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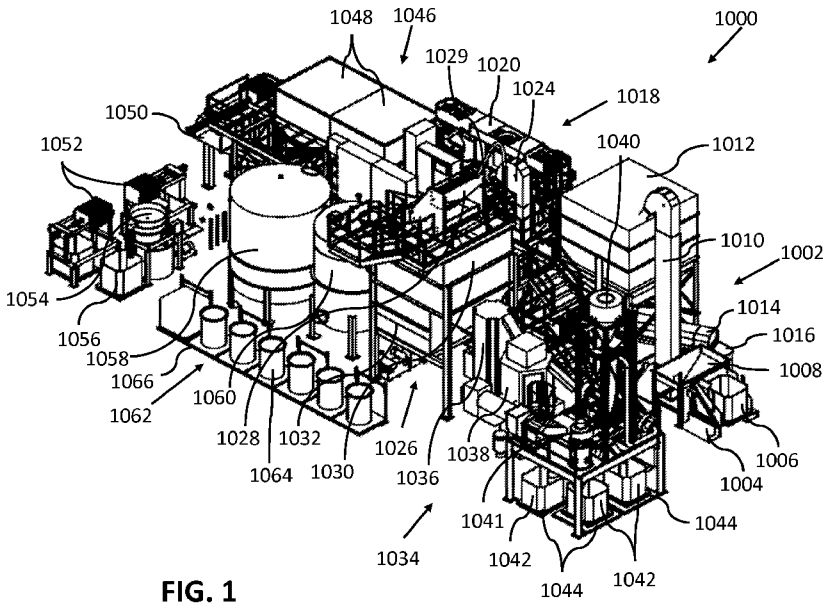

FIG. 1

(57) **Abstract**: Various embodiments of a system for coating removal are provided. In one embodiment, a system for removing a coating material from another material is provided, the system comprising: a staging hopper; a second elevator operatively connecting the staging hopper to the decoating mill; a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank, wherein the at least one rotary blade can translate horizontally and vertically; a screen station having a dump hopper and a recovery tank; a washer; a dryer; an aspirator; a large waste water filter press; at least one process water filter press; a sanitary water filter; a staging tank; a water heater; and a process chemical feed system.

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SYSTEM FOR COATING REMOVAL

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Patent Application No. 62/039,269, filed on August 19, 2014, which is incorporated by reference herein in its entirety.

BACKGROUND

[0002] Many products, including consumer goods, technology devices, food industry containers, and the like include a recyclable polymeric material plated, painted, adhered, dyed, covered in part with ink, or otherwise coated with another material. Examples of consumer goods may include toys, household items, kitchen products, and the like. Examples of technology devices may include compact discs, digital video discs, and the like. Food industry containers may include food containers, beverage containers, and the like. Plating materials may include metals, including electroplating of materials used in electronic media, decorative items, and the like. Painting materials may include paints as typically used in products to decorate, color, label, mark, differentiate, and the like. Adhesive materials may include glues, cements, bonding agents, or the like. Inks may include general inks used to provide labeling, information, mark, differentiate, and the like.

[0003] Recyclable polymer materials coated with a coating material may not be easily recyclable due to the presence of the other material. The coating material may be separated recyclable or non-recyclable. The coating material may need to be removed from the polymeric material in order to effect recycling of the polymeric material, the coating material, or both. Physically removing a coating material from a polymeric material in order to recycle the polymeric material may be at the very least impractical, if not very difficult. As a result,

coated polymeric materials may be discarded rather than recycled, simply because recycling of these materials may not be cost-effective.

[0004] Alternatively, it may be desirable to remove a coating from a material for any of a variety of reasons, not limited to recycling of either of the materials.

[0005] What is needed is a system for removing a coating from a material, including a material to be recycled.

SUMMARY

[0006] In one embodiment, a system for removing a coating material from another material is provided, the system comprising: a staging hopper; a second elevator operatively connecting the staging hopper to the decoating mill; a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank, wherein the at least one rotary blade can translate horizontally and vertically; a screen station having a dump hopper and a recovery tank; a washer; a dryer; an aspirator; a large waste water filter press; at least one process water filter press; a sanitary water filter; a staging tank; a water heater; and a process chemical feed system.

[0007] In another embodiment, a system for removing a coating material from another material is provided, the system comprising: a staging hopper; a second elevator operatively connecting the staging hopper to the decoating mill; a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank; a screen station having a dump hopper, a recovery tank, and a dewatering screen, wherein the dump hopper and the recovery tank are separated from one another by a diagonally-extending wall; a washer; a dryer; an aspirator; a large waste water filter press; at least one process water filter press; a sanitary water filter; a staging tank; a water heater; and a process chemical feed system.

[0008] In another embodiment, a system for removing a coating material from another material is provided, the system comprising: a staging hopper; a second elevator operatively connecting the staging hopper to the decoating mill; a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank, wherein the at least one rotary blade can translate horizontally and vertically; a screen station having a dump hopper and a recovery tank; a washer; a dryer; an aspirator; a large waste water filter press; at least one process water filter press; a sanitary water filter; a water separation system; a staging tank; a water heater; and a process chemical feed system.

[0009] In another embodiment, a system for removing a coating material from another material is provided, the system comprising: a staging hopper; a second elevator operatively connecting the staging hopper to the decoating mill; a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank; a screen station having a dump hopper, a recovery tank, and a dewatering screen, wherein the dump hopper and the recovery tank are separated from one another by a diagonally-extending wall; a washer; a dryer; an aspirator; a large waste water filter press; at least one process water filter press; a sanitary water filter; a water separation system; a staging tank; a water heater; and a process chemical feed system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying figures, which are incorporated in and constitute a part of the specification, illustrate various example systems and configurations, and are used merely to illustrate various example embodiments. In the figures, like elements bear like reference numerals.

