Nov. 4, 1969 N. W. PINKHAM 3,476,126

MATERIAL HANDLING APPARATUS

Filed Jan. 16, 1967 4 Sheets-Sheet 1

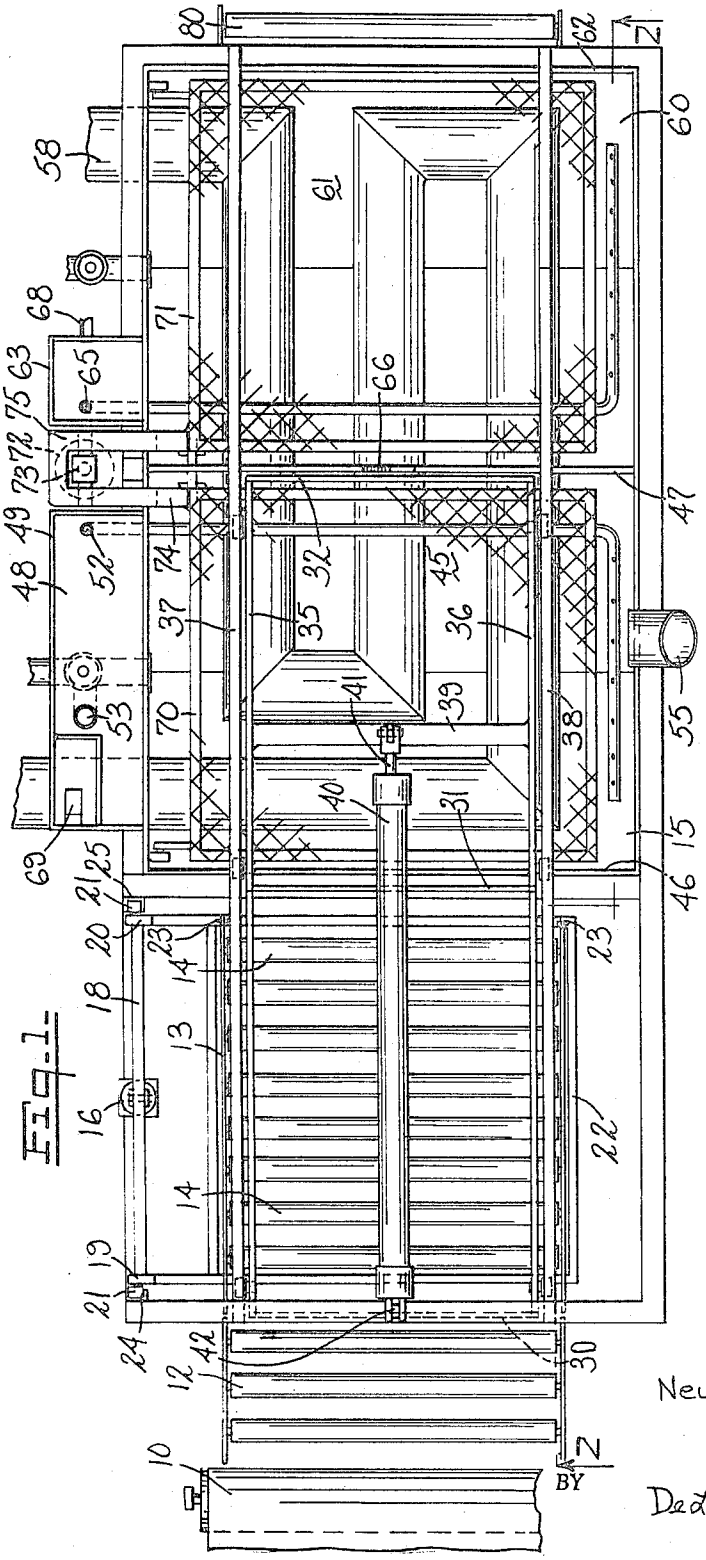


Fig. 1.

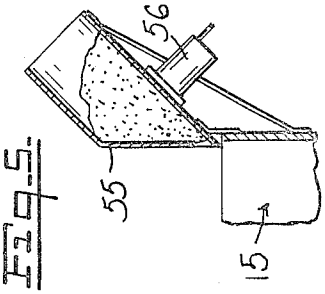


Fig. 5.

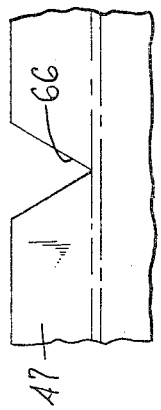


Fig. 4.

