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ULTRASONIC IMPACT CLEANERS AND METHODS OF CLEANING

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Fig.1.

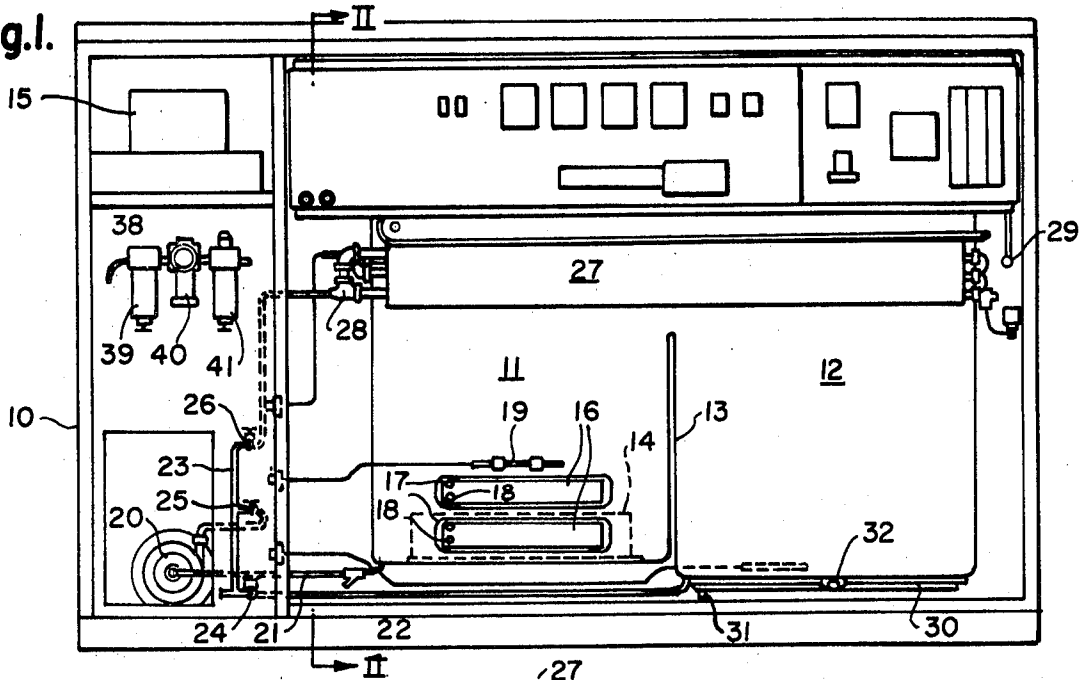


Fig.3.

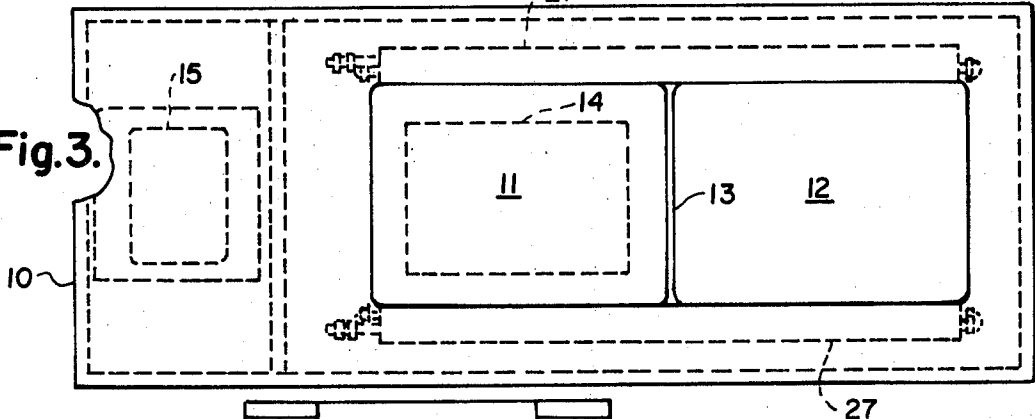
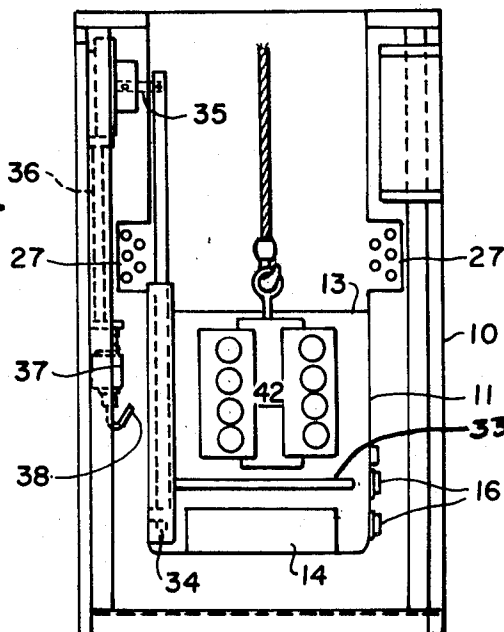


Fig.2.



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## ULTRASONIC IMPACT CLEANERS AND METHODS OF CLEANING

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Continuation-in-part of application Ser. No. 730,261, May 20, 1968. This application June 1, 1970, Ser. No. 42,036

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7 Claims

### ABSTRACT OF THE DISCLOSURE

A method for cleaning by subjecting articles to be cleaned simultaneously to impact and ultrasonically agitated solvent. An apparatus is provided having a wash tank containing solvent, means in the tank ultrasonically agitating the solvent therein and means in the tank periodically impacting the articles to be cleaned while the solvent is ultrasonically agitated.