[0011] **FIG. 1** illustrates a perspective view of a system **1000** for removing a coating material from another material.

[0012] **FIG. 2** illustrates a plan view of system **1000** for removing a coating material from another material.

[0013] **FIG. 3** illustrates a side view of system **1000** for removing a coating material from another material.

[0014] **FIG. 4** illustrates another side view of system **1000** for removing a coating material from another material.

[0015] **FIG. 5** illustrates a sectional view of a decoating mill **2018**.

[0016] **FIG. 6A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0017] **FIG. 6B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0018] **FIG. 7A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0019] **FIG. 7B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0020] **FIG. 8A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0021] **FIG. 8B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0022] **FIG. 8C** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0023] **FIG. 9A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0024] **FIG. 9B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0025] **FIG. 10A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0026] **FIG. 10B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0027] **FIG. 11A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0028] **FIG. 11B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0029] **FIG. 12A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0030] **FIG. 12B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0031] **FIG. 13A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0032] **FIG. 13B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0033] **FIG. 14A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0034] **FIG. 14B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0035] **FIG. 15A** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0036] **FIG. 15B** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0037] **FIG. 15C** illustrates a partial view of a control screen view used in a system for removing a coating material from another material.

[0038] **FIG. 16** illustrates a perspective view of a system **1000** for removing a coating material from another material.

[0039] **FIG. 17** illustrates a plan view of system **1000** for removing a coating material from another material.

[0040] **FIG. 18** illustrates a side view of system **1000** for removing a coating material from another material.

[0041] **FIG. 19** illustrates another side view of system **1000** for removing a coating material from another material.

DETAILED DESCRIPTION

[0042] **FIG. 1** illustrates a perspective view of a system **1000** for removing a coating material from another material.

[0043] System **1000** may include a loading station **1002**. Loading station **1002** may be configured to accept coated material to be introduced to system **1000**. The coated material may include a polymeric substrate. The coated material may include a polymeric film. The coated material may include a shredded polymeric film. The coated material may include sheets of polymeric film. The coated material may be broken into smaller, more manageable pieces than their original forms. The coated material may be at least one of flaked, crushed,

shredded, chipped, ground, and the like. The coated material may be processed into a small particle between about 0.5 mm and about 20.0 mm in size. The coated material may be processed into a small particle between about 1.0 mm and about 10.0 mm in size. The coated material may be processed into a small particle between about 4.0 mm and about 8.0 mm in size. The coated material may be smaller than 0.5 mm, larger than 20.0 mm, or comprise particles of varying sizes inside or outside the range recited. The coated material may be sorted such that the coated material is all of the same or similar type, composition, nature, or the like.

[0044] The coated material may be coated with any of a variety of materials, including for example: plating, paint, adhesives, dyes, ink, labels, and the like. The coated material may be coated on at least one surface. The coated material may be coated on multiple surfaces.

[0045] Loading station **1002** may include a loading device **1004**. Loading device **1004** may be configured to introduce coated material into system **1002**. Loading device **1004** may be configured to load or dump containers of coated material into system **1002**. Loading device **1004** may include any of a variety of devices, including a box dumper. Loading device **1004** may include a Gaylord Box Dumper.

[0046] The coated material may be introduced into system **1000** and loading station **1002** in a container **1006**. Container **1006** may include any box, bag, crate, pallet, or other container capable of holding the coated material. Container **1006** may be a Gaylord Box.

[0047] Loading station **1002** may include a loading hopper **1008**. Loading hopper **1008** may be configured to receive coated material introduced to loading station **1002**. Loading device **1004** may dump the contents of container **1006** into loading hopper **1008**. Loading

hopper **1008** may be gravity fed from the top with coated material selectively allowed to exit it from its bottom, side, or the like.

[0048] At least one of loading device **1004** and loading hopper **1008** may include a scale configured to measure the weight or mass of the coated material introduced in a given batch. At least one of loading device **1004** and loading hopper **1008** may include a scale configured to limit the weight or mass of the coated material introduced in a given batch.

[0049] Loading station **1002** may include a first elevator **1010**. First elevator **1010** may be a bucket elevator device configured to receive coated material at a first point and transfer the coated material to a second point above the first point. First elevator **1010** may be any elevator device, including a bucket elevator, auger elevator, belt elevator, and the like. Loading hopper **1008** and staging hopper **1012** may be operatively connected by first elevator **1010**.

[0050] Loading station **1002** may include a staging hopper **1012**. First elevator **1010** may be configured to transfer the coated material from loading hopper **1008** to staging hopper **1012**. Staging hopper **1012** may be configured to receive coated material introduced to loading station **1002**. Staging hopper **1012** may be gravity fed from the top with coated material selectively allowed to exit it from its bottom, side, or the like. Staging hopper **1012** may include a scale configured to measure the weight or mass of the coated material introduced in a given batch. Staging hopper **1012** may include a scale configured to limit the weight or mass of the coated material introduced in a given batch.

[0051] An offloading system **1014** may be operatively connected to staging hopper **1012** to allow for selective offloading of coated material from staging hopper **1012**. Staging hopper **1012** may be at least partially offloaded in the event that more coated material than desired is introduced to staging hopper **1012**. Staging hopper **1012** may be at least partially

offloaded in the case of an emergency. Staging hopper **1012** may be at least partially offloaded in the event that maintenance needs to be performed on system **1000**, loading station **1002**, or staging hopper **1012**. Offloading system **1014** may include a conveyor configured to receive coated material from staging hopper **1012**. Offloading system **1014** may include any device configured to transport material, including for example a conveyor belt, an auger, and the like. Offloading system **1014** may deposit material in a container **1016**. Container **1016** may include any box, bag, crate, pallet, or other container capable of holding the coated material. Container **1016** may be a Gaylord Box. System **1000** and/or staging hopper **1012** may include a control preventing offloading of coated material from staging hopper **1012** via offloading system **1014** during loading of coated material into staging hopper **1012** via first elevator **1010**.

