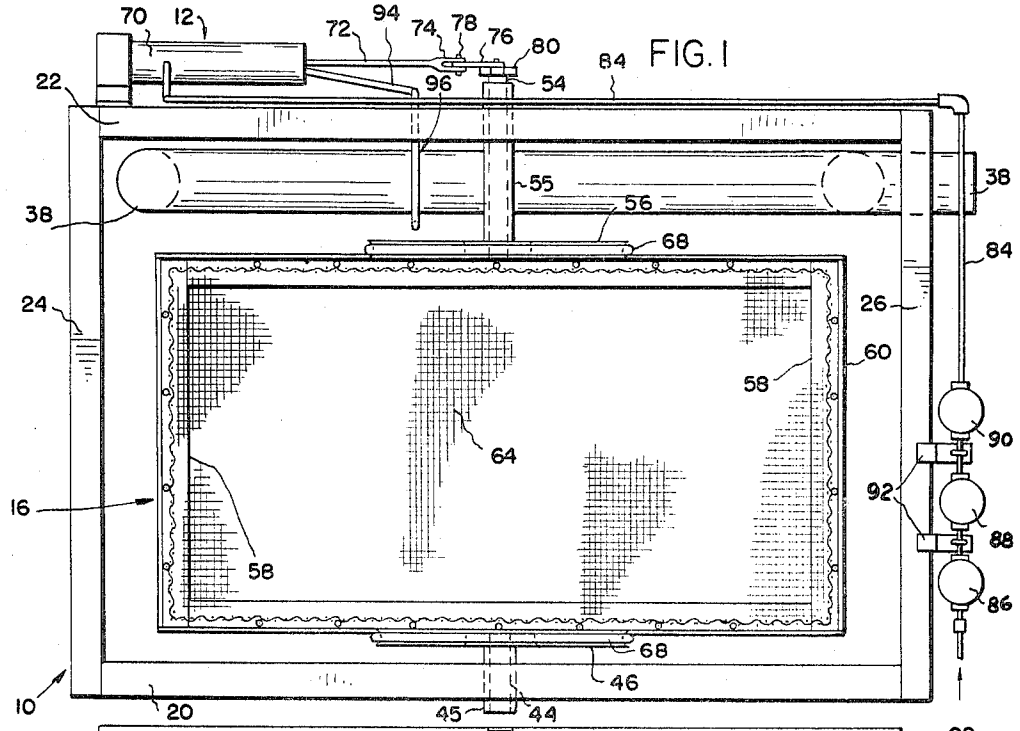
April 19, 1966 T. B. BALLARD 3,246,659

PENDULAR MOTION APPARATUS FOR SOLVENT CLEANING MACHINE PARTS

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FIG. 1



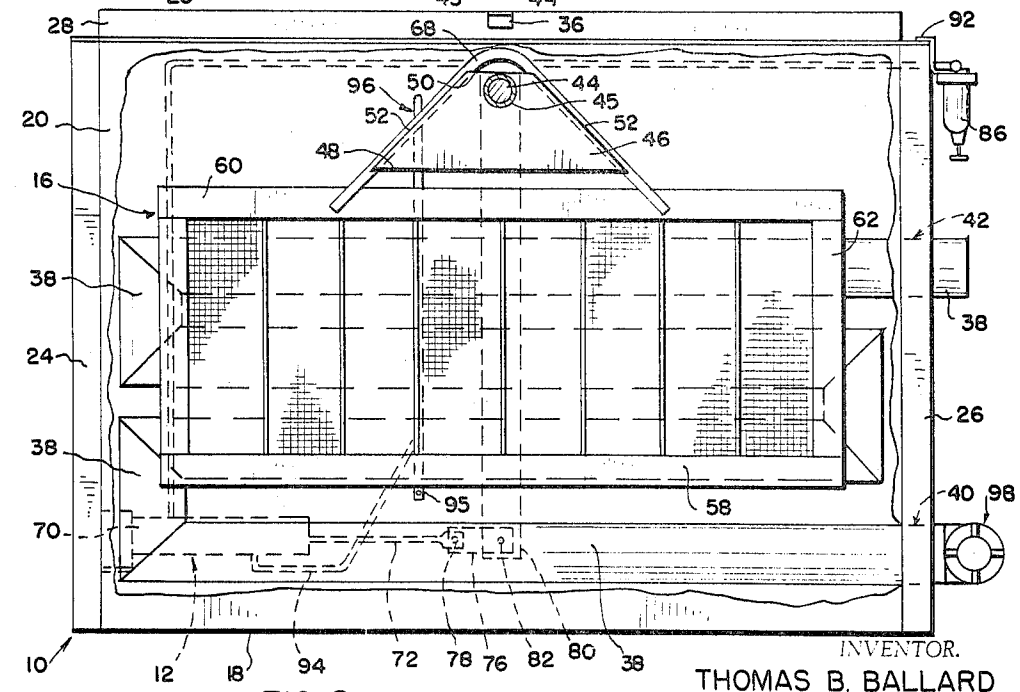


