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APPARATUS FOR TREATING LIQUIDS WITH HIGH FREQUENCY ELECTRICAL ENERGY

Filed Oct. 15, 1963

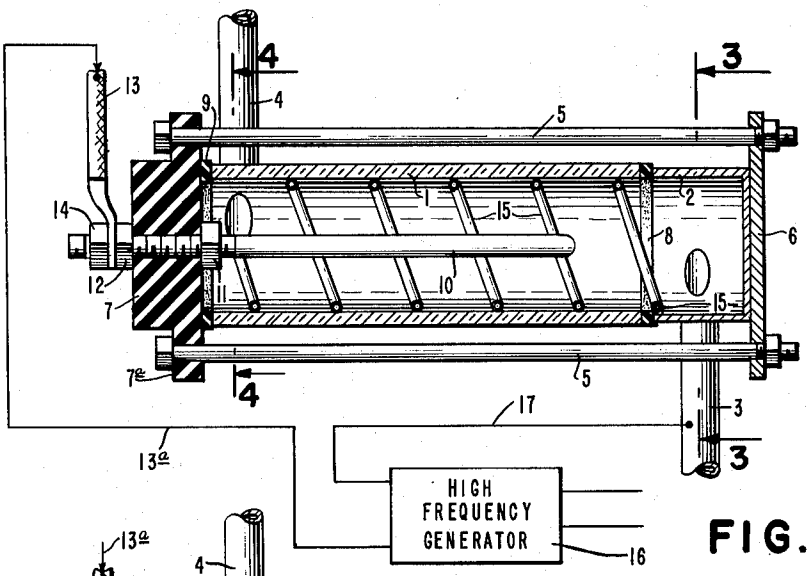


FIG.1.

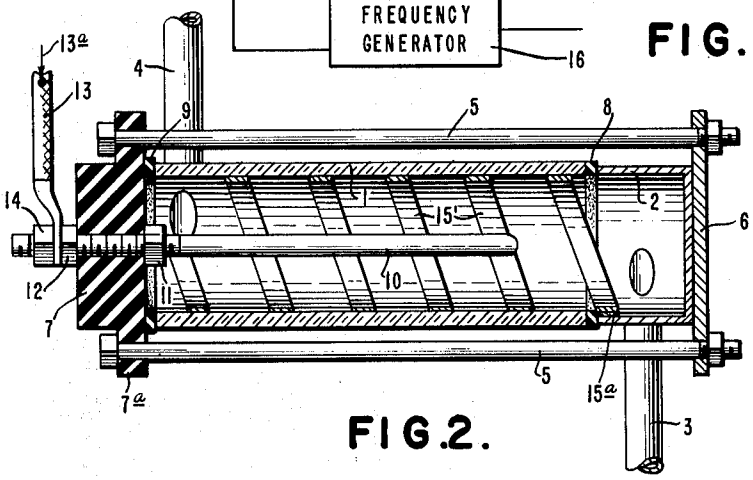


FIG.2.

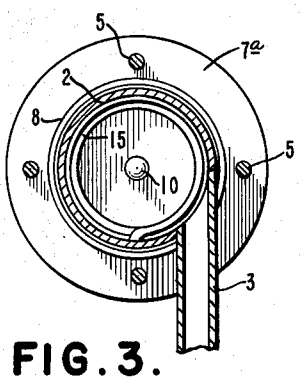


FIG.3.

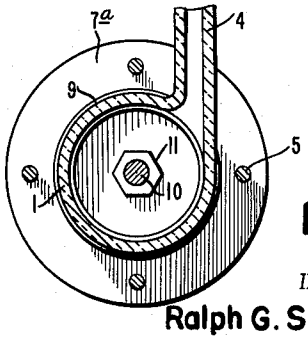


FIG.4.

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APPARATUS FOR TREATING LIQUIDS WITH HIGH FREQUENCY ELECTRICAL ENERGY

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4 Claims. (Cl. 219—10.65)

This invention relates to apparatus for applying high frequency electrical energy to liquid materials, more particularly for the removal of water by evaporation from liquid mixtures containing water and other components.

In my prior Patent No. 3,060,297, issued October 23, 1962, I have shown and described in detail such apparatus and associated equipment, and explained its chief purpose and function.

In said prior patent I disclosed an electrode structure comprising a cylindrical casing or shell of conducting material through which the liquid mixture is caused to circulate, a central electrode extending axially of this casing, and a high frequency electrical generator having one terminal connected to said casing and the other terminal connected to said central electrode. This central electrode is supported by the casing at one end only, and is substantially shorter than the casing.

In said prior patent, the liquid mixture is introduced tangentially into the casing at a point adjacent the end on which said central electrode is supported, and is discharged axially from the other end.

The object of the present invention is to devise a modified construction in which the outer shell or casing is made of glass, or other non-conducting material, and a special outer electrode is provided to constitute the other side of the circuit.

