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O. H. THOMAS

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METHOD AND MEANS FOR UTILIZING TRANSDUCERS TO BREAK UP
LIQUIDS INTO MINUTE PARTICLES
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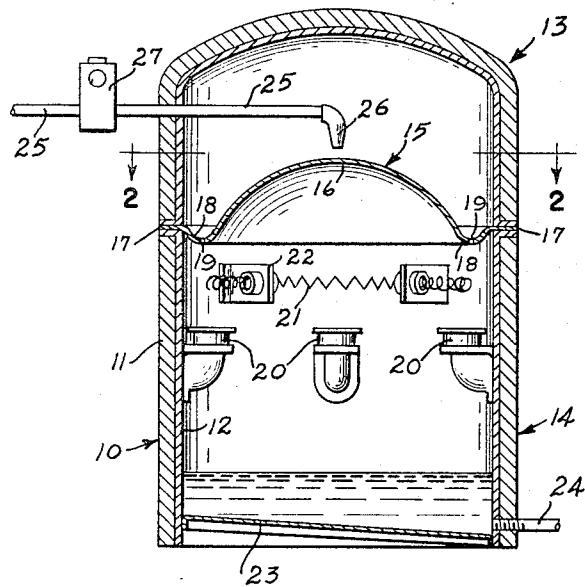


FIG. 1

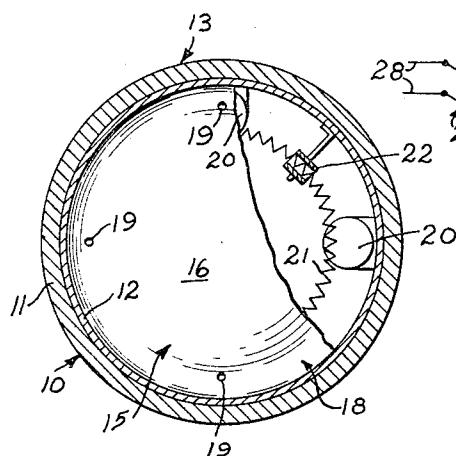


FIG. 2

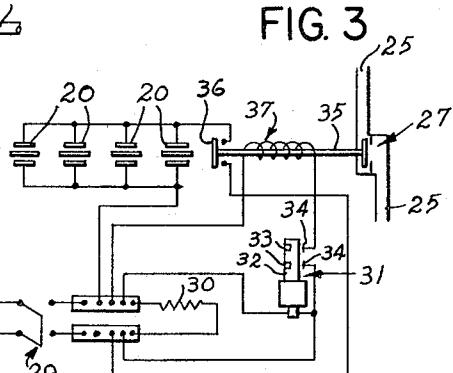
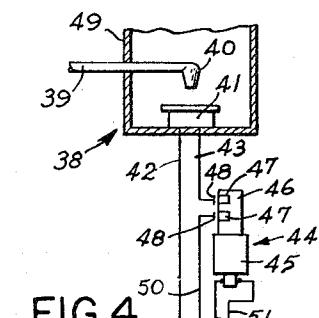


FIG. 3



INVENTOR
ORRIN H. THOMAS

BY
Sherman Levy

ATTORNEY

United States Patent Office

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1

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METHOD AND MEANS FOR UTILIZING TRANSDUCERS TO BREAK UP LIQUIDS INTO MINUTE PARTICLES

Orrin H. Thomas, Tioga, Pa., assignor, by mesne assignments, to Alvin J. Nassar, Elmira, N.Y.
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ABSTRACT OF THE DISCLOSURE

A method and means for using transducers to break up liquids into minute particles wherein there is provided a method or means for controlling the supply of liquid from a supply source and wherein the liquid supply and actuation of the transducers are timed to correspond or coact with each other.

This invention relates to a method and means for breaking up liquids into minute particles by utilizing transducers, and wherein there is provided a means for properly controlling the supply of liquid from a source of supply so that the supply of liquid is timed to correspond with the actuation of the transducers.