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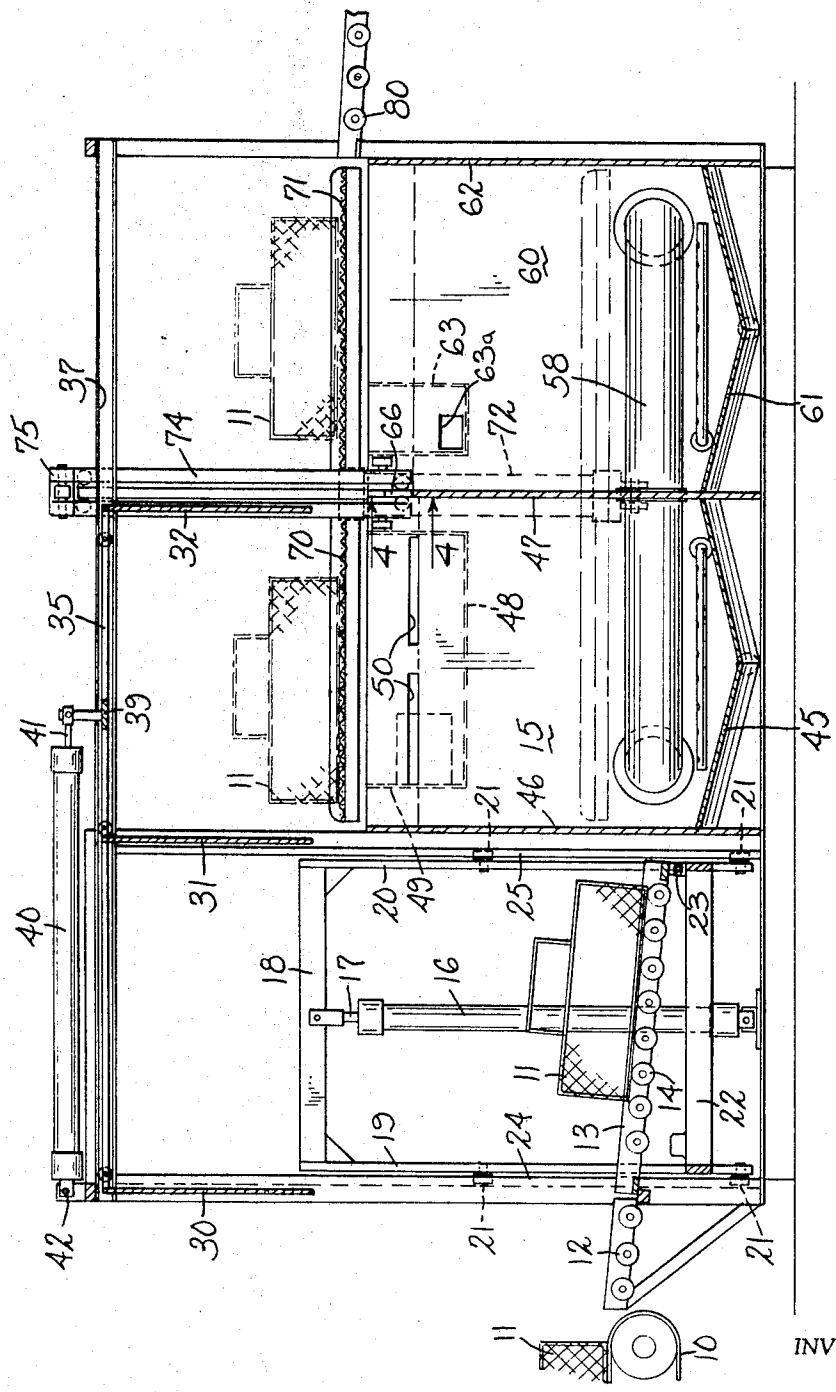
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MATERIAL HANDLING APPARATUS

