

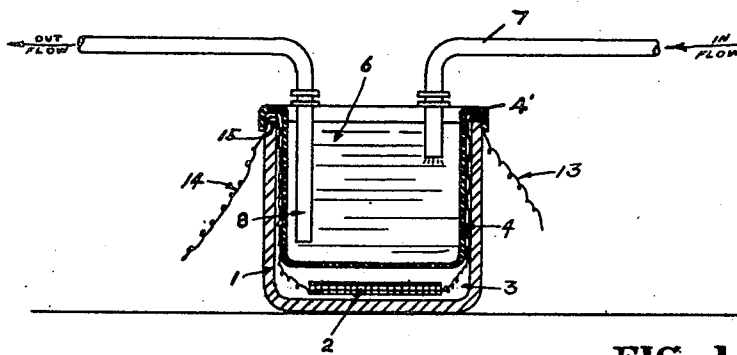
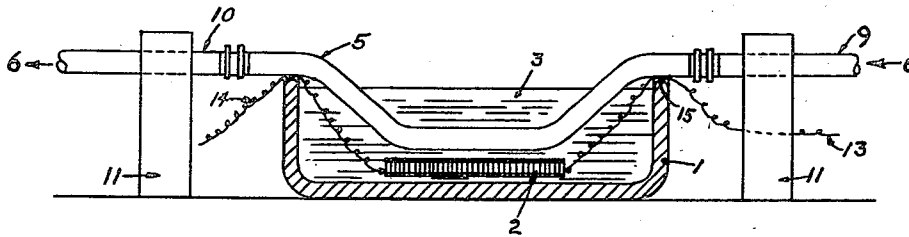
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SUPERSONIC TREATMENT OF FLUID MASSES

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SUPERSONIC TREATMENT OF FLUID
MASSES

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7 Claims. (Cl. 252-314)

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This invention relates to the treatment of various substances, particularly fluid masses, and principally clay dispersions, with supersonic vibrations to change the physical structure of the substances treated, and so combine or emulsifying the particles within the fluid dispersion having different specific gravities by reduction of the size of their particles.

The principal object of the invention is to provide apparatus for carrying out the above stated treatment which will insure the transmission of the supersonic vibrations from the generating member or members to the substance being treated with minimum loss of energy, and whereby the greatest effect of the energy directed into the substance is realized.

Another object is to provide apparatus as above outlined which is capable of treating a continuous flow of a fluid mass.

A specific object of the invention is to provide a treatment of clay particles in aqueous suspension, or forming other dispersions of solids and liquids, by supersonic vibrations for the purpose of securing a suspension or emulsion entirely composed of ultra microscopic size particles, having static qualities of irreversibility or stability.

Other objects and advantages of the invention will appear in the following description and accompanying drawing.

In the drawing:

Fig. 1 is a vertical cross section of a double container arrangement for applying supersonic vibrations to a mass within the inner container.

Fig. 2 is a view similar to that of Fig. 1 but shows the inner container formed as an elastic hose, for continuous flow treatment of the mass.

In working with supersonic, or ultrasonic vibrations in attempt to form ultra microscopic particle size aqueous dispersions of such gelling clays as bentonite, montmorillonite, etc., such as shown chemically as sodium hydrous aluminum silicate, hydrous magnesium silicate, etc.:

I found insufficient effect of the high frequency waves when applied in the generally known manner to various materials, and was not able to commercially secure a uniformly fine division of the clay particles down to less than a micron in size as required, and also found this difficulty was not only contributed to by the inherent nature of the minute particles of this type of clay to resist further division under supersonic stress, but was principally due to the great loss of pressure power of the waves generated by the supersonic emitted through absorption, reflection, or

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change in character in passing through the solid type wall of the container of the mass being treated.

Further work showed that when using a double container apparatus with the supersonic generating element in the outer container immersed in a liquid (preferably light oil) bath, and the inner container for the mass to be treated suspended in the bath, that if the inner container were made of highly elastic or elongation material similar to natural rubber, the effectiveness of the treatment with a given power output of the generating element, was increased many times—in fact, producing a continuous flow process for the practical treatment of such clays while yielding the ultra microscopic particle size of 0.01 micron, or still less if desired by somewhat longer treatment. A similar effect is produced in combining other fluids such as oil or fats and water, or water and waxes, etc.

Further work disclosed the desirability of having the elastic treating container as thin as practicable to gain the greatest advantages of the discovery, and also that the walls of the elastic treating container could be made very thin, weighing about 60 grams per square meter and still strong enough for the treatment if reinforced with a very flexible fiber such as finely spun glass; a suitable working weight would be about 600 grams per square meter.

In further detail, both figures of the drawing show at 1 an outer container for the supersonic wave emitter 2 immersed in any suitable wave transmitting fluid media 3 and with an inner container (4 in Fig. 1 and 5 in Fig. 2) for the mass 6 to be treated.

The outer container may be of any rigid material such as metal, fiber, or porcelain, but I prefer it of glass so that the condition of its contents can be readily observed, and the inner container is of highly elastic material such as natural rubber, chlorinated rubber, neoprene, synthetic rubber, or some of the synthetic resins or plastics having a soft elastic or elongation nature, and able to resist strong alkalies, acids and hydrocarbons. To aid in keeping the walls of the inner container thin, they are reinforced with a flexible fibrous filling, I have found spun glass, especially if heat treated up to 1,500 degrees F. and slowly cooled, is suitable for the purpose, the fine asbestos fiber also has value for the purpose. Such a reinforced container of rubber or the like maintains its usefulness for a much longer time than without the special reinforcement, for with the elapse of time as the

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rubber is losing its flexibility the glass fiber still sustains it as a fluid tight working unit.