FIG. 2

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PENDULAR MOTION APPARATUS FOR SOLVENT CLEANING MACHINE PARTS

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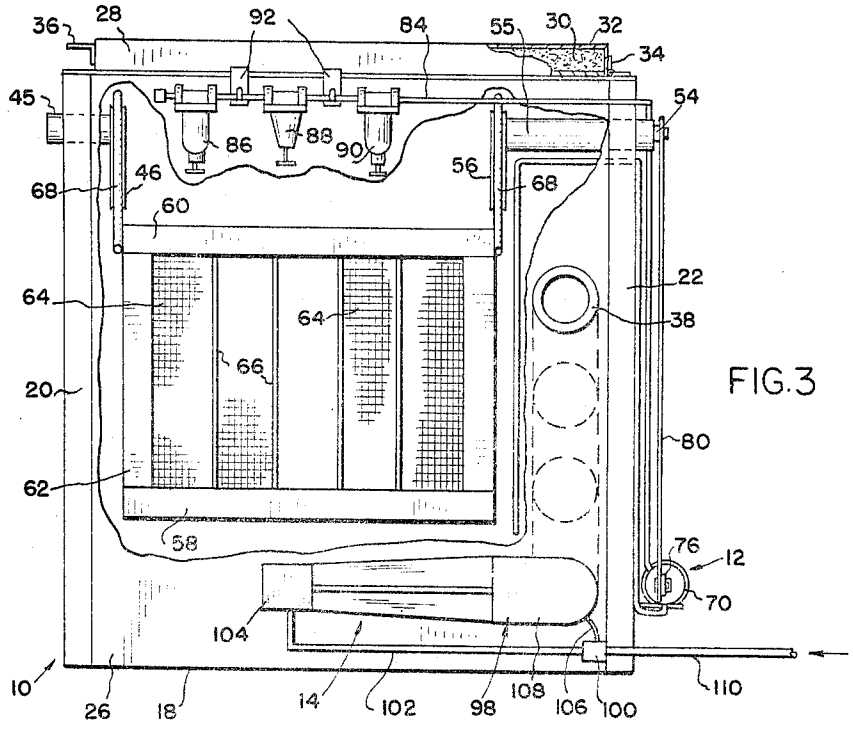