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Fig-2



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MATERIAL HANDLING APPARATUS

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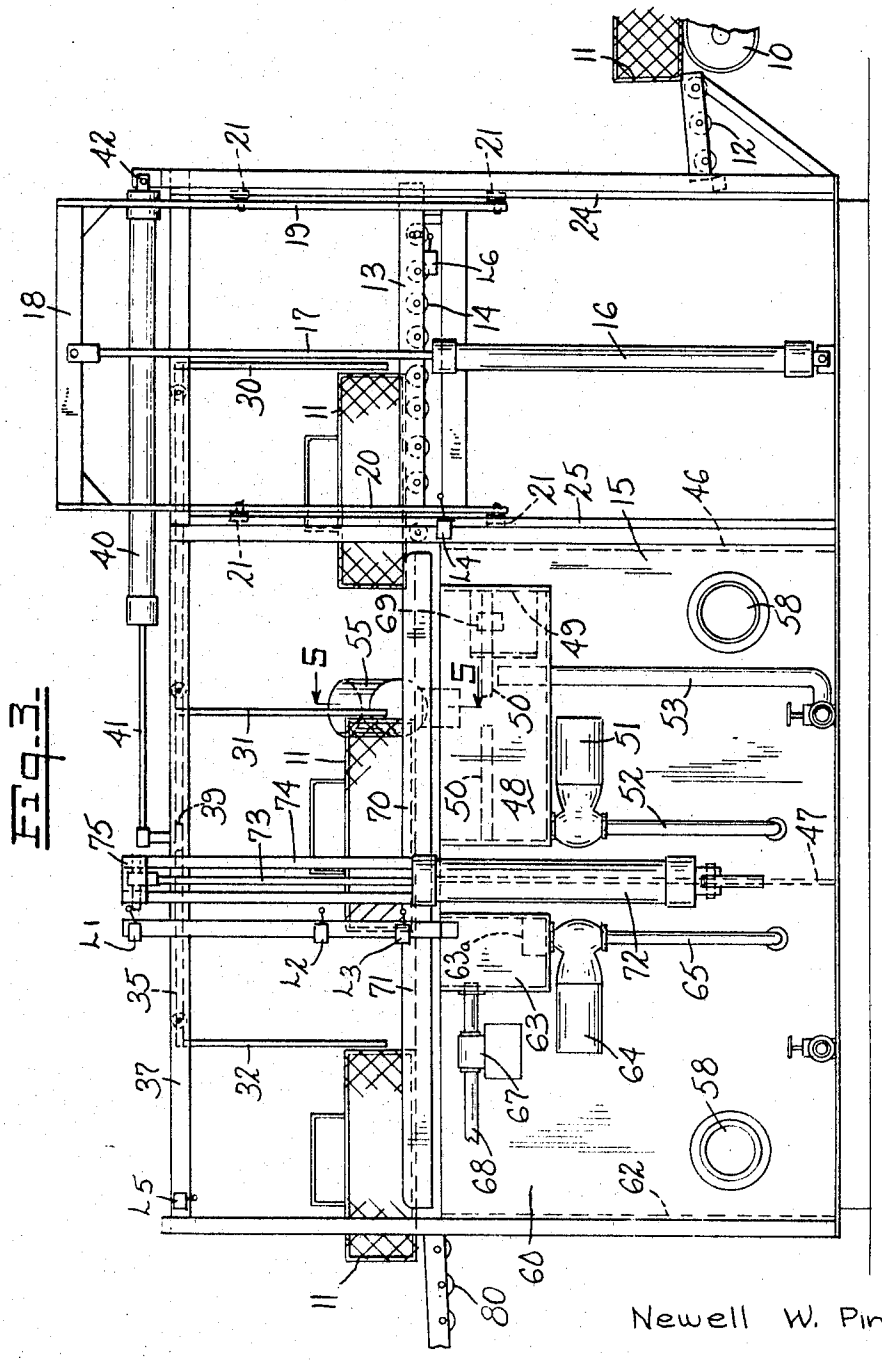


