

Sept. 15, 1942.

W. H. PAGENKOPF

2,295,912

DEHYDRATING AND TREATING APPARATUS

Filed June 3, 1940

FIG. 1

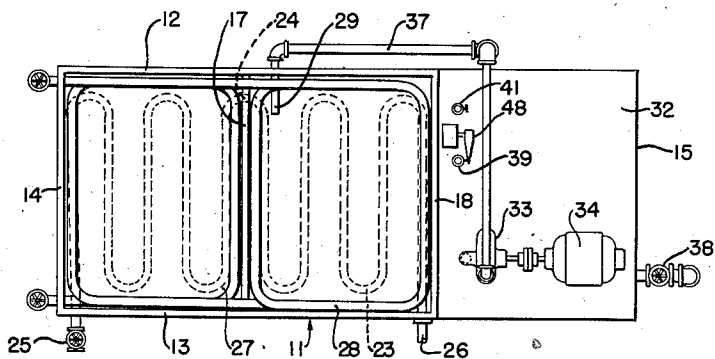


FIG. 2

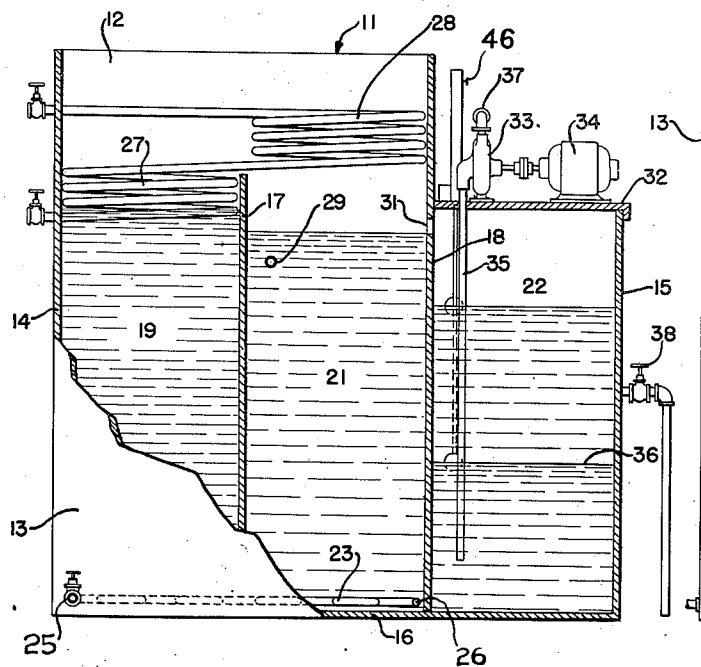
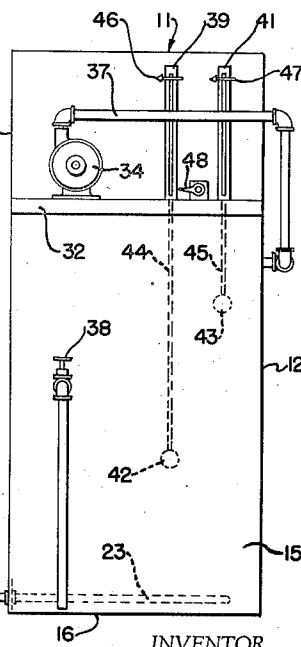


FIG. 3



INVENTOR.
WALTER H. PAGENKOPF

BY

H. B. Whitfield
ATTORNEY.

UNITED STATES PATENT OFFICE

2,295,912

DEHYDRATING AND TREATING APPARATUS

Walter H. Pagenkopf, La Grange, Ill., assignor to
Teletype Corporation, Chicago, Ill., a corpora-
tion of Delaware

Application June 3, 1940, Serial No. 338,665

10 Claims. (Cl. 91-13)

The present invention relates to fluid conditioning apparatus and more particularly to a system of receptacles for containing piece part treating solutions.