FIG.3

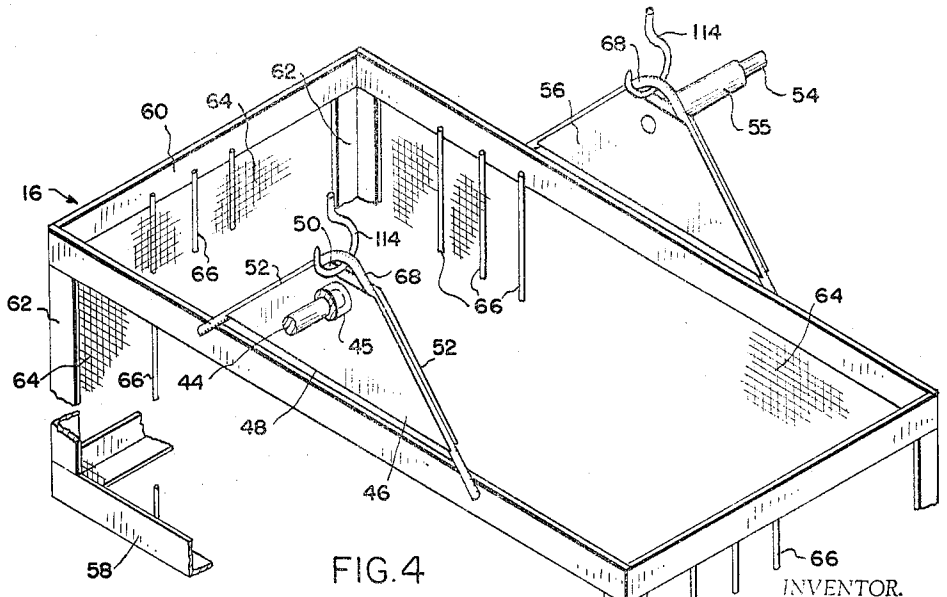


FIG.4

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3,246,659

PENDULAR MOTION APPARATUS FOR SOLVENT CLEANING MACHINE PARTS

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5 Claims. (Cl. 134—105)

This invention relates to cleaning machines and more particularly has reference to a machine for imparting a pendular motion to machine parts and the like immersed in a cleaning solution.

Washing equipment for machine parts and the like generally comprises a rectangular tank of heated cleaning solution into which a basket is introduced carrying the parts. The latter member is placed on a carrier member in the tank which undergoes the desired agitating motion in the cleaning fluid. In the past, this motion of the carrier member has been either a vertical or horizontal motion and has been accomplished by a rather complicated, expensive, and cumbersome actuating mechanism.

First, the tank has to be large enough to accommodate the carrier itself which ordinarily takes the form of a large horizontal rectangular frame. Next, suitable supporting arms must be provided in the tank for reciprocally moving the carrier in the desired direction. The basket containing the parts to be cleaned is placed vertically into the tank on the carrier member. In order to accommodate the carrier, actuating arms, and other connecting members, and to also be capable of receiving a basket of substantial capacity, the tanks presently in use must necessarily be of substantial size. These tanks therefore create a serious problem in most plants wherein space is very costly. In addition, these large tanks require large quantities of cleaning liquid and consequently excessive fuel costs for heating of the liquid.

Another problem encountered in these cleaning devices is caused by the decomposition and deterioration of the many connecting and bearing parts in these assemblies which are constantly exposed to the cleaning solution in the tank. As a result, these members must be periodically repaired or replaced, with a consequent increase in the maintenance cost of the machine.

Accordingly, it is primary object of the present invention to provide a simple, efficient parts washer of this kind which has substantially reduced exterior dimensions, yet with no effect on the washing capacity of the apparatus.

It is further object of the present invention to provide a washer of this kind in which the agitational motion is produced by a minimum number of moving parts located substantially completely exteriorly of the cleaning solution.

The present invention meets these objects by completely eliminating the carrier member, and agitating the inserted basket directly. In a preferred embodiment of the invention, which will be subsequently described in greater detail, this is accomplished with supporting members at the upper portion of the tank which support corresponding handle sections at the upper part of the basket. These supporting members are reciprocally rotated to produce a pendular or swinging motion of the basket through the heated cleaning solution. This actuating structure is extremely simple and compact, thereby permitting substantially the entire interior of the tank to be occupied by the basket. As a result, a smaller tank may be employed with less liquid and lower fuel costs than has previously been the case.

