

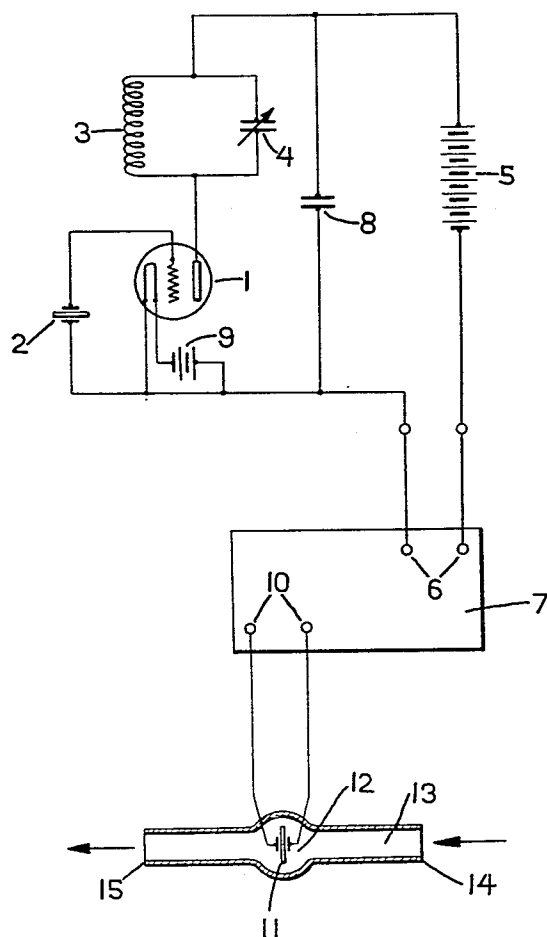
Dec. 10, 1929.

W. CLAYPOOLE

1,738,565

METHOD AND APPARATUS FOR UTILIZING HIGH FREQUENCY SOUND WAVES

Filed July 18, 1927



Inventor
Walter Claypoole
By his Attorney
R. H. Earborn

UNITED STATES PATENT OFFICE

WALTER CLAYPOOLE, OF FOREST HILLS, NEW YORK, ASSIGNOR TO THE TEXAS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

METHOD AND APPARATUS FOR UTILIZING HIGH-FREQUENCY SOUND WAVES

Application filed July 18, 1927. Serial No. 206,443.

A primary object of the present invention is to provide a method and means for producing and applying high frequency sound waves of sufficient intensity to enable their use in various ways to effect beneficial physical changes. It has been discovered that where high frequency waves of this kind are applied to a mixture of liquids or of a liquid and a solid the mixture will be transformed into a permanent emulsion. Thus if a quantity of mercury is placed in a vessel containing water and the mixture is subjected to high frequency sound waves, which are preferably above the range of audibility and which are of sufficient intensity, the mercury will be finely divided and distributed through the water in the form of a permanent colloidal solution. Similarly if paraffine is placed on water and subjected to waves of this character it will be distributed in such a way as to form a permanent emulsion.

One special beneficial use to which this effect of high frequency waves may be put is in the production of a permanent emulsion of sulphur in cutting oils. A small quantity of sulphur has been found desirable in connection with oils of this character employed for machine tools and the like, but difficulties have been experienced in the past in the way of maintaining the sulphur content in permanent emulsion when the cans containing the mixture are stored for any length of time. The present invention, therefore, contemplates a method for producing permanent suspension of sulphur particles in a body of oil so that even after a considerable period of storage the oil will still be in a condition for its intended purposes.

In the application of sound waves for the purposes above specified difficulties have been encountered in the way of providing a commercially feasible process due to the relatively small body of liquid on which the waves could be made to take effect. The peculiar properties of the waves have been found to be sufficiently effective only within a relatively small distance from the source from which the waves are emitted. An important feature of the present invention, therefore, has been to create a method as well as an

apparatus for dealing with larger bodies of liquid without necessitating the use of a large number of sound wave emitting sources. To this end the invention contemplates a continuous process whereby the liquid or mixture in the course of flowing through a portion of the apparatus will be subjected to the influence of the emitted waves as a result of which a permanent emulsion will be formed. The invention may also be utilized for the purpose of cracking or converting higher boiling oils into lower boiling oils. It is contemplated that sufficient energy may be employed in maintaining the high frequency waves to bring about the necessary breaking up of the molecular structure for this purpose. With these and other incidental objects in view one form of the invention may now be particularly described with reference to the accompanying drawing which forms a part hereof.

The single view illustrates diagrammatically means for generating high frequency sound waves and for applying them to a continuous stream of liquid to be emulsified. In the drawing there is disclosed a vacuum tube 1 which may be taken as the source of the continuous series of high frequency electrical waves which preferably have a frequency considerably above the range of audibility for sound waves. A piezo electric crystal 2 is preferably inserted in the grid circuit of the vacuum tube for the purpose of establishing a fixed frequency which, as is well known, will be substantially the same as the natural or resonant frequency of the crystal itself. The usual form of oscillating circuit may be adopted and may comprise, as shown, an inductance 3 and a variable condenser 4 arranged in parallel in the plate circuit which is supplied by a suitable source of current such as the battery designated 5. The plate circuit is suitably connected to the terminals 6 of a high power amplifier 7 of any desired and satisfactory construction. In parallel with the plate circuit there may preferably be provided a capacity 8, although this is not essential and may be omitted if desired. The filament of the vacuum tube may, as shown, be heated by current from a battery 9.