One of the final steps during the manufacture of small piece parts is that of surface plating in quantities following which the plating solution is completely removed from the piece parts by successive immersions in rinse water. Thereafter the piece parts are dried and proceed either to an assembly division or to stock supply quarters where they are stored pending subsequent assembly operations. In removing the rinse water from the piece parts two common methods have been employed; namely, that of tumbling the piece parts in a hot sawdust filled barrel or by exposing the piece parts to heated air for accelerating evaporation.

The former of these two methods is deemed objectionable because of its cumbersome and time consuming characteristics while the latter of the two methods is deemed objectionable on account of the persistent water spotting of the piece parts, a result which is believed to be attributable to the mineral content of community water supply systems. Since the use of chemically pure water for the purpose of rinsing plated piece parts would necessarily entail a prohibitive cost, it is proposed to use industrially available water supply for the purpose of rinsing and thereafter to remove the water from the surface of the piece parts in such a manner as to avoid the unsightly and therefore undesirable water spotting effects.

Accordingly, a principal object of the present invention is the provision of apparatus for treating water moistened piece parts following a general rinse operation with a water removing medium which itself is continuously purged of water accumulation by a system of receptacles and fluid circulating apparatus.

In its essential embodiment, the invention comprises a unitary rectangular tank or housing which is divided into three partitioned subchambers or receptacles. Two of the said three subchambers are open and have disposed above them a water cooled condensing coil, which consists of a substantially rectangular helix, each surrounding its particular subchamber at a point a predetermined distance above the normal fluid level and effective to cool its local atmosphere so as to condense and accordingly confine rising vapors. Of the two open subchambers, one is intended to contain a mixture of slushing compound together with a thinning agent, while the other of the two is filled to a predetermined level with a cleansing

fluid notably effective for the purpose of removing water traces from machined metal piece parts completely, effectively, and without leaving any residue of mineral or other substance which may be manifest by the characteristic water spotting as described above.

The third subchamber is functionally an auxiliary to the last described open subchamber which contains the water removing fluid and it serves as an overflow receptacle as well as a separator or purging tank, advantage being taken of the fact that the water has a lower specific gravity and therefore accumulates above the detergent fluid. Float gauges are provided, each for indicating the level of its respective fluid, water or detergent, the former being withdrawn by periodically opening a drain cock for this purpose and the latter being returned to the detergent containing immersion subchamber described above.

For a more comprehensive understanding of the present invention reference may be had to the accompanying drawing and to the detailed specification following hereinafter wherein like reference characters refer to corresponding parts throughout. In the drawing

Fig. 1 is a plan view of a processing tank assembly constructed in accordance with the features of the present invention;

Fig. 2 is a side elevation of the apparatus illustrated in Fig. 1 having portions of its proximate wall broken away to reveal the interior, and

Fig. 3 is an end elevation of the apparatus featured in Figs. 1 and 2.

Giving special attention now to the details in the accompanying drawing the reference character 11 denotes a substantially rectangular assembled unit having the parallel side walls 12 and 13, the end walls 14 and 15, and the base wall 16 all of which have been illustrated in the accompanying drawing as formed integrally. The unitary structure is divided transversely into three consecutive subchambers or compartments by the vertical partitioning walls 17 and 18. For convenient reference the subchambers are indicated 19, 21 and 22. Subchambers 19 and 21 are heated by means of a heat radiating conduit 23, a vermiform tubular element through which is piped hot water or steam for the purpose of raising the temperature of fluid contained in said chambers 19 and 21. The heat radiating element 23 is preferably sealed at the point 24 whereat it crosses the partition 17 so as to render the adjacent chambers impermeable to respective fluids.

The inlet and outlet terminals of the heat radiating element 23 are indicated 25 and 26, Fig. 1.

Chamber 19 is intended to contain a solution of slushing compound and a thinning agent for applying a relatively thin film deposit upon the dipping of piece parts therein, following the cleansing operation performed in tank chamber 21. A particular treating formula and process contemplated in this connection are fully described in copending application Serial No. 299,273.