Fig. 3

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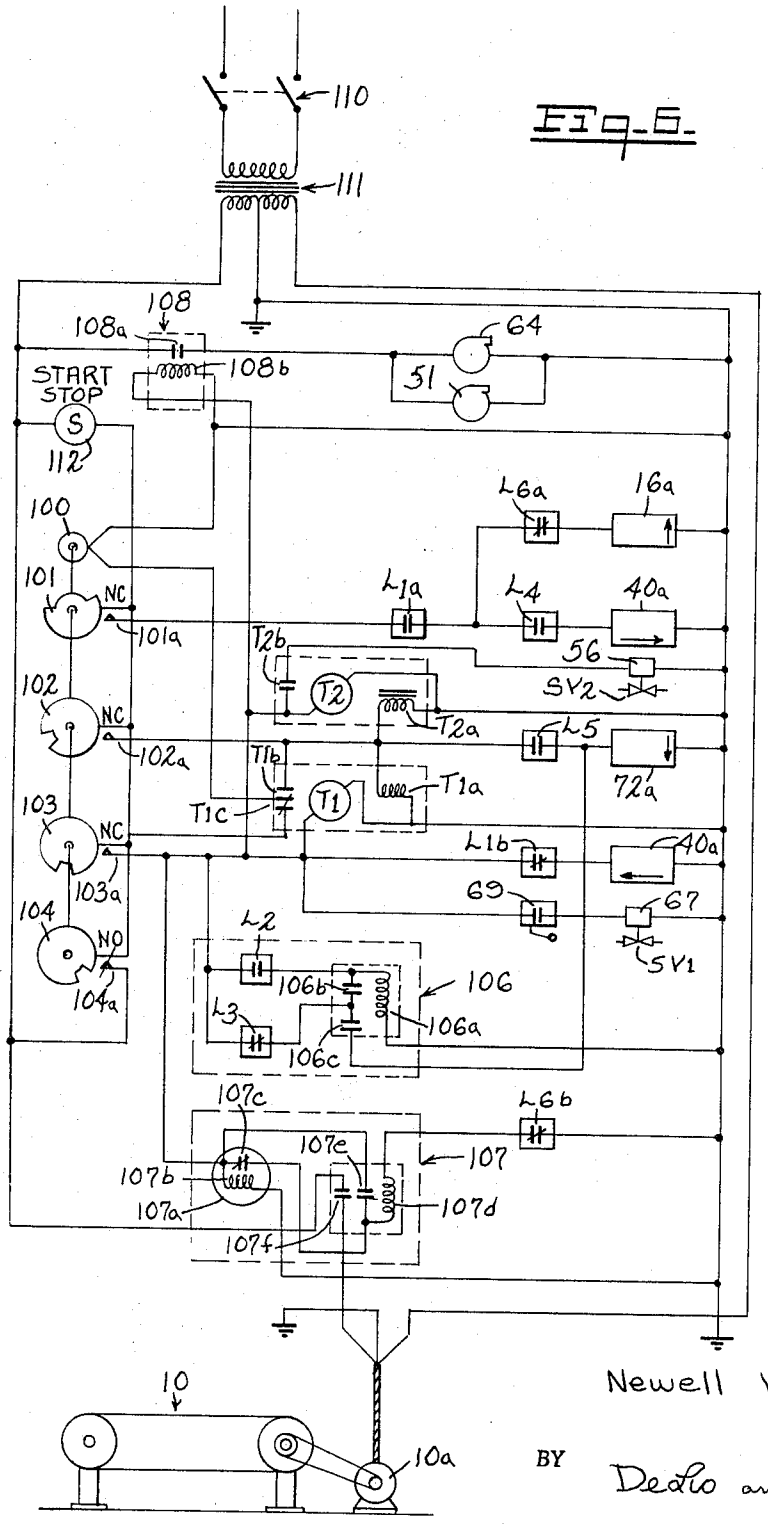
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MATERIAL HANDLING APPARATUS

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Fig. 6.



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MATERIAL HANDLING APPARATUS

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Int. Cl. B08b 3/06
U.S. Cl. 134—60 10 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for washing industrial parts, chips, or high-value scrap, or any similar materials. Additionally, the apparatus can be used for coating, plating, or mixing of materials. The apparatus includes a conveyor for supporting a basket, an elevator for raising the basket to position above a washing tank. Indexing mechanism is also provided for transferring the basket onto a second elevator which then lowers the basket into the tank. Thereafter the basket is agitated while in the tank and, after a predetermined time interval, is raised out of the tank.

This invention relates to an apparatus for washing industrial parts, chips, or high-value scrap, or any similar materials. Additionally, the apparatus may be used for coating, plating, or mixing of materials.

The apparatus of this invention is constructed to use water solutions of soaps, bases, detergents, etc. at high temperatures to remove cutting oils, chips and industrial soil from parts in process. The apparatus of this invention does not require industrial solvents, such as trichloroethylene and, accordingly, it will function with substantial cost saving. Additionally, the apparatus of this invention does not require an operator in attendance, as with prior art vapor degreasing techniques. Further, with the apparatus of this invnetion, there is no industrial health hazard nor objectionable odor developed during the cleansing process.

In view of the foregoing, it is an object of this invention to provide a new and improved material handling apparatus.