In order that the invention may be readily understood, reference is had to the accompanying drawing, forming part of this specification, and in which:

FIG. 1 is a longitudinal section through my novel electrode structure;

FIG. 2 is a similar view, showing a slightly different construction;

FIG. 3 is a transverse section substantially on the line 3—3 of FIG. 1, looking in the direction of the arrows; and

FIG. 4 is a transverse section substantially on the line 4—4 of FIG. 1, looking in the direction of the arrows.

Referring to the drawing in detail, my novel electrode structure comprises an elongated casing **1**, of circular cross-section, formed of insulating material such as glass or plastic.

At one end of this casing is a cup-shaped conducting member **2**, of substantially the same diameter as said casing, disposed in co-axial relation with its open end abutting the end of the casing, a gasket **8** being interposed to provide a fluid-tight joint.

At the other end, the casing is closed by a heavy disc **7**, of insulating material, a gasket **9** being interposed between them to provide a fluid-tight joint. The disc, casing and cup-shaped member are held in assembled relation by means of tie bolts **5** passing through a plate **6** at one end and a flange **7a** formed on the disc **7**, at the other end.

As in my said prior patent, an inner rod electrode **10** is supported at one end only on the disc **7**, being held in

position by nuts **11** and **12** engaging a threaded portion of the rod. This rod electrode is shorter than the casing, and extends axially thereof, so as to provide a free annular space therebetween.

In my said prior patent, the liquid material being treated was introduced into the end of the casing adjacent the insulating disc, and discharged from the other end. In a prior co-pending application, I have disclosed and claimed an arrangement in which the liquid material is introduced into that end of the casing adjacent the free end of the rod electrode, and discharged from the end adjacent the supporting disc. In the present case, I have illustrated a similar arrangement. The inlet pipe **3** is connected with the cup-shaped member **2**, and the discharge pipe **4** is at the opposite end of the casing. So far as the present invention is concerned, either arrangement may be employed.

As shown in FIGS. 3 and 4, these pipes **3** and **4** are advantageously disposed tangentially, as in my said prior patent.

Disposed co-axially of said casing **10** is a helical conducting member. This may consist of a coiled rod, tube or wire **15**, as shown in FIG. 1, or a thin strip of sheet metal, as shown at **15'** in FIG. 2. In either case, one end of the helical coil is grounded to the cup-shaped member **2** as shown at **15a**, the other end of the coil being unconnected with anything. While in the drawing these helical coils are shown as inside the casing, it will be understood that they may as well be outside. If the helical coil is, as shown, inside the casing, it should be placed closely adjacent the walls thereof, so as not to interfere with the free flow and whirling motion of the liquid material. If the coil is outside the casing, it should, in general, be adjacent the walls, but will operate if spaced slightly from them.

A high frequency generator of the type described in said prior patent is indicated at **16**. One lead **17** of this generator is grounded, as, for example, on the inlet pipe **3**, while the other lead, **13a**, is connected with the terminal **13**, secured to the inner electrode by means of a nut **14**.

In operation, the liquid to be treated is forced, as by means of a pump (not shown) through inlet pipe **3**, and tangentially into cup-shaped member **2**. Thence it flows axially along the casing **1**, with a whirling motion, and escapes through discharge pipe **4**. Meanwhile, high frequency electrical oscillations are impressed between the inner electrode **10** and helical conductor **15** (or **15'**), and the liquid material flowing in the annular space between these conductors is traversed by this electrical energy just the same as if the casing itself were made of conducting material, as in said prior patent.

What I claim is:

1. In the application of high frequency electrical energy to liquid materials, an electrode structure comprising an elongated casing of circular cross-section formed of insulating material, a helical conducting member disposed co-axially of said casing adjacent the walls thereof, an insulating disc closing one end of said casing, means closing the other end thereof, an inner rod conducting member extending axially of said casing so as to provide an open annular space between them, said rod member being shorter than said casing and supported at one end only by said disc, means connecting said rod member and one

end only of said helical conducting member with the two poles of a high frequency generator, an inlet pipe connected with said annular space adjacent one end of said casing, an outlet pipe connected with said annular space at the other end of said casing, and means for causing the liquid material being treated to flow from said inlet pipe into and through said annular space inside of said helical conducting member, and out through said discharge pipe.

2. An electrode structure in accordance with claim 1 in which the helical conducting member is located inside of said casing.

3. An electrode structure in accordance with claim 1, in which a cup-shaped conducting member, of substantially the same diameter as the casing is disposed in coaxial alignment therewith, with its open end abutting one

end of the casing, and in which the inlet pipe is connected with said cup-shaped member.

4. An electrode structure in accordance with claim 3, in which one end of said helical conducting member is electrically connected with said cup-shaped member, and thus grounded.

References Cited by the Examiner

UNITED STATES PATENTS

2,620,172	12/52	Jenett et al.	219—10.65
3,060,297	10/62	Sargeant	219—10.65

FOREIGN PATENTS

517,798	2/40	Great Britain.

RICHARD M. WOOD, *Primary Examiner.*