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IMMERSION DEVICES FOR TREATING LIQUIDS

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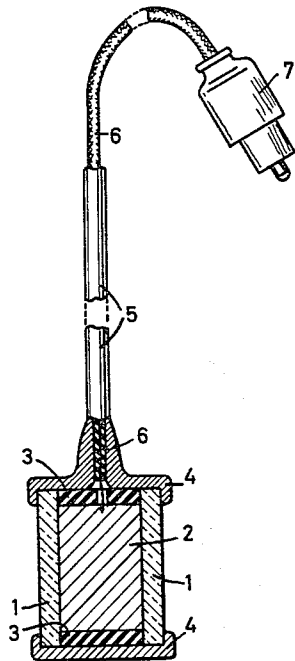


Fig. 1

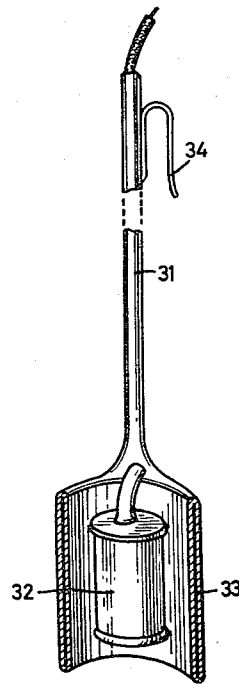


Fig. 3

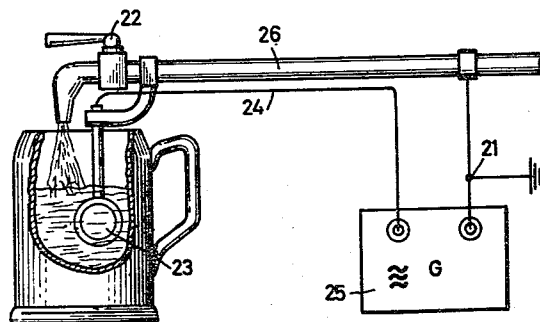


Fig. 2

1

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IMMERSION DEVICES FOR TREATING LIQUIDS

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2 Claims. (Cl. 259—1)

My invention relates to portable immersion devices for treating liquids by subjecting them to sonic or supersonic oscillations.

The sonic or supersonic treatment of liquids has so far substantially been limited to industrial and laboratory applications. The necessary sonic devices and electric generators (the term "sonic" being here and hereinafter understood to include the supersonic frequencies) have been expensive and complicated and could be serviced only by skilled personnel. In most cases, the known sonic oscillators are firmly attached to the treating vessels, and special devices are provided for supporting the oscillator bodies and for attaching the pertaining electrodes to these bodies.

It is an object of my invention to devise a sonic immersion oscillator of a simple and inexpensive design that can readily be used by anyone in the manner of a portable appliance for household purposes, or for commercial applications such as in bars and restaurants, or pharmaceutical and chemical laboratories.

Another, ancillary object of my invention is to devise a handy electric appliance for the stirring, shaking or mixing of liquids that eliminates the necessity for revolvable or otherwise movable mechanisms or movable magnetic armatures and diaphragms and is composed only of virtually fixed parts, thus affording an extremely sturdy design and a high reliability of operation.

To achieve these as well as such other objects and advantages as will appear from the following, I provide an immersion appliance for the sonic treating of liquids that, in general design, appearance and manipulation, is similar to an electric immersion heater for household use. The appliance comprises an insulated rod-shaped or tubular handle portion enclosing the electric supply conductor, and a head portion which is firmly joined with the handle portion and consists essentially of a sonic oscillator. According to a more specific feature of my invention, the oscillator is a piezoelectric supersonic device, preferably a ceramic piezo oscillator, for instance, of barium titanate. The oscillator may comprise one or a plurality of oscillator bodies. Such an immersion appliance may be operated with a simple high-frequency generator having, for instance, only one electronic tube of about 5 to 10 watts power output, which may be energized directly from the line without requiring an additional power-supply unit or rectifier. Consequently, an appliance according to the invention is also simple and inexpensive as regards the required high-frequency generator.

An appliance according to the invention may be used in the manner of an electric immersion heater. It can readily and safely be manipulated with utmost security from electric shocks, especially when a ceramic piezo oscillator of barium titanate is provided, such oscillators operating with a relatively low voltage of only about 100 volts. A cord with a plug connector may be provided for removably connecting the appliance to a small high-frequency generator. As is the case with an immersion

2

heater, the appliance has no exterior parts under voltage. For using the appliance, it is simply immersed into the liquid to be sonically treated. For use with conductive liquids, particularly those consisting mostly of water, the appliance may be given a piezo oscillator without an exterior electrode, the liquid to be treated then serving as the second electrode. For use with non-conductive or poorly conductive liquids an exterior electrode is to be provided, this electrode being preferably kept at ground potential. However, since in the latter design the electrode carrying the high-frequency voltage is not accessible from the outside, the device is just as safely manipulatable as one without an exterior electrode.

The foregoing and other features of the invention will be apparent from the embodiments described in the following with reference to the drawings, in which:

Fig. 1 shows a part-sectional view of a sonic immersion appliance according to the invention;

Fig. 2 shows an appliance according to the invention designed for the conditioning of beer or the like beverage; and

Fig. 3 is a perspective and part sectional view through a combined sonic and heating appliance also according to the invention.