[0052] System **1000** may include a decoating mill **1018**. Decoating mill **1018** may include a tank configured to receive a coated material. Decoating mill **1018** may include a tank configured to receive a liquid, such as water. The liquid may be a heated liquid. The liquid may be heated to between about 82 °C (180 °F) and about 93 °C (200 °F). Decoating mill **1018** may include a tank configured to receive decoating chemicals. Decoating mill **1018** may include a tank configured to receive a mixture of at least two of a coated material, a liquid, and a decoating chemical. Decoating mill **1018** may include a tank configured to receive a slurry including a coated material and a liquid, and optionally a decoating chemical. Decoating mill **1018** may accept coated material and mix it with a liquid to decoat the coated material. Decoating mill **1018** may accept coated material and mix it with a liquid and at least one decoating chemical to decoat the coated material. Decoating mill **1018** may accept coated material slurry and mix it in high shear conditions in order to effect removal of the coatings from the coated materials.

[0053] Decoating mill **1018** may include a tank that may be first loaded with heated liquid, such as heated water. Coated material in particle form may be added to decoating mill **1018** tank and to the heated liquid. Finally, any required chemicals may be added to the mixture within the decoating mill **1018** tank.

[0054] Decoating mill **1018** may include at least one rotary blade extending into the tank. Decoating mill **1018** may include two rotary blades. Decoating mill **1018** may include three rotary blades.

[0055] Decoating mill **1018** may include a plurality of rotary blades having different diameters. Decoating mill **1018** may include a first rotary blade having a diameter of about 81.3 cm (32.0 in.). Decoating mill **1018** may include a second rotary blade and a third rotary blade each having a diameter of about 71.1 cm (28.0 in.). Decoating mill **1018** may include rotary blades having any of various diameters. The one or more rotary blade may have any of a variety of diameters.

[0056] Decoating mill **1018** may include rotary blades having shafts configured to extend the rotary blades into the tank. At least one of the rotary blades may be configured to move relative to the tank in a horizontal direction. At least one of the rotary blades may be configured to translate up to about 45.7 cm (18.0 in.) relative to the tank in a horizontal direction. At least one of the rotary blades may be configured to move relative to the tank in a vertical direction. At least one of the rotary blades may be configured to translate up to about 121.9 cm (48.0 in.) relative to the tank in a vertical direction. The one or more rotary blade may be configured to move in any of a variety of distances either vertically or horizontally.

[0057] Movement of at least one of the rotary blades vertically and/or horizontally relative to the interior of the tank may change a mixing vortex experienced by the coated

material slurry within the tank. Depending upon the nature, size, quantity, and mixture of the coated material and coated material slurry, at least one of the rotary blades may be moved vertically and/or horizontally relative to the interior of the tank to achieve a desired mixing vortex.

[0058] Decoating mill **1018** may include at least one motor operatively connected to the one or more rotary blade to effect rotation of the one or more rotary blade. Decoating mill **1018** may include at least one motor operatively connected each of the one or more rotary blade to effect rotation of the one or more rotary blade. The at least one motor may include a horsepower of about 300 hp. The at least one motor may have any of a variety of horsepowers. Decoating mill **1018** may include a variable frequency drive. Decoating mill **1018** may include a variable frequency drive operatively connected to the one or more rotary blade. The variable frequency drive may permit adjustment of the RPM of at least one of the one or more rotary blade. System **1000** may gather data from the at least one motor, including torque, and may adjust the one or more rotary blade's RPM as necessary to effect proper mixing of the coated material slurry.

[0059] Decoating mill **1018** may include an inspection port on the side of its tank. The inspection port may be about 5.1 cm (2.0 in.) in diameter and about 15.2 cm (6.0 in.) in length to permit an operator of system **1000** to obtain a sample of the coated material slurry within decoating mill **1018**. Inspection port may include any of a variety of dimensions as necessary to obtain a sample of the coated material slurry within decoating mill **1018**.

[0060] Decoating mill **1018** may include a drive system **1020** including the at least one motor. Drive system **1020** may at least one actuator configured to effect movement of the one or more rotary blade horizontally or vertically relative to the tank.

[0061] Decoating mill **1018** may include a second elevator **1024**. Second elevator **1024** may be a bucket elevator device configured to receive coated material at a first point and transfer the coated material to a second point above the first point. Second elevator **1024** may be any elevator device, including a bucket elevator, auger elevator, belt elevator, and the like. Second elevator **1024** may transport coated material from staging hopper **1012** to decoating mill **1018**. System **1000** and/or staging hopper **1012** may include a control preventing transfer of coated material from staging hopper **1012** to decoating mill **1018** via second elevator **1024** during loading of coated material into staging hopper **1012** via first elevator **1010**. Second elevator **1024** may operatively connect staging hopper **1012** to decoating mill **1018**.