In addition, the pendular motion produces a more thorough cleaning action than either horizontal or vertical motion alone can achieve.

It can be seen that the present invention provides a

simpler, more efficient, and more economical parts washer than those presently in use. The simplicity of its actuating structure permits the present machine to be easily and economically fabricated and to be substantially free from mechanical failure.

Other objects and advantages of the present invention will be more readily apparent from the following detailed description of a preferred embodiment thereof. The description makes reference to the drawings in which:

FIGURE 1 is a plan view of the present parts washer tank with the parts basket supported in the tank and the lid removed for purposes of illustration;

FIGURE 2 is a front view of the tank of FIGURE 1 with a portion of the front wall broken away;

FIGURE 3 is a side view of the tank of FIGURES 1 and 2 with a side wall broken away; and

FIGURE 4 is a perspective view of a portion of the basket showing the support plates of the tank in position under the handles of the basket.

Referring to the drawings in detail, a preferred embodiment of the present invention is shown and generally includes a cleaning tank **10**, air actuating means **12**, heating means **14**, and a basket **16**.

The cleaning tank **10** is a rectangular structure having a horizontal floor **18**, a front wall **20**, a rear wall **22**, and side walls **24** and **26**. A flat rectangular lid **28**, mounted along the upper edges of the walls **20–26**, comprises a thick layer of insulation **30** covered on all its faces with a thin metal layer **32**, and is hingedly connected to the rear wall **22** by means of a series of spaced-apart hinges **34**. A handle **36**, in the form of a metal angle member, projects forwardly from the forward face of the lid **28**. In its lower or closed position, the lid **28** completely seals the open upper end of the tank **10**.

A heat transfer tube **38** is disposed along the inner face of the rear wall **22**. The tube **38** extends back and forth across the width of the tank **10** as it ascends along the rear wall **22**. The inlet end of the tube **38** projects through a hole **40** in the side wall **26**. The rearward end of the tube **38** projects through a second hole **42** above the first hole **40** in the side wall **26**.

A short rod **44** is journaled in a short section of tubing **45** which is fixed in the front wall **20** and extends perpendicularly therethrough. A trapezoidally shaped support plate **46** having a base edge **48**, upper edge **50**, and diagonally extending concave side edges **52**, is fixed to the end of the rod **44** inside of the front wall **20** and is thus free to rotate with respect to the tube **45**. A second rod **54** is journaled in a short tube **55**, fixed in the rear wall **22** in horizontal alignment with the first tube **45**. The rod **54** is fixed at its inner end to a support plate **56** identical to support plate **46**.

The basket **16**, as shown in FIGURE 4, comprises a rectangular floor frame **58** and a corresponding upper frame **60**. Vertical supports **62** are provided at each of the four corners between the two frames **58** and **60**. A heavy wire screen **64** extends across all four sides and the floor of the basket. A series of spaced vertical screen support rods **66** are disposed along the inside of all four sides of the basket **16** and retain the screen **64** against the inside of the upper and lower frames **60** and **58**. A pair of L-shaped handles **68** constructed of bar stock, are fixed midway along the outer faces of the longer sides of the upper frame **60**. The handles **68** are shaped so as to fit over the support plates **46** and **56** of the cleaning tank **10**. The width of the basket, excluding the handles **68** is equal to the width of the space between the opposing support plates **46** and **56**. Thus, the basket **16** may be lifted and placed vertically into the tank **10** with the handles **68** disposed over the upper edge **50** and diagonally extending side edges **52** of the support plates **46** and **56**. The concave diagonal edges **52** receive the

handles 68 and thereby support the basket 16 in position. At the midportion of the handles 68, where the two leg sections meet, the handles will project above the upper edge 50 of the support plates. This permits the basket 16 to be easily removed from the tank 10 after cleaning.