As described in said copending application, the slushing compound thinner used in storage compartment 19 may consist of carbon tetrachloride or trichloroethylene, both noninflammable liquids having comparatively low boiling points. On this account, in order to prevent losses resulting from evaporation, a condenser coil 27, preferably a metal helical element, is placed near the top of the chamber 19 surrounding its confining wall surfaces and at a level just above that of the liquid as clearly illustrated in Fig. 2. Cold water is circulated through said helix 27 in order to obtain a cooling of the local atmosphere and an immediate condensation of the vapors rising from the thinner and slushing compound and also for the purpose of preventing or minimizing the formation of a vapor zone. Said coil 27 is placed relatively close to the surface level of its liquid, contrasting in this respect with the conditions which obtain in storage tank 21 as will be described later. For this reason the condenser coil 28 which may, for practical reasons, be a continuation of coil 27 is located above the liquid level of tank 21 with an intervening space so as to encourage and permit the maintenance of a limited vapor zone for a purpose which will be described later.

The fluid contained in chamber 21 may be either of the thinning agents aforementioned, carbon tetrachloride or trichloroethylene, which fluids are both water removing mediums and from its tank 22 either is continuously discharged into the chamber 21 through an inlet pipe 29. The fluid level of chamber 21 may not exceed that shown in Fig. 2, however, because of the overflow opening 31 through which the excess is discharged into the separating tank 22. By utilizing dehydrating agents or detergents, such as those mentioned whose specific gravities are greater than that of water, the pollution material (water, mineral, etc.) accumulated together with the solvent in tank 21, as a result of dipping operations as described above, will tend to rise above the detergent and will be discharged through the opening or openings 31 into the separation chamber 22 in preference to the discharge therethrough of the detergent itself. Accordingly, the action will be such as to purify the content of chamber 21 by the constant elimination of water and/or such other foreign substances as may be in solution with the water, achieving the maintenance at all times of the comparatively pure detergent within said chamber 21.

It will be recalled that a zone between the liquid level and the condenser coil 28 is permitted to form in which a dense vapor of the solvent will be maintained so that upon removing piece parts from the cleansing tank or chamber 21 following the water stripping effect of the liquid detergent, any traces of water which may thereafter adhere on account of the passing of said parts through any possible water accumulations on the surface of said detergent will be further

acted upon by said detergent vapor. Accordingly, there is assured a thorough cleansing or stripping of the piece parts which may thereafter be immediately plunged into the slushing compound of chamber 19. In practice it has been found that by means of an arrangement such as is here disclosed and by the use of a solvent such as trichloroethylene, ferrous piece parts may be processed and treated so as to avoid completely the undesirable effects of water spotting discussed above.

Moreover, by reason of the arrangement illustrated in Figs. 1 and 2 whereby the solutions in compartments 21 and 19 are maintained in such close proximity each to the other, there may not only be effected the economy of heating both tanks by the use of a single radiation unit 23, the condensing of both vapors by the use of a single system of condenser pipes 27 and 28, but also and of important utility, there may be effected the immediate dipping of piece parts cleaned in tank 21 into the slushing compound solution of tank 19 before the exposure to the atmosphere during transit may have an opportunity of air spotting or oxidizing the piece part surfaces.

Tank compartment 22 unlike the compartments 19 and 21 is preferably closed by a top cover 32 which serves also as a rest or support for the circulating unit which consists of a fluid pump 33 and an electric motor 34 for impelling the same. The intake pipe 35 of pump 33 extends down into the compartment 22 to an extent sufficiently below the minimum level 36, Fig. 2, of the solvent component of said tank, but not to such an extent of depth as to reach the possible level of precipitates accumulating within said compartment. The exhaust pipe of circulating pump 33 is indicated 37 and it continues over its tank cover 32, then downwardly, connecting ultimately with the inlet pipe 29, described above, which discharges into the stripping solvent compartment 21.