[0062] System **1000** may include a screening station **1026**. Following successful and/or satisfactory decoating of the coated material within decoating mill **1018**, the decoated slurry may be transferred to screen station **1026**. This transfer may be referred to as a "pump over." Upon successful and/or satisfactory decoating of the coated material within decoating mill **1018**, the decoated slurry, which may be a mixture of a liquid, a decoated material, a coating, and optionally at least one chemical, may be transferred to screening station **1026**. The decoated slurry may be introduced to a dewater screen **1028**. A transfer pipe **1029** may effect the transfer of the decoated slurry from decoating mill **1018** to dewater screen **1028**. The decoated slurry may be pumped from decoating mill **1018** to dewater screen **1028**. Dewater screen **1028** may be oriented vertically above a split tank having a diagonally-extending wall separating an upper portion of the tank and a lower portion of the tank. The upper portion may be a dump hopper **1030** while the lower portion may be a recovery tank **1032**. In practice, the decoated slurry may be introduced to dewater screen **1028** wherein at least a portion of process liquid from the decoated slurry may be separated from the decoated slurry. The diagonally-extending wall separating dump hopper **1030** from recovery tank **1032** may

include a screen configured to capture at least a portion of the decoated material in dump hopper **1030** while allowing at least a portion of the coating and any liquid and/or chemical, the collection of which is referred to as a "sludge" to continue downward to recovery tank **1032**. The screen may be configured to capture the majority of the decoated material in dump hopper **1030** while allowing the majority of the sludge to pass through to recovery tank **1032**.

[0063] Process water recovered in recovery tank **1032** may optionally be directed to the decoating mill **1018** tank during pump over operations. The pump over operation may require additional fluid in the decoating mill **1018** tank so as to permit efficient transfer of the decoated slurry to screening station **1026**.

[0064] Dump hopper **1030** may be gravity fed from the top with decoated material selectively allowed to exit it from its bottom, side, or the like.

[0065] System **1000** may include a wash station **1034**. Wash station **1034** may include a washer **1036**. Decoated material captured in dump hopper **1030** may be fed to washer **1036**. Washer **1036** may apply a clean liquid, such as water, to the decoated material. Washer **1036** may rinse the decoated material to further separate any residual sludge from the decoated material.

[0066] Wash station **1034** may include a dryer **1038**. The decoated material may be directed from washer **1036** to dryer **1038**. Dryer **1038** may dry the decoated material through separation of at least a portion of the liquid from the decoated material. Dryer **1038** may dry the decoated material through separation of most of the liquid from the decoated material. Dryer **1038** may dry the decoated material through evaporation of at least a portion of the liquid on the decoated material. Dryer **1038** may dry the decoated material through evaporation of most of the liquid on the decoated material.

[0067] Wash station **1034** may include an aspirator **1040**. Decoated material may be transferred from dryer **1038** to aspirator **1040** via a pipe, auger, conveyer, or the like. Decoated material may be transferred from dryer **1038** to aspirator **1040** via any of a variety of means. Decoated material may be further separated from any other materials in aspirator **1040**. Decoated material may be a polymeric material, and coating may be a metal. Aspirator **1040** may further separate any residual metals from the decoated material. Aspirator **1040** may collect and/or discard residual materials, including residual metals, thus leaving an almost homogenous collection of decoated material. Aspirator **1040** may pass the decoated material near a magnet **1041** to further separate any metals attracted to a magnetic field.

[0068] Decoated material may pass out of aspirator **1040** and into one or more collection container **1042**. System **1000** may include a control that permits selective filling of one or more collection container **1042**. One or more collection container **1042** may be placed upon a scale **1044** so as to measure the quantity of decoated material within collection container **1042** to prevent overfilling of collection container, fill specific orders of decoated material, and the like. Each of one or more collection container **1042** may rest upon an individual scale **1044**. Upon reaching a desired weight, a filled collection container **1042** can be removed from system **1000** and prepared for transport, further recycling, further processing, and the like. An empty collection container **1042** can be substituted for a removed collection container **1042**. System **1000** can direct flow of decoated material to other collection containers **1042** during exchange of a filled collection container **1042** for an empty collection container **1042**. System **1000** may automatically switch output of decoated material between collection containers **1042** based on weight of collection containers **1042**.

[0069] System **1000** may include a waste water treatment station **1046**. Waste water treatment station **1046** may include at least one settling tank **1048**. Sludge from recovery

tank **1032** may be transported to settling tank **1048**. Sludge from recovery tank **1032** may be pumped to settling tank **1048**. Sludge from recovery tank **1032** may be transported to settling tank **1048** via any of a variety of methods, including a conveyor, an auger, and the like.

[0070] Sludge may be allowed to settle in settling tank **1048** into its solid and liquid components, namely coating and processing liquid/chemicals.

[0071] Waste water treatment station **1046** may include a large waste water filter press **1050**. Coating allowed to settle in settling tank **1048** may be directed to large waste water filter press **1050**. Large waste water filter press **1050** may include a plurality of filter panels into which the coating is passed. The filter panels may be pressed together to further separate any liquids from the coating. The filtered coating may be removed from large waste water filter press **1050** and system **1000** for further processing or discarding. Sludge from recovery tank **1032** may be transported directly to large waste water filter press **1050**.

[0072] Waste water treatment station **1046** may include at least one process water filter press **1052**. At least one process water filter press **1052** may filter process water from at least one of settling tank **1048**, large waste water filter press **1050**, washer **1036**, dryer **1038**, and recovery tank **1032**. At least one process water filter press **1052** may filter process water and allow recycling of process water back into the remainder of system **1000**. At least one process water filter press **1052** may include a plurality of filter panes into which the process water is passed. The filter panels may be pressed together to extract any contaminants from the process water. Contaminants may be removed from the filter panels for further processing or discarding.