An object of the present invention is to provide an improved method and means for breaking up liquids into very small particles and wherein transducers are adapted to cause a liquid or fluid such as water or the like to immediately break up into millions of very small particles, the present invention utilizing a "push-pull" circuit to properly control the flow of the liquid.

A further object is to provide a method and means of the type stated wherein various types of liquids such as water can be treated or atomized or broken up into small particles, and wherein the present invention is adapted to be used in a wide variety of applications such as in internal combustion engines for breaking up fuel or gasoline before it enters the venturi combustion chamber, and carburetor so that more efficient use of the fuel is insured, and wherein the present invention is instantaneous and continuous in operation to accomplish the desired purposes.

Still another object is to provide such a method and means that is economical to manufacture and utilize and which is efficient in operation and which is durable in form and conducive to the most economical use of materials and uniformity of members formed therefrom.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there are shown in the drawings forms which are presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIGURE 1 is a sectional view illustrating one form of the present invention.

FIGURE 2 is a sectional view taken on the line 2—2 of FIGURE 1.

FIGURE 3 is a schematic view illustrating the wiring diagram for the present invention.

FIGURE 4 is a view illustrating a modification.

Referring in detail to the drawings, and more particularly to FIGURES 1, 2 and 3 of the drawings, the numeral 10 indicates a hollow body member which may include outer and inner portions 11 and 12, FIGURE 1, and the body member 10 may include upper and lower sections or portions 13 and 14. The numeral 15 indicates a baffle which is suitably mounted in the body member 10, and the baffle 15 is adapted to include a central rounded raised portion 16, and the baffle 15 is adapted to have its outer peripheral portion 17 suitably secured to the body member 10. The baffle 15 may further include an annular

2

trough 18 which has a plurality of apertures or openings 19 therein for a purpose to be later described.

Suitably mounted in the hollow member 10 is a plurality of spaced apart transducers 20, and the numeral 21 indicates a heating element or electric heating coil which may be suitably supported on insulated members 22, and the heating coil 21 may be connected to a suitable source of electrical energy.

The numeral 23 indicates an inclined bottom wall in the lower portion of the member 10, and an outlet pipe 24 communicates with the lower interior portion of the member 10 whereby hot liquids such as hot water can be conveyed to a suitable location for any desired purpose. The numeral 25 indicates an inlet pipe or conduit which is adapted to be connected to a suitable source of supply of liquid such as cold water to be atomized and heated, and a valve 27 is arranged in the line or conduit 25 for controlling the flow of liquid through the line 25 in a desired manner, there being a discharge nozzle 26 on the inner end of the line 25.

As shown in FIGURE 3 there is illustrated schematically the wiring diagram for the present invention wherein the numeral 28 indicates input lines for supplying electrical energy from a suitable source of supply, and a suitable switch 29 may be provided in the circuit as well as a resistance 30. The numeral 31 indicates a timing mechanism which is adapted to include a rotary core or element 32 that has contacts 33 thereon that are mounted for movement into and out of engagement with terminals or contacts 34, and the numeral 37 indicates a solenoid that has a push-pull element or core 35 associated therewith, and the valve 27 for the inlet line 25 is adapted to be on one end of the movable element 35, while an actuator 36 is on the other end of the element 35, and the element 36 is adapted to control actuation of the transducers 20.

Attention is now directed to FIGURE 4 of the drawings wherein there is illustrated a modification wherein the numeral 38 indicates generally this modification which consists of an inlet line 39 that is adapted to be connected to a suitable source of supply of liquid to be treated, and a discharge nozzle 40 is on the inner end of the line 39. The numeral 41 indicates a transducer which may be arranged in a container or body member 49, and lines or conductors 42 and 43 are adapted to be electrically connected to the transducer 41. The numeral 44 indicates a timing mechanism which may have a construction generally similar to the previously described timing mechanism 31, and the timing mechanism 44 may include a stationary member 45, and the timing mechanism 44 may also include a rotary core or element 46 which has contacts 47 that are mounted for movement into and out of electrical engagement with terminals 48 on the wires 43 and 50. The numeral 51 indicates wires which may be suitably electrically connected to the timing mechanism 44.