Another object of this invention is to provide a new and improved apparatus for washing materials.

Another object of this invention is to provide a new and improved apparatus suitable for plating, acid cleaning, coating, rinsing, soaking, chip-removing and mixing materials.

A further object of this invention is to provide a new and improved washing apparatus which utilizes water solutions of soaps, bases and detergents for removing cutting oils, chips and industrial soils from parts in process.

Still other objects and advantages of this invention will in part be obvious and will in part be apparent from the specification.

The invention accordingly comprises the features of construction, combinations of elements and arrangements of parts which will be exemplified in the constructions hereinafter set forth and the scope of the invention will be indicated in the claims.

For a fuller understanding of the invention, reference is had to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a top view of the apparatus according to this invention;

FIG. 2 is a view of the apparatus taken along line 2—2 of FIG. 1;

FIG. 3 is a side view of the apparatus according to this invention;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken along line 5—5 of FIG. 3; and

FIG. 6 is a schematic diagram, partially diagrammatic, of the electrical control system for operating the apparatus according to this invention.

Referring now to FIGS. 1–5, there is shown the material handling apparatus which includes an automatic feed conveyor 10 for delivering a wire basket, a porous container, or the like, shown at 11 over a plurality of rollers 12 which are supported by the apparatus frame. The basket 11 is positioned on top of an elevator platform 13 comprising a plurality of rollers 14. The function of the elevator platform 13 is to raise the container to a level such that it may be positioned in a wash tank shown at 15. The platform 13 is raised by an air-operated cylinder 16 having a piston 17 which, when actuated, raises a member 18 to which is coupled two other members shown at 19 and 20 provided with guide rollers 21. The members 19 and 20 support another member 22 to which the platform 13 is hinged at 23.

Upon extension of the piston 17 in an upward direction, the members 18, 19 and 20 are guided in guides shown at 24 and 25, respectively, to raise the platform 13. When the container 11 has been raised, an indexing mechanism comprising a plurality of plates 30–32, functions to position the container over the wash tank 15. The plates 30–32 are coupled to members 35 and 36, respectively, which ride on tracks 37 and 38, respectively. The members 35 and 36 are coupled together by a bracket 39. The bracket 39 and the plates 30–32 are positioned by a cylinder 40 having a piston 41, said cylinder 40 being coupled to the frame at 42. By causing the piston 41 to move to the right of FIG. 2, the plates 30–32 will also move to the right of FIG. 2, and vice versa.

The wash tank 15 comprises a bottom 45 and side walls 46 and 47. As part of the tank 15, there is provided a supplemental tank 48, a section of which is partitioned by walls shown at 49. In order for the supplemental tank 48 to communicate with the wash tank 15, openings 50 are provided. Also as part of the supplemental tank 48, there is provided a pump mechanism 51 having a tube 52 extending into the wash tank 15. The tube 52 is provided with a plurality of openings for permitting water to be expelled therefrom. The pump 51 takes the water at the bottom of supplemental tank 48 and recirculates it through the wash tank 15. The supplemental tank also has a weir 53 for skimming the surface of the expelled fluid of the wash tank.In this manner the scum of surface dirt of the wash tank is permitted to be removed by the tap at the end of tube 52.

There is also provided a soap dispenser shown at 55, which is coupled to a vibrating mechanism 56 for dispensing soap into the wash tank 15. The soap is placed in the dispenser 55 and exits through openings therein as it is vibrated.

The water in the tank 15 is heated by hot gases piped through a conduit shown at 58. The hot gases are provided from a furance in the manner of the prior art. Positioned adjacent to the wash tank 15 is a rinse tank shown at 60, having a bottom 61, one side wall 62 and the other side wall provided by the common side wall 47 of the wash tank. The rinse tank 60 is also provided with a supplemental tank 63 and a pump mechanism 64 having a pipe 65 for recirculating water into the bottom of the tank 60. Water enters the supplemental tank 63 through an opening 63*a* located below the water level. The water in the rinse tank is also heated by gases in the conduit 58 which passes into the tank 15.

The side wall 47, positioned between the wash tank 15 and the rinse tank 60, has a V-shaped cut 66 therein which permits the flow of the water from the rinse tank to the wash tank. Clean water is provided to the rinse

tank by means of a valve **67** which controls the flow of water from a pipe **68** connected to a fresh water source. The amount of water permitted to enter the rinse tank is controlled by a flow control relay **69**. The operation of the mechanism for providing clean water to the rinse tank operates on demand, based on the water level in the wash tank. The operation of the relay **69** will be more fully explained in conjunction with the description of FIG. 6. By the use of the system for providing fresh water, the water from the rinse tank is used in the wash tank and clean water is provided only to the rinse tank.