[0073] Waste water treatment station **1046** may include a sanitary water filter **1054**. Sanitary water filter **1054** may collect and process any drainage water from system **1000**. Sanitary water filter **1054** may receive liquid from at least one of settling tank **1048**, large

waste water filter press **1050**, washer **1036**, and dryer **1038**. Sanitary water filter **1054** may collect fines from liquids used in system **1000**. Contaminants removed during filtering in sanitary water filter **1054** may be collected in a container **1056** for removal or further processing.

[0074] System **1000** may include a staging tank **1058**. Staging tank **1058** may be a tank configured to contain a liquid, such as water. Staging tank **1058** may store a filtered water. Water from staging tank **1058** may be transported via pipes or other tubing to at least one of a heating tank **1060**, decoating mill **1018**, recovery tank **1032**, and washer **1036**.

[0075] Heating tank **1060** may include a tank configured to contain a liquid, such as water. Heating tank **1060** may be configured to heat a liquid, such as water. Heating tank **1060** may use any of a variety of means to heat a liquid, including electric heating elements, gas heating elements, and the like. Heating tank **1060** may heat a liquid, such as water, to between about 82 °C (180 °F) and about 93 °C (200 °F). Heating tank **1060** may receive liquid from at least one process water filter press **1052**. Heating tank **1060** may receive liquid from staging tank **1058**.

[0076] System **1000** may include a process chemical feed system **1062**. Process chemical feed system **1062** may contain any of a variety of chemicals required or desired for decoating a material in decoating mill **1018**. Process chemical feed system **1062** may pump chemicals from at least one chemical storage container **1064**. At least one chemical storage container **1064** may rest upon a scale **1066**. Scale **1066** may be utilized to measure the amount of chemical transferred from at least one chemical storage container **1064** to decoating mill **1018** in a given operation. System **1000** may monitor the weight of chemical subtracted during chemical transfer and stop the flow of chemical once a desired amount has been transferred.

[0077] **FIG. 2** illustrates a plan view of system **1000** for removing a coating material from another material. As more clearly illustrated in **FIG. 2**, decoating mill **1018** may include a decoating mill tank **1022**. Decoating mill tank **1022** may contain the coated material, liquid, and optionally chemicals using during the decoating process.

[0078] **FIG. 3** illustrates a side view of system **1000** for removing a coating material from another material. As more clearly illustrated in **FIG. 3**, screening station **1026** may include a diagonally-extending wall **1031** separating dump hopper **1030** from recovery tank **1032**. Diagonally-extending wall **1031** may include a screen.

[0079] **FIG. 4** illustrates another side view of system **1000** for removing a coating material from another material. As more clearly illustrated in **FIG. 4**, transfer pipe **1029** may effect the transfer of the decoated slurry from decoating mill **1018** to dewater screen **1028**.

[0080] **FIG. 5** illustrates a sectional view of a decoating mill **2018**. Decoating mill **2018** may include a drive system **2020**. Decoating mill **2018** may include a decoating mill tank **2022**.

[0081] Decoating mill tank **2022** may include any of a variety of shapes. Decoating mill tank **2022** may be, for example, substantially cylindrical. Decoating mill tank **2022** may have any of a variety of widths, diameters, or heights. Decoating mill tank **2022** may have a height of about 365.8 cm (144.0 in.). Decoating mill tank **2022** may have a height less than about 365.8 cm (144.0 in.) or greater than about 365.8 cm (144.0 in.).

[0082] Drive system **2020** may include at least one motor **2070**. At least one motor **2070** may be capable of delivering any of various powers. At least one motor **2070** may be capable of delivering about 300 hp. At least one motor **2070** may be capable of delivering less than about 300 hp. At least one motor **2070** may be capable of delivering more than about 300 hp. At least one motor **2070** may be capable of delivering about 300 hp at about 1,765 RPM.

[0083] At least one motor **2070** may be operatively connected to at least one variable frequency drive. At least one motor **2070** may include any of a variety of output elements such as a shaft connected to a pulley. At least one motor **2070** may include an output pulley having a diameter of about 33.5 cm (13.2 in.).

[0084] At least one motor **2070** may be operatively connected to a drive input element, such as a pulley connected to a shaft. At least one drive input element may include an input pulley having a diameter of about 71.1 cm (28.0 in.). The input pulley may be mechanically coupled to the output pulley referenced above. The input pulley may be mechanically connected to the output pulley through any of a variety of coupling elements, including for example a belt or a chain. The output pulley and input pulley may have a ratio of about 2.12:1. In one embodiment, the output pulley and the input pulley may be replaced with an output gear and an input gear, respectively.

[0085] At least one motor **2070** may operate within any of a variety of RPM ranges. At least one motor **2070** may operate within a range of about 1,236 RPM to about 1,450 RPM. At least one motor **2070** may operate at a speed less than about 1,236 and/or greater than about 1,450. At least one motor **2070** may operate between about 800 RPM and about 1,800 RPM. At least one motor **2070** may operate less than about 800 RPM or greater than about 1,800 RPM. At least one motor **2070** may operate between about 800 RPM and about 1,236 RPM. At least one motor **2070** may operate between about 800 RPM and about 1,450 RPM. At least one motor **2070** may operate between about 1,236 RPM and about 1,800 RPM. At least one motor **2070** may operate between about 1,450 RPM and about 1,800 RPM.