It is to be understood that a push-pull circuit is adapted to be utilized with the arrangement shown in FIGURE 4 similar to the push-pull circuit shown and described in connection with FIGURE 3.

From the foregoing, it will be seen that there has been provided a method of and means for utilizing transducers to atomize or break-up liquids into minute particles, and in use with the parts arranged as shown in the drawings and in particular as shown in FIGURES 1, 2 and 3 of the drawings, it will be seen that a liquid such as water may be supplied from a suitable source of supply through the conduit or pipe 25, and as long as the valve 27 is open, this liquid can drop down through the nozzle 26 onto the raised portion 16 of the baffle or dome 15. This water will then run down into the trough 18 and the water can drop down through the openings 19 onto the transducers 20. When the transducers 20 are properly actuated, the water will be atomized and will subsequently be acted

upon by the heating element 21 to condense the water which will then drop down into the lower portion of the member 10 and this water can then flow out in heated condition out through the pipe 24 to a desired location so that it can be used for any desired purpose.

Attention is directed to FIGURE 3 of the drawings wherein it will be noted that there is provided a push-pull type of circuit which includes the timing mechanism 31 and this arrangement is such that when the valve 27 is open, the transducers 20 are off, and similarly when the valve 27 is closed, the transducers 20 are on or energized. Thus, a continuous cyclic operation is carried out whereby the liquid is alternately supplied through the line 25 when the valve 27 is open, and then when the transducers are on, the valve 27 is in closed position. This push-pull arrangement is accomplished by means of the parts including the timing mechanism 31 wherein the element 32 will be continuously rotating so that its contacts 33 will move into and out of engagement with the terminals 34 to selectively actuate the solenoid 37 whereby the element 35 will shift back and forth to cause the valve 27 to be closed when the transducers 20 are energized, and similarly when the valve 27 is open, the transducers 20 are off.

With reference to the modification shown in FIGURE 4, a simplified version is illustrated wherein parts such as the baffle 15 are eliminated so that a liquid can drop directly onto the transducer 41 from the nozzle 40, and a timing mechanism 44 is adapted to be used in conjunction with a push-pull arrangement so that the arrangement shown in FIGURE 4 is such that the supply of liquid through the pipe 39 is stopped when the transducer 41 is actuated. Similarly, the supply of liquid through the pipe 39 can continue when the transducer 41 is off. To accomplish this a solenoid similar to the previously described solenoid 37 is adapted to be used, and a control valve is adapted to be arranged in the line 39.

It will therefore be seen that according to the present invention there has been provided a basic method and means for breaking up liquids into minute particles that are microscopic and wherein the liquids can be broken up into particles that are a great deal smaller than is possible with any known atomization method. The present invention can be used in a great many different applications in industry and the like and has important commercial applications.

As is known, a transducer consists basically of a wafer of a suitable substance with means for applying either mechanical or electrical impulses and such a wafer possesses certain unusual characteristics. Thus, when an electrical current is applied to the transducer, it emits mechanical vibrations. When mechanical vibrations or mechanical pressure is applied, the transducer emits or gives off electrical impulses. It has been discovered in accordance with the present invention that when a drop of water is placed on a transducer and an electrical current is applied, that the vibrations of the transducer cause the water drop to immediately break up into millions of minute particles.

Also in accordance with the present invention there has been developed and provided an electrical "push-pull" circuit which employs a transducer and a solenoid valve to control the flow of the liquid, and such a valve is indicated by the numeral 27. In use, the solenoid coil 37 is selectively energized which actuates the armature 35 of the solenoid and opens the liquid control valve 27 to permit a predetermined measured amount of water or liquid to drop onto the transducers such as the transducers 20. When the armature 35 of the solenoid 37 reaches its maximum travel, the current is automatically applied to the transducer which immediately breaks up the water into mist-like particles. The current cycles back and forth between the control valve 27 and the transducers 20 and thus the process continues in the desired manner.