Generally speaking, the apparatus of FIGS. 1–5 operates as follows: the container **11** is positioned upon platforms shown at **70** and **71** by the platform **13** and the plates **30** and **31**. The platform **70** is positioned within the tank **15** and the platform **71** is positioned within the rinse tank **60**. During operation of the apparatus, the container **11** is lowered into the wash tank and the rinse tank by the movement of platforms **70** and **71**, respectively. The movement of the platforms is controlled by an air-actuated cylinder **72** having a piston **73** which is connected by a U-shaped member **74** to the platforms **70** and **71**. The member **74** is connected to piston **73** by a member shown at **75**. As may be seen, the platforms **70** and **71** have mesh surfaces, such that when immersed in fluid, the fluid may enter the container **11** positioned thereon. More particularly, in operation, the container **11** is delivered from the conveyor **10** onto the elevator and then raised by the platform **13**. At this point the plate **30** moves the container onto the platform **70** and thereafter the container is lowered into the tank **15**. The container is then agitated for a predetermined period of time, that is, raised and lowered between two predetermined positions within the wash tank. After agitation, the platform **70** raises the container and then the plate **31** moves it to the platform **71**. Thereafter it is lowered into the rinse tank **60** and it is again agitated. After a predetermined period of time the container is again raised and is pushed out by plate **32** onto rollers **80**. If desired, the apparatus according to this invention could also be provided with a drying chamber into which the container may be positioned. In operation, the container is positioned within the tanks and, thereafter, the plates **30–32** are moved back to their original position.

This apparatus may be operated on a continuous basis, such that while the parts in one container are being washed, the parts in another container are being rinsed, and a third container is being positioned by the platform **13**, such that the plates **30–32** may move the containers into position for the next phase of operation.

To more fully explain the operation of the apparatus, attention should now be directed to FIG. 6 which schematically shows the control system for operating the apparatus of FIGS. 1–5. In FIG. 6 the contacts or switches are schematically shown as two solid parallel lines with or without slash lines therethrough. Those switches having parallel lines without slash marks indicate normally open switches and those having parallel lines with slash marks therethrough denote normally closed switches. The blocks indicated as **16***a*, **40***a* and **72***a* represent the valves to control cylinders **16**, **40** and **72**, respectively. The cylinder **16** has a normally retracted piston, whereas cylinder **72** has a normally extended piston, that is, the piston of cylinder **16** must be forced upwardly but is self-retractible, whereas the piston of cylinder **72** is normally extended but must be forced into retracting position. On the other hand, piston **41** of cylinder **40** will move only in either direction under the influence of air or fluid pressure. In this apparatus the cylinders are preferably pneumatically actuated from a source of air (not shown), although it is to be understood that hydraulically actuated means, etc., may be applied to accomplish the same result. It should be understood that the source of air for controlling the cylinders disclosed in the drawing is the same as is used in the prior art.

FIG. 6 also shows contacts for limit switches **L1–L6**. Switch **L1** is shown in FIG. 3, and is responsive to the mechanism for positioning platforms **70** and **71**. Limit switches **L2** and **L3** are also provided, which are responsive to the position of the platforms **70** and **71** and which function to control the agitation of the container **11**. Limit switch **L4** is provided and is responsive to the position of the platform **13**, whereas a limit switch **L5** is further provided which is responsive to the position of the plates **30–32**. Another switch **L6** is positioned to be responsive to the container **11** passing thereover. Switch **L6** also acts as a safety device in the event two containers should be provided at the same time. As shown in FIG. 6, there is also provided a plurality of control servo valves **SV1** and **SV2**. The valve **SV1**, which is synonymous with valve **67**, controls the entrance of fresh water into the rinse tank **60**, whereas valve **SV2** controls the entrance of air to the vibrator **56** of the soap dispenser **55**.

A motor **100**, including cams **101–104**, is provided to control the timing of the operation of the circuitry of FIG. 6. Each of these cams is shaped such that it can control contacts **101***a*–**104***a*, respectively. Initially, contacts **101***a*–**103***a*, which are normally closed contacts, are held open by the cams, whereas normally open contact **104***a* is closed due to the position of the cutout in cam **104**.