The air actuating means 12 comprises an air cylinder 70 fixed at its rearward end to the lower portion of the outer face of rear wall 22. The air cylinder arm 72 is reciprocally linearly actuated by means of a reversing valve (not shown). The end of the arm 72 is slotted at 74 to receive one end of a short connecting member 76 which is pivotably connected to the arm 72 by means of a small pin 78. The opposite end of the connecting member 76 is pivotally fastened to the lower end of an actuating arm 80, in the form of an elongated plate, by means of a pin 82. The upper end of the actuating arm 80 is fixed to the outer end of the rod 54. Thus, reciprocal linear actuation of the air cylinder 70 produces a pendular motion in the arm 80, and consequently a reciprocal rotation of the rod 54 and the support plate 56.

Compressed air is fed to the cylinder through a suitable conduit 84 which passes the air through an air filter 86, an air reducer 88, and an air line lubricator 90, all located on the upper portion of the outer face of side wall 26. The filter reducer and lubricator are fixed together and help in place on the side wall 26 by means of a pair of clamps 92.

An exhaust air line 94 is connected to the exhaust of the air cylinder 70 and extends vertically along the rear face of the rear wall 22. The air line 94 passes through a horizontal hole 96 adjacent the upper end of the side wall 22 and passes into the interior of the tank 10. Inside the tank, the air line 94 extends downwardly to a point adjacent the floor 18. A hole 95, at the lower end of the air line 94, permits exhaust air in the line to escape into the surrounding fluid. This escaping air forms bubbles which move upwards through the liquid and produce an agitation or mixing of the liquid. The hole 96 is located above the normal surface of the liquid in the tank 10 in order to prevent leakage of liquid through the hole.

The heating means 14 comprises a gas burner 98 which is mounted along the outer face of the lower portion of side wall 26. A thermostatic control device 100 is mounted along the side wall 26 below the gas burner. An ignition fuel line 102 extends between the thermostatic control 100 and the ignition section 104 in the gas burner 98. A temperature transmitting line 106 extends between the combustion chamber 108 in the gas burner and the thermostatic control 100. Thus, the thermostatic control is adapted to receive information as to the temperature of the combustion chamber 108 through the line 106 and to accordingly adjust the quantity of fuel introduced through a fuel line 110 to the ignition section of the gas burner.

In operation, the basket 16 is filled with the machine parts which are to be washed, and is lifted by suitable means, such as the grappling hooks, indicated at 114, on a conventional overhead crane. The lid 28 of the tank 10 is opened and the basket 16 is placed inside with the handles 68 supported on the support plates 46 and 56, as shown in FIGURE 4. This permits the basket 16 to swing freely on the support plates within the interior of the tank. The tank has been previouly filled with a suitable cleaning solution and the gas burner 98 actuated to provide sufficient heat in the heat transfer tube 38, to thereby bring the water in the tank to the desired temperature.

The lid is closed and the air cylinder 70 actuated, thereby producing a linear reciprocal motion in the arm 72. This, in turn, causes the actuating arm 80 and the connected rod 54 and the support plate 56 to undergo a reciprocal rotational motion. The basket 16, which is supported on the support plates 46 and 56, will consequently undergo a pendular motion in the fluid. The exhaust air

entering the exhaust air line 94 is discharged at the end of the line into the body of liquid in the tank; this produces an agitational or mixing motion in the liquid body, thereby producing a more efficient cleaning action. After the machine parts have been suitably cleaned, the lid 28 is again opened, the grappling hooks 114 again positioned about the upwardly projecting central portion of the handles 68, and the basket 16 removed from the tank 10.

It can be seen that this pendular motion of the basket and its supported machine parts in the tank of cleaning solution produces a more efficient cleansing of the machine parts than is possible with only a vertical or horizontal motion. In addition, the only parts which will be subject to wear are at the connection between the air cylinder and the actuating arm, in the rods 44 and 54, the support plate 46 and 56, and the handles 68 on the basket. With the exception of the lower portion of the support plates 46 and 56, all these members are located externally of the body of liquid in the tank. As a result, decomposition through chemical action on the various moving parts of the present apparatus is substantially avoided. The simplicity of the design of the present apparatus will result in a minimum of maintenance and repair during the comparatively long life of the equipment.