In Fig. 1 the inner container 4 is shown suspended from the upper edge of the outer container 1 as by a thickened upper rim 4' just above the wave emitter 2, and the liquid mass 6 being treated is admitted to the container from a tube 7 from a gravity supply tank or pump, not shown, and after treatment the mass 6 is pumped out of a tube 8, preferably of rubber.

In Fig. 2 the inner container takes the form of an elastic tube 5 of rubber or the like, and preferably flexibly reinforced as previously described, and looped into the outer container and under the wave transmitting liquid 3 therein, and with opposite ends of the elastic tube 5 clamped or otherwise secured to pipe extensions 9, 10, rigidly supported as by blocks 11, so that the liquid mass being treated within the elastic tube may be slowly and continuously flowed or pumped through it by any suitable means, not shown.

For the inner container unit the amount of spun glass fiber found to yield the optimum suits is from about 1% to 5% by weight. This amount strengthens the rubber or other elongation substance without a close meshing of the fibers, and in this way the elongation or elasticity is not impaired. The fiber is preferably used cut in lengths from 2 mm. to 4 mm. While the drawing shows the inner container as immersed within the wave transmitting liquid 3, in some cases the inner container may be only slightly immersed, or even floating on the liquid 3.

As the production of suitable high frequency oscillating currents and their transmutation to supersonic waves of compression and rarification in a transmitting liquid by use of a piezo-electric quartz crystal, is well known, no description of it need be given here, except to state that the crystal or equivalent transducer is indicated at 2 within the outer container and spaced slightly below the elastic inner container, while the high frequency current wires 13 and 14 delivering energy to the transducer pass into the container through notches 15 in its upper rim. The frequency of the alternating current suitable for treatment of gelling clay or other suspensions is between about 15,000 cycles and 900,000 cycles; producing vibrations of from 200,000 to 840,000 cycles per sec. The total current found satisfactory being around 600 watts.

In some cases the transduction may be aided or wholly accomplished through means of magnetostriction rods immersed in the liquid 3, or directly in the fluid mass 6.

Where excessive heat is developed in the electro-vibratory assembly, cooling or refrigeration coils around or within the outer container or tank may be used, as well as understood and requiring no drawing.

In preparing gelling clays for supersonic treatment an aqueous suspension is first made, preferably of from about 1 to 3½%, allowed to settle to remove the foreign particles, decanted, and then subjected to the action of supersonic vibrations of the character and in the manner set out. The result produced cannot be obtained by the use of rigid wall containers, it produces a disperse of a character never commercially producible before, and one which has an important place in the production of colloidal dispersions, oil and water emulsions, or the like.

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The time required for the supersonic treatment varies from a few minutes to an hour or more, depending on the density or volume of the suspension and power of the supersonic waves applied and degree of molecular reduction desired.

As it is manifest from the foregoing description the thin walled elastic container in which the supersonic treatment takes place, while preferably of soft rubber, and reinforced with spun glass fibre to permit of the walls of the container being extremely thin—such as to weigh but about "60 grams per square meter" as set out on page 3 of the specification, yet instead of soft rubber it may be of any closely physical similar elastic material such as the various synthetics set out in the last paragraph of page 3, and hence my use of the word "rubber" herein and in my appended claims is to be taken as including any such physically similar materials.

Having thus described my invention and the manner of its use what I claim is:

1. The method of treating fluid masses by means of supersonic waves which includes supporting the mass in a thin walled suspended soft rubber container while applying the treatment, and with the rubber container in exterior contact with a supersonic wave transmitting liquid, and the pulsations being set up directly in said liquid.

2. The method of treating fluid masses by means of supersonic waves which includes flowing the mass through a suspended soft rubber hose immersed in a supersonic wave transmitting liquid in turn receiving the pulsations from a transducer.

3. In the supersonic wave treatment of fluid masses, the supporting of such masses in a thin flexible soft rubber container during the treatment, said flexible soft rubber container having its walls reinforced with a flexible fibre, and being in exterior contact with a supersonic wave transmitting liquid in which the pulsations are set up.

4. In the supersonic wave treatment of fluid masses, the supporting of such masses in a thin flexible soft rubber container during the treatment, said flexible soft rubber container having its walls reinforced with spun glass fibre, and being in exterior contact with a supersonic wave transmitting liquid in which the pulsations are set up.

5. In the supersonic wave treatment of fluid masses, the supporting of such masses in a suspended flexible soft rubber hose during the treatment, said hose having its walls reinforced with a flexible fibre.

6. In the supersonic wave treatment of fluid masses, the supporting of such masses in a flexible elastic container during the treatment, said elastic container being a flexible hose of soft elastic rubber with its walls reinforced with spun glass fibre.

7. The method of producing aqueous suspensions of gelling clays of sub-micron particle size which includes subjecting the suspension to elutriation followed by subjection to the action of supersonic waves while supported within a suspended soft rubber thin walled container directly exposed to supersonic waves until the clay particles are substantially all reduced below one micron in size.

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