Additionally, to provide a controlled time cycle for washing and rinsing, a timer motor **T1** is provided which controls the relay coil **T1***a* and contacts **T1***b* and **T1***c*. Another timer motor **T2** is also provided to control the length of time the soap is dispensed from the dispenser **55**. The timer **T2** also controls the energization of a coil **T2***a* and a contact **T2***b*.

At **106** of the drawing there is shown the circuitry for causing the platforms **70** and **71** to raise and lower within tanks **15** and **60** to agitate the water to wash and rinse the parts held in the container **11**. Additionally, at **107** there is shown the control circuitry for the conveyor schematically shown at **10** in FIGS. 1–3.

Also disclosed generally at **108** is the circuitry for the control of the operation of the pumps **51** and **64** which control the circulation of the water within the wash and rinse tanks.

Now considering the operation of the apparatus of FIGS. 1–5 in conjunction with the schematic diagram of FIG. 6, power is supplied to the circuitry by closure of a switch **110** through a transformer shown at **111**. A start-stop switch **112** is then depressed to close, such that cam motor **100** is energized through contact **T1***c* and the cams **101–104** start rotating clockwise. At this point, normally open switch **L1***a* is held closed by the position of ram member **73**.

Assuming now that the container **11** from the conveyor **10** is positioned properly on platform **13**, the switch **L6***a* will be normally closed although it opened momentarily as the container entered the platform **13**. As the motor **100** continues to rotate, the cam **101** will permit its contact **101***a* which was held open, to close and thereby energize the valve **16***a*, causing the platform **13** to rise. When the platform **13** reaches the top of its travel, the formerly open switch **L4** closes, energizing valve **40***a* and thus the piston of the cylinder **40** begins to move plates **30–32** to cause the container with the work parts therein to be moved above the wash tank **15**. The indexing mechanism carrying plates **30–32** thereafter causes limit switch **L5** to close. At this time the cam **101** once again causes contact **101***a* to open. Thereafter, the cam **102** permits switch **102***a* to close, energizing valve **72***a* and thus forcing fluid into the cylinder **72** and causing it to move in a downward direction through switch **L2**. This causes the platforms **70** and **71** to move downwardly into the tanks. Simultaneously, timers **T1** and **T2**

are reset by the closure of contact 102*a*. As the resetting of timers T1 and T2 causes contacts T2*b* to close and T1*c* to open and T1*b* to close, the motor 100 keeps operating since it is now energized through contact T1*b*. At this time the cam 103 permits contact 103*a* to close and the motor 100 stops, since cam 102 has now timed out and contact 102*a* again opens. Upon closure of contact 103*a*, the pumps 51 and 64 begin to operate since the relay contact 108*a* closes and coil 108*b* is energized. Additionally, since the water control switch 69 is now on the power line, if water is needed in the wash tank the valve SV1 will operate to permit water to flow therein. Simultaneously, the agitation circuit is energized, that is, the circuit 106 will cause the platforms 70 and 71 to be continuously positioned between two locations within the wash and rinse tanks. At this point the cylinder 40 has moved the indexing mechanism plates 30–32 back to original position, since the normally closed switch L1*b*, which is held open, is permitted to close and, further, switch L5 opens.

At this time the timers T1 and T2 also begin to operate. After piston 73 has bottomed the platforms 70 and 71, the switch L3 opens and the piston 73 will again try to normally extend. When the platforms 70 and 71 reach a predetermined height, the switch L2 will be caused to close, thereby energizing coil 106*a* and closing contacts 106*b* and 106*c*. This then causes piston 73 to again move downwardly and switch L2 opens. Power is continuously applied, since switch L3 maintains power to the valve 72*a* through the closed relay contact 106*c*. When the cylinder again causes platforms 70 and 71 to bottom within the tanks, the limit switch L3 opens, thus de-energizing valve 72*a* and permitting the piston 73 to once again extend upwardly.

The oscillations between two levels in the tanks continues until the timer T1 times out and causes the normally closed contact T1*c* to close once again to cause motor 100 to start. At this time the cam 103 rotates and opens the contact 103*a* and thereby de-energizes the circuitry 106. While timer T1 is operating, timer motor T2 is operating to close contact T2*b*, thus actuating the vibrator through the valve SV2. The valve SV2 causes air to be provided to the vibrator, causing the dispenser 55 to expel soap therefrom. The vibrator is of the common, pneumatically-actuated, prior art type and may be purchased from Branford Vibrators of New Britain, Connecticut. The control for the vibrator, which is generally shown at 107, at actuated in response to the closing of contact 103*a*.