In the amplifier 7 the electrical waves having a frequency controlled by the crystal 2 are highly amplified and when taken off from the output terminals 10 of the amplifier they will have considerable intensity. Suitable electrical connections are provided from the terminals 10 to the contact pieces, such as metal foil or the like, placed on opposite sides of another piezo electric crystal 11 which may be made of any suitable material, such as quartz, and has a natural or resonant frequency substantially the same as that of the crystals 2. As is well known the effect of the alternating electric stress acting on the crystal 11 is to set the latter into vibration and when the natural or resonant frequency of the crystal is substantially the same as the frequency of the electrical waves imposed upon it the vibrations will be of considerably greater magnitude than if these frequencies were materially different. These vibrations of the crystal 11 will, therefore, set up high frequency sound waves in the surrounding medium, which waves will preferably be of such frequency as to be out of the range of audibility. For the purpose of treating a liquid in the manner hereinbefore specified, the crystal 11 may be inserted in an enlarged portion 12 of a tube 13. The construction is preferably such that the area of cross section of the open passage surrounding the crystal will be substantially the same as the area of a cross section through a normal portion of the tube.

In operation the liquid or mixture to be treated and which will preferably have been agitated sufficiently to create a temporary suspension of the sulphur particles may enter at the end 14 of the tube and flow in the direction indicated by the arrow through the large portion 12 and to the opposite end 15 into a container. The sulphur before being mixed with the oil will preferably be heated to a certain extent. This heating may be to the extent of introducing it in liquid form or even in vapor form in which case flowers of sulphur will be formed. Upon passing the crystal 11 the liquid mixture will be subjected to the effects of the constantly emitted high frequency sound waves with the result that a permanent emulsion will be created of the liquids or liquid and solid entering the tube 14.

The rate of flow of the mixture through the tube 13 may be regulated in any suitable way so that it will be subjected to the influence of the sound waves for a sufficient period to insure complete emulsification. This may vary to a certain extent depending upon the nature of the constituents of the mixture. In order to permit a greater speed of flow past the crystal the mixture may be partly or completely recycled or several crystals may be arranged in series so that the mixture will pass them successively. An increase in volume

of output may also be effected by arranging several tubes and crystals in parallel.

It will be understood that many modifications may be made in the form of apparatus disclosed herein without departing from the spirit of the present invention and that the novel method of treating liquids is not limited to the particular use which has been explained. The invention will be found to be of considerable utility in all cases where it is desired to create a permanent suspension of solid or liquid particles in a body of liquid. The invention may also be utilized in the performance of other physical effects upon bodies of liquid such as may be brought about by the direct application of high frequency sound waves. Thus, high boiling oil in either liquid or vapor phase when made to flow past a vibrating crystal of this character may by virtue of the bombardment of the molecules be converted into lower boiling oils. The invention is to be understood as limited only by the scope of the claims which follow.

What I claim is:

1. A method of changing the physical characteristics of fluid bodies which comprises the generation of high frequency sound waves above the range of audibility in a restricted passage and continuously conducting a stream of fluid through said passage.
2. A method of changing the physical characteristics of fluid bodies which comprises the generation of high frequency electrical waves, the conversion of said electrical waves into sound waves above the range of audibility, and continuously passing a stream of fluid in proximity to the sound wave emitting source.
3. A method of creating a permanent emulsion which comprises the generation of high frequency electrical waves, the conversion of said waves into sound waves above the range of audibility, and the continuous passage in proximity to the source of said sound waves, of a mixture of constituents to be emulsified.
4. A method of creating a permanent emulsion which comprises the generation of high frequency electrical waves, the amplification of said electrical waves to high intensity, the conversion of said waves into sound waves above the audible range, and the continuous passage in proximity to the source of said sound waves of a mixture of constituents to be emulsified.
5. In apparatus for the production of physical effects upon fluid bodies means for setting up high frequency electrical waves, means for converting said electrical waves into sound waves, and means for conducting a fluid to be treated in proximity to the source of said sound waves.
6. In apparatus for the production of physical effects upon fluid bodies means for setting up high frequency electrical waves,

said means including a vacuum tube and an oscillating circuit, means for maintaining a fixed frequency in said circuit, means for converting said electrical waves into sound waves, said converting means including a piezo electric crystal having a natural frequency substantially the same as that of the electrical waves, and means for conducting a fluid to be treated in proximity to the source of said sound waves.

7. In apparatus for the production of physical effects upon fluid bodies means for setting up high frequency electrical waves, means for amplifying said waves, means for converting said amplified electrical waves into sound waves, and means for conducting a fluid to be treated in proximity to the source of said sound waves.

8. In apparatus for creating a permanent emulsion means for producing high frequency sound waves above the range of audibility, and means for conducting a mixture to be emulsified in proximity to said sound wave emitting means.

9. In an emulsifying device a fluid conduit, a vibratory body located within the conduit and means for vibrating the body.

10. In an emulsifying device a fluid conduit, a vibratory body located within the conduit and means for vibrating the body at such high frequency as not to emit audible sound waves.

11. The method of treating fluids which comprises passing them in a stream through a restricted passage and subjecting said stream in transit to high frequency vibrations above the audible limit.

In witness whereof I have hereunto set my hand this 9th day of July, 1927.

WALTER CLAYPOOLE.