horizontal axis and having the portion thereof below its axis of rotation extending into said casing but spaced therefrom, said rotary portion being formed with a continuous channel forming groove presented toward one wall of said casing and concentric with said axis, means carried by said casing forming a seal between the wall of said casing and the contiguous part of said rotary portion closing said groove and thereby forming an enclosed passage constituting the treatment container, said rotary portion constituting an electrode having continuous surfaces upon which matter precipitated from the liquid being treated is deposited, a discharge electrode mounted on

said stationary portion and lying within, and extending along, said closed passage, and means positioned above said casing for removing the matter deposited on said surface.

8. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and an annular rotary portion rotatable about a horizontal axis, said rotary portion being formed with a groove presented toward said stationary portion and concentric with said axis, and the stationary portion closing the contiguous portion of said groove and thereby forming an enclosed passage constituting the container, said rotary portion constituting an electrode having surfaces within said groove upon which matter precipitated from the liquid being treated is deposited, a segmental electrode carried by said stationary portion, projecting into but spaced from the walls of said groove, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said container surface of said rotary portion, means positioned above the stationary portion of the container for removing the matter deposited on said surface, and inlet and outlet conduits whereby the liquid is adapted to be led in a stream into and out of said enclosed passage, said conduits communicating with said passage through said stationary portion.

9. Apparatus for removing suspended matter from liquid, comprising a container for the liquid having a stationary portion and an annular rotary portion rotatable about a horizontal axis, said rotary portion being formed with a groove presented toward said stationary portion and concentric with said axis and the stationary portion closing the contiguous portion of said groove and thereby forming an enclosed passage constituting the container, said rotary portion constituting an electrode having surfaces within said groove upon which matter precipitated from the liquid being treated is deposited, a segmental electrode carried by said stationary portion, projecting into but spaced from the walls of the groove, means for generating an electrostatic field between said electrodes whereby suspended matter in the liquid is deposited on said containing surface of said rotary portion, means positioned above the stationary portion of the container for removing the matter deposited on said surface, inlet and outlet conduits whereby the liquid may be led in a stream into and out of said enclosed passage, said conduits communicating with said passage through said stationary portion, and heating means over which said liquid is adapted to pass prior to its entry into the inlet conduit.

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