The conveyor of this apparatus operates only during the time the parts in the container are being washed in the tank 15. The conveyor control system comprises a silicon control time delay relay 107*a* of the type which may be purchased from Heinemann, Inc. of New Jersey. The time delay relay comprises a coil 107*b* and a normally closed contact 107*c*. Additionally, the control system for the conveyor comprises relay coil 107*d* for controlling relay contacts 107*e* and 107*f*. As part of the overall conveyor control, the limit switch L6*b*, which is responsive to the passage of parts container 11 thereover, is also coupled in circuit with the coil 107*d*. In operation, when contact 103*a* closes, the coil 107*d* is energized to close contacts 107*e* and 107*f* and thus start the conveyor motor 10*a*. After a short period of time (approximately two seconds) coil 107*b* causes delay contact 107*c* to open, but coil 107*d* remains energized through a holding circuit comprising contact 107*e*, coil 107*d* and switch L6*b*. As the container 11 passes over limit switch L6*b*, this switch opens, thereby de-energizing coil 107*d* and opening contacts 107*e* and 107*f*. At this time the container 11 is again ready to be raised, depending upon the operation of the cam motor 100.

After the time period that 103*a* opens again, eventually cam 104 causes the normally open but held closed contact 104*a* to open. If the start-stop switch is in the stop position the whole system will stop; if not, and the switch remains in the start position, the entire operation will again repeat itself in the order previously described.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description are efficiently attained and since certain changes may be made in the above constructions without departing from the spirit and scope of the invention, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An apparatus, having two adjacent tanks therein, for washing, coating, plating or mixing of industrial parts, comprising
   (a) a first tank,
   (b) a first elevator platform positioned outside and adjacent to the bottom of said first tank when it is in position for receiving any container having parts therein, said first elevator platform adapted to include a section of a conveyor,
   (c) means for raising and lowering said first elevator platform,
   (d) a second elevator platform for holding a container thereon located above said first tank,
   (e) means for raising and lowering said second elevator platform,
   (f) a second tank located adjacent to said first tank,
   (g) a third elevator platform for holding a container thereon located above said second tank,
   (h) means for raising and lowering said third elevator platform, and
   (i) an indexing mechanism which simultaneously moves a container located on said first elevator platform to said second elevator platform, a container located on said second elevator to said third elevator platform, and a container located on said third elevator platform from said third platform, with each of said containers loosely sitting on its respective platform and said indexing mechanism being operative only when each of said elevator platforms is in the raised position.

2. An apparatus in accordance with claim 1, including conveyor means operable during the period of time a container is being agitated in the first tank, to deliver another container to said first elevator platform.

3. An apparatus in accordance with claim 1, wherein the first tank is a wash tank and the second tank is a rinse tank, including means for causing the transfer of fluid from said rinse tank to said wash tank in accordance with the level of fluid in said wash tank.

4. An apparatus in accordance with claim 3, including vibratory means for dispensing cleansing agents into said wash tank for predetermined periods of time.

5. An apparatus in accordance with claim 3, including a supplementary tank connected to said wash tank so that the liquid in said wash tank can easily flow into said supplementary tank, and wherein a weir is provided in said wash tank for skimming of dirt on said liquid and pumping means for recirculating clean water from the supplemental tank into the wash tank.

6. An apparatus in accordance with claim 1, wherein said indexing mechanism for positioning a container on said second and third elevator platforms moves back to its original starting position after said second and third elevator platforms move into said tank.

7. An apparatus in accordance with claim 1, including electrical means on said first elevator platform which stops the elevator from moving if an additional object is placed on the elevator in addition to a single container.

8. An apparatus in accordance with claim 1, further including means for independently oscillating the second and third elevator platforms within the first and second tanks, respectively, between two levels in said tanks for predetermined periods of time.

9. An apparatus in accordance with claim 1, and further including means for simultaneously oscillating the second and third elevator platforms within the first and second tanks, respectively, between two levels in said tanks for predetermined periods of time.

10. An apparatus in accordance with claim 1, including means for skimming soil from said first tank.

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ROBERT L. BLEUTGE, Primary Examiner

U.S. Cl. X.R.

134—66, 83, 93, 133, 141