Claims

The claims defining the invention are as follows:

1. A liquid treatment unit for at least partially removing particles from a flow of a treatment liquid, the liquid treatment unit comprising:

an electrocoagulation unit, the electrocoagulation unit comprising:

a housing including a housing inlet and a housing outlet through which the flow of liquid is movable in use in a liquid flow path;

a plurality of electrodes housed within the housing in the liquid flow path, the electrodes being configured to be electrically charged;

a cyclonic separator unit, the cyclonic separator unit comprising

a cylindrical container, the cylindrical container including a separator inlet for receiving the flow of the treatment liquid from the electrocoagulation unit, and a separator outlet located proximate to or towards a top of the cylindrical container, and proximate a central axis of the cylindrical container;

a guide located at least partly in the cylindrical container, the guide including a cylindrical skirt extending at least partly down a length of the cylindrical container defining an outer flow path for the flow of the treatment liquid where the treatment liquid flows in a circular direction around an outside of the cylindrical skirt, and an inner flow path in which the flow of the treatment liquid moves inwardly of the cylindrical skirt and upwardly towards the separator outlet;

a hollow column suspended within the cylindrical skirt and being concentric therewith, the hollow column having:

a plurality of substantially frusto-conical guide members mounted to the hollow column extending outwardly therefrom,

wherein the substantially frusto-conical guide members are nested with each other at regular spaced distances to define a filter flow path between each adjacent nested frusto-conical guide member,

wherein at least one or more of the plurality of substantially frusto-conical guide members includes a wall that defines a continuous series of troughs and ridges extending radially outwardly, and

wherein the filter flow path provided by the hollow column and guide members effectively allows settling out of particulates suspended in the treatment liquid thereon, to remove particles from the flow of treatment liquid.

2. A liquid treatment unit as claimed in claim 1, wherein the liquid treatment unit includes at least one ultrasonic transducer configured to stream ultrasound waves into the flow of liquid in the electrocoagulation unit.

3. A liquid treatment unit as claimed in claim 1, wherein the hollow column includes perforations.

4. A liquid treatment unit as claimed in claim 1, wherein the continuous series of troughs and ridges extend spirally along the wall.

5. A liquid treatment unit as claimed in claim 1, wherein the frusto-conical guide members are located inwardly of the cylindrical skirt.

6. A liquid treatment unit as claimed in claim 1, wherein the guide defines a flow path between an inner surface of the cylindrical skirt and the substantially frusto-conical guide members.

7. A liquid treatment unit as claimed in claim 1, wherein the continuous series of troughs and ridges defines a triangle wave pattern in cross-section, wherein each trough terminates in a valley apex and each ridge terminates in a peak apex.

8. A liquid treatment unit for at least partially removing particles from a flow of treatment liquid, the liquid treatment unit comprising:
an electrocoagulation unit, the electrocoagulation unit comprising:
a housing including a housing inlet and a housing outlet through which the flow of liquid is movable in use in a liquid flow path;
a plurality of electrodes housed within the housing in the liquid flow path, the electrodes being configured to be electrically charged;
a cyclonic separator unit, the cyclonic separator unit comprising:
a cylindrical container, the cylindrical container including a separator inlet for receiving the flow of the treatment liquid from the electrocoagulation unit, and a separator outlet located proximate to or towards a top of the cylindrical container, and proximate a central axis of the cylindrical container;
a guide located at least partly in the cylindrical container, the guide including a cylindrical skirt extending at least partly down a length of the cylindrical container defining an outer flow path for the flow of the treatment liquid where the treatment liquid flows in a circular direction around an outside of the cylindrical skirt, and an inner flow

path in which the flow of the treatment liquid moves inwardly of the cylindrical skirt and upwardly towards the separator outlet;

a hollow column suspended within the cylindrical skirt and being concentric therewith, the hollow column having:

a plurality of substantially frusto-conical guide members mounted to the hollow column extending outwardly therefrom,

wherein the substantially frusto-conical guide members are nested with each other at regular spaced distances to define a filter flow path between each adjacent nested frusto-conical guide member,

wherein at least one or more of the plurality of substantially frusto-conical guide members includes a wall that defines a continuous series of troughs and ridges extending radially outwardly,

wherein the continuous series of troughs and ridges defines a triangular wave pattern in cross-section, wherein each trough terminates in a valley apex and each ridge terminates in a peak apex;

wherein the troughs and ridges of the substantially frusto-concial guide members extend spirally along the wall, and

wherein the filter flow path provided by the hollow column and guide members effectively allows settling out of particulates suspended in the treatment liquid thereon, to remove particles from the flow of treatment liquid.

9. The liquid treatment unit as claimed in claim 8, further comprising:

a surface skimming arrangement,

wherein the surface skimming arrangement is configured to remove floating contaminants from the surface of the treatment liquid in the cyclonic separator unit.

10. The liquid treatment unit as claimed in claim 1, wherein each substantially frusto-conical guide member has a central aperture at a first end thereof through which the hollow column extends and an outer periphery at a second end thereof opposite the first end, and wherein the continuous series of troughs and ridges extend across an entirety of the wall from the central aperture to the outer periphery.

11. The liquid treatment unit as claimed in claim 8, wherein each substantially frusto-conical guide member has a central aperture at a first end thereof through which the hollow column extends and an outer periphery at a second end thereof opposite the first end, and wherein the continuous series of troughs and ridges extend across an entirety of the wall from the central aperture to the outer periphery.