Accordingly, the solvent, which because of its higher specific gravity settles below the water accumulations in the separating compartment 22, is drawn up through intake pipe 35 and is forced out by the circulating pump 33 to discharge into compartment 21. This causes the afore-described continuous overflowing of said compartment 21 through the opening 31 into the separating tank 22. Because of incidental losses due to evaporation, etc., it may be necessary to add periodically to the solvent which circulates throughout compartments 21 and 22. Water accumulations in compartment 22, however, being the product of the stripping action will continue to increase in compartment 22 and may be drawn off at periodic intervals consistent with the nature of the work under treatment by opening the drain cock 38. It is advisable to locate the water drain cock 38 sufficiently above the maximum solvent level 36 in compartment 22 so that there may not be any risk of permitting the solvent to flow out of this discharge conduit accidentally.

Except for the servicing of the fluids, that is, by periodic replenishment of the solvent and the slushing compound and periodic drawing off of the water accumulations, the apparatus requires little maintenance and regulatory attention. Even to the extent of apprising an operator as to the amount of the solvent present in the system at any time or as to the amount of water accumulation in tank 22 at any time, means are

provided for displaying at a point of easy vantage, the actual level of the two fluids in compartment 22. This is accomplished by providing two float gauges indicated 39 and 41. In the specific showing, these indicators consist essentially of the gravity float elements 42 and 43 which are carried at the lower extremity of their respective gauge rods 44 and 45.

Float 42 is too heavy to be supported by the water in the upper portion of compartment 22 but is light enough to be supported by the solvent beneath level 36. Float element 43, however, is sufficiently buoyant to be supported by the water in the upper portion of chamber 22 so that accordingly each of these elements will assume a position corresponding to the surface level of its supporting fluid. Correspondingly the rods 44 and 45 will be maintained so as to position their index pointers 46 and 47 denoting longitudinally with respect to the upstanding gauges 39 and 41, the amount of fluids respectively within the compartment 22.

Should the quantity of the solvent in compartments 21 and 22 be permitted to become depleted to such an extent that the level 36 in compartment 22 becomes lower than a predetermined minimum, an undesirable condition might obtain which would permit some of the water to be drawn into the intake pipe 35 and accordingly to be returned to the stripping compartment 21. This result might occur if the supervisor neglected to observe the indicator 46 and failed to replenish the stock of solvent in tanks 21 and 22. To prevent the continued circulation of pump 33 under these conditions, means have been provided for arresting circulating motor 34 under the control of gauge 46. This is done by providing the feather touch supervisory switch 48 of which several embodiments are commercially available. Switch 48 controls the motor circuit of circulating pump motor 34 in the conventional manner. Under the circumstances, when index pointer 46 descends to a level whereat a portion of it may engage feather touch switch arm 48, the latter is caused to open the power circuit for said motor 34. This arrests circulating pump 33 and prevents the aforescribed possibility of polluting the solvent in tank 21.

In the foregoing, this invention has been described and illustrated with reference to a particularly contemplated embodiment. It is not intended, however, that this shall constitute any restrictions upon the inventive scope. Accordingly, no limitations are to be inferred nor implied except as recited in the hereunto appended claims.

What is claimed is:

1. A piece part treating apparatus comprising, a principal enclosure, vertical partitions dividing said enclosure into a plurality of consecutive subchambers, a heat exchange element for raising the temperature of fluid contained in certain ones of said subchambers, vapor cooling elements disposed over said certain ones of said subchambers for confining vaporization therefrom, one of said vertical partitions having apertures at a predetermined level therein for permitting fluid overflow from one of said subchambers to a separating chamber, and fluid circulating means for drawing the fluid from said separating chamber and for returning said fluid into said subchamber.