The device illustrated in Fig. 1 has a hollow cylindrical oscillator body 1 of a ceramic-type piezoelectric material; preferably barium titanate. This body tightly encloses a cylindrical electrode 2 which may consist of a solid body of metal. The electrode 2 is insulated and sealed against water by sealing discs 3 and by front covers 4. The upper sealing disc and the upper cover 4 have an opening through which the electric supply wire 6 extends to the electrode 2. An exterior electrode for the oscillator body 1 is not provided, the appliance being intended for use with conductive liquids so that the liquid contacting the oscillator body forms itself the counter electrode. The handle portion 5 of the appliance consists of an elongated tubular body of insulating material. It encloses the electric supply conductor 6 for the electrode 2 and is firmly joined with the upper front cover 4 of the oscillator. A connector plug 7 permits connecting the appliance to a high-frequency generator (not illustrated). The lower cover 4 also protects the oscillator body 1 from being damaged.

The holding or cover portions of the oscillator and the handle of the appliance are preferably made of a material resistant to chemical attack. Consequently, the material may be chosen in dependence upon the particular liquids to be treated. It is further advantageous to select a material of good dielectric properties to minimize or prevent high-frequency losses.

As will be recognized from the embodiment so far described, an appliance according to the invention is a relatively small apparatus that can readily and safely be manipulated for home use as well as for commercial and industrial applications. For instance, the apparatus may serve to impart a stirring or shaking effect on beverages or other liquids when these liquids are in the pots, cups, glasses or other vessels ordinarily used. In this manner, the appliances may be used for the preparation of tea or coffee, the mixing of beverages, the dissolving of powdered material, the preparation of dehydrated food, the artificial aging of alcohol and alcoholic beverages in small quantities, or for improving the sparkling and foaming quality of beer and the like beverages, to mention only some of the applications. When used in the preparation of tea, coffee or similar infusions, the supersonic treatment by a device according to the invention effects a more rapid and more extensive lixiviation. In this manner a saving of about one-quarter to one-third may be obtained.

3

For the purpose of improving the life and foaming qualities of beer, the appliance according to the invention may be equipped with a holding device at or near the beer tap so that the oscillator extends downwardly. This has the advantages that the immersion device need not be touched by hand. The immersion can then be effected by lifting a filled glass or mug from below against the immersion device. If the device is so mounted that it enters into the vessel when the beer is being tapped, then the sonic treatment may occur while the beer is flowing into the vessel. Since beer is an electrically good conductive liquid, the sonic devices does not require an exterior electrode. For sonic treatment during the tapping of the beer, a tap faucet of metal and, hence, the beer itself may serve as the exterior electrode. In other cases, it may be preferably to provide a second electrode which is immersed into the beverage together with the oscillator.

Fig. 2 shows how the appliance may be mounted on a beer tap 22. The appliance 23, designed in accordance with the above-described embodiment, has its supply cable 24 connected to a small high-frequency generator 25. The metallic piping 26 leading the beer to the tap serves as the second electrode. It is also connected to the generator 25 and is grounded at 21.

According to the invention, the sonic device may be combined with an electric immersion heater as is apparent from the embodiment shown in Fig. 3. A single handle portion 31 carries a sonic oscillator 32 as well as an electric heater 33. The handle encloses the supply conductors for the heater and for the oscillator. A hook 34 near the upper end of the handle permits hanging the appliance over the rim of a vessel. The oscillator 32 may be similar to that of Fig. 1. For treating conductive liquids, a metallic surface of the heater 33 may also form the exterior electrode for coaction with the oscillator 32.

Aside from the applications already mentioned, devices according to the invention may be used for many other purposes for which an oscillatory treatment is favorable. For instance, seed material may be sonically treated for increasing the germinating ability. The devices according to the invention are especially advantageous for laboratories because they are handy and especially suitable for carrying out a series of tests. While the known laboratory devices with a sonic oscillator attached to a pertaining vessel must be filled with each sample and must thereafter be emptied and cleaned

4

before the next sample can be tested, a device according to the invention may be immersed in a rapid sequence into any number of individual vessels or beakers thus greatly expediting the tests performable with a single oscillator.

I claim:

1. An immersion device for treating liquids, comprising an insulated handle rod, an electric immersion heater of hollow cylindrical shape and a piezoelectric oscillator both joined with said handle and a piezoelectric for joint immersion in the liquid to be treated, said oscillator being surrounded by said heater, and electric conductor means extending through said handle to said heater and said oscillator.

2. A single electrode immersion device for treating, mixing and stirring liquids, comprising an elongated hollow handle portion and a head portion rigidly joined with said handle portion at one end thereof and forming a portable unit together with said handle portion, said head portion comprising a hollow cylindrical ceramic single bodied piezo oscillator element having its axis of symmetry coincident with the longitudinal axis of said handle and having an outer cylindrical surface adapted to be directly contacted by the liquid to be treated, said outer surface being operable at ground potential, a cylindrical electrode sealed and snugly fitting within the hollow of said piezo element and in surface contact with the interior thereof, and an insulated electric conductor extending from the outside through said handle portion and being connected with said electrode.

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