In the arrangement shown in FIGURE 4, it is to be understood that this cycle of operation is also adapted to be utilized and wherein the current will cycle back and forth between the control valve in the line 39 and the transducer 41 so as to insure that the liquid will be broken up into mist-like particles in the desired manner.

With the present invention fine atomization can be accomplished, and the present invention can be used for breaking up any liquid into small particles. The water supply is intermittent as previously described and the device or arrangement cycles back and forth. The present invention can be used for domestic and household heating devices or it can be used in commercial and other domestic applications and it can be made in large or small sizes. Also the present invention can be made into a steam generator. In addition the present invention can be used in internal combustion engines inasmuch as it can be used for breaking up gasoline before it enters the venturi combustion chamber and carburetor so that better use of the fuel is accomplished.

When a drop of liquid is placed on a transducer, it breaks up into vapor, so that by making the circuit whereby the cycle operation can take place, the liquid is continuously broken up and wherein there is obtained fine atomization. There are a great many applications for the present invention such as for home use and industrial use. The present invention is not limited to any particular liquid or application. By utilizing the resistance 21 which is heated, hot water can be drained off through the pipe 24. The present invention is thus a circuit with a solenoid type valve combined with transducers in a push-pull circuit. In the arrangement shown in FIGURE 4 the parts can be used with an internal combustion carburetor or the like. The present invention is instantaneous. It is to be noted that the transducers are not immersed but there is a back and forth operation to accomplish the desired purposes.

The timing mechanism 31 serves to sequentially operate the solenoid 37 to move the element 35 back and forth in the desired manner. In one position the solenoid will open the valve 27 at which time the current to the transducers 20 is shut off. When the solenoid moves to the opposite position, the valve 27 is closed, and in this position the current is passed to and through the transducers 20. The element 32 is adapted to continuously rotate as long as the switch 29 is closed so that its contacts 33 will periodically make and break contact with the terminals 34 whereby the desired action can take place. Thus, with the present invention there is provided a means for atomizing a liquid such as water by means of transducers. The present invention is adapted to operate sequentially and operates in a continuous manner although the transducers and liquid control valve are selectively on and off so that the action can take place in the desired manner. Thus, when the transducers are on, the valve is closed, and when the transducers are off, the valve is opened.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. A method of breaking up liquids into minute particles, comprising the steps of sequentially introducing measured quantities of liquid onto at least one transducer, and selectively controlling the flow of liquid onto the transducer, and wherein the method is cyclic so that when the transducer is on, the flow of liquid is off, and wherein the transducer is off, the flow of liquid is on.
2. In a means for breaking up liquid into minute particles that are microscopic, transducer means, and means for selectively supplying liquid from a source of supply to the transducer means, and cyclic means for insuring that when the transducer is on, the flow of liquid is off, and when the transducer is off, the flow of liquid is on.

3. In a device of the character described, a hollow body member, a baffle mounted in said body member and having a central rounded raised portion, and an annular trough which has spaced apart openings therein, the outer periphery of the body member being arranged so that the outer portion of the baffle is secured thereto, a plurality of spaced apart transducers mounted in said body member, a heating coil in said body member, a bottom wall in the lower portion of the body member, an inlet pipe and an outlet pipe connected to the body member, a valve in 10 said inlet pipe, a discharge nozzle on the inlet pipe, and an electrical push-pull circuit including a solenoid having a movable element which has on one end thereof a means for selectively opening and closing the valve, and on the

other end thereof a means for selectively turning the transducers on and off, and a timing mechanism in said circuit.

4. In a device of the character described, a container 5 having a transducer therein, an inlet pipe for selectively conveying liquid to the transducer, and a timing mechanism operably connected to the transducer.

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