2. A conditioning apparatus for the processing of fluids comprising, a first compartment for containing piece part water stripping solvent, a

second compartment positioned to receive solvent overflow from said first compartment, means for heating said solvent in said first compartment, means for condensing vaporization from said solvent of said first compartment, and a plurality of gauge means for indicating the levels in said second compartment of solvent and of superimposed stripping water.

3. A conditioning apparatus for reclaiming detergents used in the removal of rinse water from plated piece parts comprising, a structure comprising an open vessel compartment for containing detergent fluid and a closed vessel compartment for containing the overflow from said open vessel compartment for permitting stratification into components, fluid circulating apparatus for drawing detergent from a lower stratum of said closed vessel compartment and for discharging it into said open vessel compartment, means for gauging the amount of water stratum in said second compartment, and a drain for drawing off part of said water stratum periodically.

4. A piece part treating apparatus comprising, a vessel divided into three consecutive subchambers by partitions, a heat element for the first and second subchambers, vapor cooling elements disposed over said two subchambers equipped with the heating element for retarding vaporization from said subchambers, one of said partitions between the second of said heated subchambers and third of said other of said subchambers having apertures at a predetermined level therein for permitting fluid overflow from said second heated subchamber to said third chamber, and fluid circulating means for drawing the fluid content of said third chamber and for discharging said fluid into said second heated subchamber.

5. Apparatus for processing fluids comprising, a container for piece part cleansing solvent, a container for receiving solvent overflow from said first mentioned container, means for heating said cleansing solvent, means for condensing vaporization from said heated cleansing solvent, and a plurality of gauge means for indicating the levels in said container for solvent overflow of solvent and of other matter accumulation.

6. A conditioning apparatus for separating foreign matter from solvents used in the removal of rinse water from piece parts under treatment comprising, an open vessel compartment for containing solvent fluid and a closed vessel compartment, means for overflowing the contents from said open vessel compartment including said solvent and said foreign matter into said closed vessel compartment for stratification, fluid circulating apparatus for drawing solvent from a lower stratum of said closed vessel compartment and for discharging it into said open vessel compartment, and means for gauging the amount of strata accumulation in said closed vessel compartment.

7. A conditioning apparatus for the processing of fluids comprising, a first compartment for containing a detergent fluid, a second compartment positioned to receive the overflow from said first compartment, means for heating the fluid in said first compartment, means for condensing vaporization from said fluid in said first compartment, and a plurality of gauge means for indicating the levels in said second compartment of detergent fluid and of waste fluid accumulated therewith.

8. An apparatus for the reclamation of detergent fluids, comprising a processing compart-

ment for containing a detergent fluid, a second compartment positioned to receive the overflow from said processing compartment, means for heating the fluid in said processing compartment, means for condensing vaporization from said fluid above said processing compartment, a plurality of gauge means for indicating the levels in said second compartment of detergent fluid and of waste fluid accumulated thereby, means for recirculating detergent fluid from said second compartment to said first compartment, and means for discharging waste fluid from said second compartment.

9. Apparatus for cleansing articles and for applying protective coatings thereto, comprising a container for a cleansing liquid, a container for a coating liquid positioned adjacent said first mentioned container, a single means for heating the contents of both of said containers, means positioned above said cleansing liquid for confining the vaporization zone above said con-

tainer containing the cleansing liquid, and means partially immersed in said coating liquid for eliminating a vaporization zone above said container containing the coating liquid.

10. In an apparatus for cleansing articles and for applying protective coatings thereto, a pair of containers, a supply of volatile cleansing liquid in one of said containers, a supply of coating material dissolved in a volatile vehicle in the other container, means for heating the contents of both containers, vapor condensing means positioned in the container containing the cleaning liquid and spaced above the surface of said cleansing liquid for affording a limited vaporization zone, and vapor condensing means positioned in the container containing said coating liquid and partially immersed in said coating material for avoiding a vaporization zone of said volatile vehicle of said coating material.

WALTER H. PAGENKOPF.