This application is a continuation-in-part of my co-pending application Ser. No. 730,261 filed May 20, 1968.

This invention relates to ultrasonic impact cleaners and particularly to a cleaner apparatus and method in which objects to be cleaned are subjected to impact forces from a mass independent of the object to be cleaned of sufficient force to create mechanical shock waves within the object to be cleaned while immersed in an ultrasonically agitated solvent.

The use of ultrasonically agitated cleaning baths has been practiced for a considerable period of time. For example, various objects are cleaned of grease and soil by using ultrasonically agitated baths of solvents such as Freon and the like. There are, however, many instances where the rate of soil removal is excessively slow due to large amounts of impacted grease and soil. This is particularly true in the case of complex or laminar structures such as motor or engine blocks, motor stators, armatures, assembled transformer plates and the like. In such cases, the removal of grease and particulate soil is seldom successful by any presently practiced methods due to the slow rate of grease dissolution and the mechanical locking of particulate solids between tight surfaces.

I have found that impact forces independent of the object being cleaned in combination with ultrasonic forces in the presence of the usual solvents will clean such structures rapidly and thoroughly whereas neither, alone, will accomplish thorough cleanliness without exposure of the structures to damaging or extremely long cleaning periods.

Preferably I subject objects to be cleaned to impact forces from a mass independent of the article to be cleaned and of sufficient force to create mechanical shock waves within the object to be cleaned while simultaneously immersing said objects in an ultrasonically agitated solvent. I preferably provide a wash tank containing solvent, means in said tank ultrasonically agitating said solvent, and impact means in said tank periodically impacting an object to be cleaned within said wash tank. A temperature controlling means is preferably provided in the tank to maintain the solvent at a selected temperature. Preferably a vapor rinse tank is provided adjacent the wash tank with a vapor condenser extending around both the wash and rinse tank to prevent escape of solvent vapors.

In the foregoing general description of my invention I have set out certain objects, purposes and advantages of my invention. Other objects, purposes and advantages of the invention will be apparent from a consideration of the following description and the accompanying drawings in which:

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FIG. 1 is a front elevational view with panels open; FIG. 2 is a section on the line II—II of FIG. 1;

FIG. 3 is a top plan view of the apparatus of FIG. 1. Referring to the drawings I have illustrated a housing

10, containing a wash tank 11 and a vapor rinse tank 12 adjacent thereto and separated by a common wall 13. An immersible transducer 14 is provided in the bottom of the wash tank 11. The transducer 14 is connected to a generator 15 mounted in housing 10 of any usual design by conventional means. Heaters 16 are provided in the wash tank 11 and are connected to a source of electrical power by means of connections 17 and 18. The heaters are controlled by a tank thermostat 19. A pump 20 is connected by line 21 through strainer 22 to the bottom of tank 11 to deliver solvent from the tank 11 through manifold line 23 and valves 24, 25 and 26 to either the cooler 27 or the vapor rinse tank 12. The cooler 27 is cooled by circulating water from solenoid valve 28 at the cooling water inlet. The cooling water is discharged at outlet 29.

The vapor rinse tank 12 is provided with a heater 30 connected by terminals 31 to a source of power through safety reset thermostat 32.

A vertically movable shaker table 33 is provided in the wash tank 11 and is movable in guides 34 on the side-wall of the tank. The table is connected by link 35 to a vertically movable slide assembly 36 mounted on and actuated by air cylinder 37 on housing 10 outside the tank 11. The air cylinder 37 is supplied with air from an external line 38 through a conventional air filter 39, pressure regulator 40 and lubricator unit 41. An article to be cleaned such as a motor block 42 is immersed into solvent in wash tank 11 above shaker table 33.

In operation the article 42 to be cleaned is lowered into solvent in wash tank 11 at a preselected temperature. The solvent is agitated by transducer 14 to provide ultrasonic solvent cleaning. At the same time as the solvent is agitated the air cylinder 37 is cyclically operated to move the slide assembly 36 vertically up and down, carrying with it the table 33 which impacts against the article 42 at the top of each stroke. This combination of impact and ultrasonically agitated solvent quickly removes even the most stubborn grease and soil.

While I have illustrated and described certain preferred practices and embodiments of my invention in the foregoing specification, it will be understood that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. A method of cleaning an object comprising the steps of subjecting the object to be cleaned to cyclic impact forces from a mass independent of the object to be cleaned of sufficient force upon contact of said mass with said object to create mechanical shock waves within the object to be cleaned and simultaneously subjecting said object to an ultrasonically agitated solvent.

2. The method as claimed in claim 1 wherein the solvent is maintained at a substantially constant temperature.

3. An apparatus for cleaning an object to remove grease and particulate soil comprising a housing, a wash tank in said housing containing a solvent, means in said wash tank ultrasonically agitating said solvent, means for suspending said object to be cleaned in said solvent and impact means in said tank cyclically impacting said object with a mass independent of the object to be cleaned and of sufficient force upon contact of said mass with said object to create mechanical shock waves within the object to be cleaned.

4. An apparatus as claimed in claim 3 wherein heating means are provided in said tank for heating said solvent.

5. An apparatus as claimed in claim 3 wherein the means for ultrasonically agitating the solvent is a transducer fixed to the bottom of the wash tank.

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6. An apparatus as claimed in claim 3 wherein a vapor rise tank is provided within the housing adjacent the wash tank.

7. An apparatus as claimed in claim 6 wherein a coolant coil extends along the top of the wash tank and the vapor rinse tank.

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