[0086] At least one motor **2070** may be operatively connected to at least one shaft **2072**. At least one shaft **2072** may be connected to an input pulley, which in turn is mechanically coupled to an output pulley, which may be connected to at least one motor **2070**. At least one

shaft **2072** may be an elongated shaft. At least one shaft **2072** may be configured to operate within a range of about 583 RPM and about 684 RPM. At least one shaft **2072** may operate at a speed less than about 583 RPM and/or greater than about 684 RPM. At least one shaft **2072** may operate at a speed of between about 800 RPM and 1,800 RPM. At least one shaft **2072** may operate at a speed of less than about 800 RPM and/or greater than about 1,800 RPM. At least one shaft **2072** may operate at a speed of between about 583 RPM and about 1,800 RPM. At least one shaft **2072** may operate at a speed of between about 583 RPM and about 800 RPM. At least one shaft may operate at a speed of between about 684 RPM and about 800 RPM. At least one shaft may operate at a speed of between about 684 RPM and about 1,800 RPM.

[0087] At least one shaft **2072** may extend into decoating mill tank **2022**. At least one shaft **2072** may be a metal shaft. At least one shaft **2072** may be a steel shaft. At least one shaft **2072** may be a stainless steel shaft. At least one shaft **2072** may be made of any of a variety of materials. At least one shaft **2072** may have a diameter of about 15.2 cm (6.0 in.). At least one shaft **2072** may have any of a variety of diameters, including diameters less than about 15.2 cm (6.0 in.) and greater than about 15.2 cm (6.0 in.).

[0088] At least one shaft **2072** may be connected to at least one actuator configured to move at least one shaft **2072** at least one of longitudinally and transversely. At least one shaft **2072** may be configured to move longitudinally up to about 121.9 cm (48.0 in.). At least one shaft **2072** may be configured move any distance longitudinally, including less than about 121.9 cm (48.0 in.) and greater than about 121.9 cm (48.0 in.). At least one shaft **2072** may be configured to move transversely up to about 45.7 cm (18.0 in.). At least one shaft **2072** may be configured to move any distance transversely, including less than about 45.7 cm (18.0 in.) and greater than about 45.7 cm (18.0 in.).

[0089] At least one shaft **2072** may be connected to at least one rotary blade, including for example at least one of rotary blade **2074**, **2076**, and **2078**. At least one shaft **2072** may be connected to any number of rotary blades, including less than three rotary blades and greater than three rotary blades. At least one shaft **2072** may be directly connected to at least one rotary blade, including for example at least one of rotary blade **2074**, **2076**, and **2078**. At least one shaft **2072** may be indirectly connected, through a gear train, pulley system, transmission, or the like, to at least one rotary blade, including for example at least one of rotary blade **2074**, **2076**, and **2078**.

[0090] Rotary blade **2074** may include any diameter able to fit within decoating mill tank **2022**. Rotary blade **2074** may have a diameter of about 71.1 cm (28.0 in.). Rotary blade **2074** may have a diameter less than about 71.1 cm (28.0 in.) or greater than about 71.1 cm (28.0 in.).

[0091] Rotary blade **2074** may operate at any of a variety of RPMs, and may have any of a variety of blade tip speeds. Rotary blade **2074** may have a range of blade tip speeds between about 1,303.1 meter per minute ("mpm") (51,304.0 inch per minute ("ipm")) and about 1,528.9 mpm (60,192.0 ipm). Rotary blade **2074** may have blade tip speeds less than about 1,303.1 mpm (51,304.0 ipm) and greater than about 1,528.9 mpm (60,192.0 ipm). Rotary blade **2074** may have a range of blade tip speeds between about 1,787.4 mpm (70,371.7 ipm) and about 4,021.7 mpm (158,336.3 ipm). Rotary blade **2074** may have a range of blade tip speeds between about 1,303.1 mpm (51,304.0 ipm) and about 4,021.7 mpm (158,336.3 ipm). Rotary blade **2074** may have a range of blade tip speeds between about 1,528.9 mpm (60,192.0 ipm) and about 1,787.4 mpm (70,371.7 ipm). Rotary blade **2074** may have a range of blade tip speeds between about 1,528.9 mpm (60,192.0 ipm) and about 4,021.7 mpm (158,336.3 ipm). Rotary blade **2074** may have a range of blade tip speeds between about 1,303.1 mpm (51,304.0 ipm) and about 1,787.4 mpm (70,371.7 ipm).

[0092] Rotary blade **2074** may be mechanically coupled to shaft **2072**. Rotary blade **2074** may be configured to move vertically up to about 121.9 cm (48.0 in.). Rotary blade **2074** may be oriented between about 25.4 cm (10.0 in.) and about 147.3 cm (58 in.) from the top of decoating mill tank **2022**. Rotary blade **2074** may be configured to move transversely up to about 45.7 cm (18.0 in.).

[0093] Rotary blade **2076** may include any diameter able to fit within decoating mill tank **2022**. Rotary blade **2076** may have a diameter of about 71.1 cm (28.0 in.). Rotary blade **2076** may have a diameter less than about 71.1 cm (28.0 in.) or greater than about 71.1 cm (28.0 in.).

[0094] Rotary blade **2076** may operate at any of a variety of RPMs, and may have any of a variety of blade tip speeds. Rotary blade **2076** may have a range of blade tip speeds between about 1,303.1 mpm (51,304.0 ipm) and about 1,528.9 mpm (60,192.0 ipm). Rotary blade **2076** may have blade tip speeds less than about 1,303.1 mpm (51,304.0 ipm) and greater than about 1,528.9 mpm (60,192.0 ipm). Rotary blade **2076** may have a range of blade tip speeds between about 1,787.4 mpm (70,371.7 ipm) and about 4,021.7 mpm (158,336.3 ipm). Rotary blade **2076** may have a range of blade tip speeds between about 1,303.1 mpm (51,304.0 ipm) and about 4,021.7 mpm (158,336.3 ipm). Rotary blade **2076** may have a range of blade tip speeds between about 1,528.9 mpm (60,192.0 ipm) and about 1,787.4 mpm (70,371.7 ipm). Rotary blade **2076** may have a range of blade tip speeds between about 1,528.9 mpm (60,192.0 ipm) and about 4,021.7 mpm (158,336.3 ipm). Rotary blade **2076** may have a range of blade tip speeds between about 1,303.1 mpm (51,304.0 ipm) and about 1,787.4 mpm (70,371.7 ipm).