It will be apparent to those skilled in the art to which this invention pertains, that various changes or modifications in the construction of the component parts may be made wihout departing from the spirit of the invention or from the scope of the appended claims.

Having thus described my invention, I claim:

1. In a cleaning machine of the type described, including a tank adapted to retain liquid, heating means for heating said liquid, and a basket adapted to be inserted in said liquid, the improvement comprising:

(a) a pair of handles fixed to the upper portion of the outer face of parallel sides in said basket, said handles comprising downwardly diverging arms fixed at their lower ends to said basket;

(b) a pair of trapezoidal support plates fixed along the interior of parallel sides of said tank, and adapted to removably support said basket by means of said handles in said tank, said arms of said handles being supported by means of the diagonal faces of said support plate;

(c) and actuating means adapted to impart a reciprocal rotational motion to said support plates and thereby produce a pendular motion of said basket in said tank through said liquid.

2. In a cleaning machine of the type described, including a tank adapted to retain liquid, heating means for heating said liquid, and a basket adaptd to be inserted in said liquid, the improvement comprising:

(a) a pair of handles fixed to the upper outer face of parallel sides in said basket, each of said handles comprising downwardly diverging arms fixed at their lower ends to said basket;

(b) a pair of pivotable trapezoidal support plates fixed to the inner upper face of opposite walls of said tank, and adapted to removably support said basket by means of said handles in said tank, said arms being then supported on the diagonal edges of said support plates;

(c) an elongated actuating arm fixed to one of said support plates and extending downwardly therefrom;

(d) a linear reciprocal actuator connected to the lower end of said actuating arm such that linear reciprocal motion of said actuator imparts a reciprocal rotational motion to said support plates and thereby produces a pendular motion of said basket in said tank through said liquid.

3. In a cleaning machine of the type described, including a tank adapted to retain liquid, heating means for heating said liquid, and a basket adapted to be removably inserted in said liquid, the improvement comprising:

(a) a pair of handles fixed to the upper outer face of

parallel sides of said basket, each of said handles comprising downwardly diverging arms joined together at their upper ends and fixed at their lower ends to said basket so that their sides and the included sides of the basket forms a triangle;

(b) a pair of trapezoidal support plates pivotably supported on the inner upper faces of the opposite walls of said tank, with their bases in a generally horizontal plane, said plates being adapted to removably support said basket by receiving the interior side of the upper end of said handle on the diagonal edges of said support plates;

(c) an elongated actuating arm fixed to one of said support plates and extending downwardly therefrom;

(d) a linear reciprocal actuator connected to the lower end of said actuating arm so that linear reciprocal motion of said actuator imparts a reciprocal rotational motion to said support plates and thereby produces a pendular motion of said basket in said tank through said liquid.

4. The machine of claim 3 wherein the handles are formed of stock having a round cross section and the

diagonal edges of said support plates are grooved to receive said handles.

5. The machine of claim 4 wherein the upper ends of said handles extend above the truncated edges of the trapezoidal plates when the handles are supported on the plates so as to allow a hook to be inserted under the joined-up edges of the handle so as to remove the handle from said plates and said tank.

References Cited by the Examiner

UNITED STATES PATENTS

601,508	3/1898	Fellows	134—160 X
947,460	1/1910	Schlabs	134—160
1,593,417	7/1926	Barley	134—160 X
2,520,354	8/1950	Zinty	134—141 X
3,054,411	9/1962	Randall	134—160 X
3,141,468	7/1964	Kupferschmid	134—159 X

FOREIGN PATENTS

733,258	7/1955	Great Britain.

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