[0095] Rotary blade **2076** may be mechanically coupled to shaft **2072**. Rotary blade **2076** may be configured to move vertically up to about 121.9 cm (48.0 in.). Rotary blade

2076 may be oriented about 106.7 cm (42.0 in.) below rotary blade **2074** on shaft **2072**. Rotary blade **2076** may be oriented less than about 106.7 cm (42.0 in.) or greater than about 106.7 cm (42.0 in.) below rotary blade **2074** on shaft **2072**. Rotary blade **2076** may be oriented between about 132.08 cm (52.0 in.) and about 254.0 cm (100.0 in.) from the top of decoating mill tank **2022**. Rotary blade **2076** may be configured to move transversely up to about 45.7 cm (18.0 in.).

[0096] Rotary blade **2078** may include any diameter able to fit within decoating mill tank **2022**. Rotary blade **2078** may have a diameter of about 76.2 cm (30.0 in.). Rotary blade **2078** may have a diameter less than about 76.2 cm (30.0 in.) or greater than about 76.2 cm (30.0 in.). Rotary blade **2078** may be oriented below one or both of rotary blade **2074** and rotary blade **2076**. Rotary blade **2078** may have a greater diameter than one or both of rotary blade **2074** and rotary blade **2076**. Rotary blade **2078** may be larger than, and positioned relative to, rotary blade **2074** and rotary blade **2076** to facilitate increased movement of material within decoating mill **2018**.

[0097] Rotary blade **2078** may operate at any of a variety of RPMs, and may have any of a variety of blade tip speeds. Rotary blade **2078** may have a range of blade tip speeds between about 1,406.8 mpm (55,385.0 ipm) and about 1,650.5 mpm (64,980.0 ipm). Rotary blade **2078** may have blade tip speeds less than about 1,406.8 mpm (55,385.0 ipm) and greater than about 1,650.5 mpm (64,980.0 ipm). Rotary blade **2078** may have a range of blade tip speeds between about 1,915.1 mpm (75,398.2 ipm) and about 4,309.0 mpm (169,646.0 ipm). Rotary blade **2078** may have a range of blade tip speeds between about 1,395.6 mpm (54,947.0 ipm) and about 4,309.0 mpm (169,646.0 ipm). Rotary blade **2078** may have a range of blade tip speeds between about 1,637.4 mpm (64,466.0 ipm) and about 1,915.1 mpm (75,398.2 ipm). Rotary blade **2078** may have a range of blade tip speeds between about 1,637.4 mpm (64,466.0 ipm) and about 4,309.0 mpm (169,646.0 ipm).

Rotary blade **2078** may have a range of blade tip speeds between about 1,395.6 mpm (54,947.0 ipm) and about 1,915.1 mpm (75,398.2 ipm).

[0098] Rotary blade **2078** may be mechanically coupled to shaft **2072**. Rotary blade **2078** may be configured to move vertically up to about 121.9 cm (48.0 in.). Rotary blade **2078** may be oriented about 106.7 cm (42.0 in.) below rotary blade **2076** on shaft **2072**. Rotary blade **2078** may be oriented less than about 106.7 cm (42.0 in.) or greater than about 106.7 cm (42.0 in.) below rotary blade **2076** on shaft **2072**. Rotary blade **2078** may be oriented between about 238.8 cm (94.0 in.) and about 360.7 cm (142.0 in.) from the top of decoating mill tank **2022**. Rotary blade **2078** may be oriented between about 160.0 cm (63.0 in.) and about 38.1 cm (15.0 in.) from the bottom of decoating mill tank **2022**. Rotary blade **2078** may be configured to move transversely up to about 45.7 cm (18.0 in.).

[0099] Decoating mill tank **2022** may include an outlet **2080**. Outlet **2080** may be oriented at or near the bottom of decoating mill tank **2022**. Outlet **2080** may have any of a variety of diameters as may be necessary to achieve desired material flow rate, material size, size of decoating mill tank **2022**, and the like. Outlet **2080** may have a diameter of about 10.2 cm (4.0 in.). Outlet **2080** may have a diameter of less than about 10.2 cm (4.0 in.) or greater than about 10.2 cm (4.0 in.).

[00100] A pump inlet line **2082** may connect outlet **2080** to a pump **2084**. Pump inlet line **2082** may be any of a variety of diameters, including for example about 10.2 cm (4.0 in.). Pump **2084** may be configured to pump decoated slurry from within decoating mill tank **2022**. Pump **2084** may be configured to pump decoated slurry from within decoating mill tank **2022** to a screening station (such as screening station **1026** illustrated in **FIG. 1**) and/or a dewater screen (such as dewater screen **1028** illustrated in **FIG. 1**).

[00101] Pump **2084** may be any of a variety of pumps capable of pumping a decoated slurry. Pump **2084** may be an impeller pump. Pump **2084** may include an inlet having any of a variety of diameters, including for example about 10.2 cm (4.0 in.). Pump **2084** may include an outlet having any of a variety of diameters, including for example about 7.6 cm (3.0 in.).

[00102] A pump outlet line **2086** may be connected to an outlet of pump **2084**. Pump outlet line **2086** may be configured to transport decoated slurry from pump **2084** to a screening station (such as screening station **1026** illustrated in **FIG. 1**) and/or a dewater screen (such as dewater screen **1028** illustrated in **FIG. 1**). Pump outlet line **2086** may be made of any of a variety of materials, including for example a steel, a stainless steel, and the like. Pump outlet line **2086** may have any of a variety of diameters, including for example about 7.6 cm (3.0 in.).

[00103] Pump outlet line **2086** may include any of a variety of elbows, bends, and the like to direct decoated slurry from decoating mill **2018**. Pump outlet line **2086** may include long radius elbows. Pump outlet line **2086** may include elbows having a radius of at least about 76.2 cm (30.0 in.). Pump outlet line **2086** may include elbows having a radius large enough to permit desired flow rate of decoated slurry from decoating mill **2018**.

[00104] **FIGS. 6A** and **6B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 6A** and **6B** illustrate a recipe editor view for a user interface of system **1000**. The recipe editor allows one to control various inputs in system **1000**, including for example: amount of caustic to add to decoating mill tank **1022**, amount of various chemicals to add to decoating mill tank **1022** (some of which are illustrated as Chemicals A-F), rotary blade shaft horizontal and vertical positions, amounts of water to be added to decoating mill tank **1022**, amount of coated material to be

added to decoating mill tank **1022**, feed conveyor speed to add coated material to decoating mill tank **1022**, aspirator **1040** blower speed, average processing time, and the like. Once a user inputs the various values to be used, the inputs can be saved as a recipe so a user does not have to manually enter these various values again.

[00105] **FIGS. 7A** and **7B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 7A** and **7B** illustrate the various system parameters during operation of system **1000**. For example, a user can input values such as: water temperatures, rotary blade positions, flow rates of various liquids, liquid fill levels, chemical levels, shaft speeds, and the like. The individual parameters may be adjusted in through user interface.

[00106] **FIGS. 8A**, **8B**, and **8C** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 8A**, **8B**, and **8C** illustrate the system view allowing a user to monitor various properties of process chemical feed system **1062**. The various properties include, for example, chemical levels in decoating mill tank **1022**.

[00107] **FIGS. 9A** and **9B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 9A** and **9B** illustrate the system view allowing a user to monitor various properties of waste water treatment station **1046** and screen station **1026**. Properties include water temperatures, valve positions, phases, filter press positions, status of various process steps of waste water treatment station **1046** and screen station **1026**, and the like.

[00108] **FIGS. 10A** and **10B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 10A** and **10B** illustrate the system view allowing a user to monitor various properties of staging water tank

1058 and heating tank **1060**. Properties include water temperatures, water levels, pump status, valve positions, and the like.

[00109] **FIGS. 11A** and **11B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 11A** and **11B** illustrate the system view allowing a user to monitor various properties of at least one process water filter press **1052**, dump hopper **1030**, and recovery tank **1032**. Properties include water levels, valve positions, filter press positions, and the like.

[00110] **FIGS. 12A** and **12B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 12A** and **12B** illustrate the system view allowing a user to monitor various properties of dump hopper **1030**, and recovery tank **1032**, washer **1036**, dryer **1038**, aspirator **1040**, and collection containers **1042**. Properties include water levels, valve positions, status of washing, status of drying, status of aspirating, weight of collection containers **1042**, and the like.

[00111] **FIGS. 13A** and **13B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 13A** and **13B** illustrate the system view allowing a user to monitor various properties of decoating mill **1018**, dump hopper **1030**, recovery tank **1032**, staging water tank **1058**, and heating tank **1060**, particularly during a pump over operation. Properties include fluid levels, fluid temperatures, valve positions, pump status, shaft vertical positions, shaft horizontal positions, and the like.

[00112] **FIGS. 14A** and **14B** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 14A** and **14B** illustrate the system view allowing a user to monitor various properties of loading station **1002** including staging hopper **1012** and first elevator **1010**, decoating mill **1018**, and

second elevator **1024**. Properties include loading station **1002** status, staging hopper **1012** capacity, first elevator **1010** status, second elevator **1024** status, and the like.

[00113] **FIGS. 15A**, **15B**, and **15C** illustrate partial views of a control screen view used in system **1000** for removing a coating material from another material. **FIGS. 15A**, **15B**, and **15C** illustrate the system view allowing a user to monitor various properties of decoating mill **1018**, staging hopper **1012**, screen station **1026**, second elevator **1024**, and chemical feed system **1062**. Properties include staging hopper **1012** level, second elevator **1024** status, chemical feed system **1062** status and levels, screen station **1026** status, rotary blade position and RPM, valve position, pump status, and the like.

[00114] System **1000** additionally includes various platforms, structures, catwalks, and the like to allow system **1000** to be interconnected as necessary, and to maintain the relative positions of various stations during operation of system **1000**. System **1000** may be assembled on a site with the intention of system **1000** remaining stationary. Alternatively, system **1000** may be designed so as to be modular in nature, such that system **1000** can be transported via truck or rail and set up at sites as necessary.

[00115] **FIGS. 16-19** illustrate various views of a system **1000** for removing a coating material from another material. The various views of system **1000** illustrated in **FIGS. 16-19** are similar to the various views of system **1000** illustrated in **FIGS. 1-4**, but with the addition of a water separation station **16070**.

[00116] In one embodiment, system **1000** may additionally include water separation station **16070**. Water separation station **16070** may include a separation tank **16074** holding a liquid, such as, for example, water. It is understood that any liquid with appropriate characteristics may be used in the place of, or in addition to, water.

[00117] Decoated material captured in dump hopper **1030** may be directed into separation tank **16074**. Decoated material from dump hopper **1030** may be directed into separation tank

16074, including via gravity, a pump, an auger, and the like. Decoated material from dump hopper **1030** may be directed into separation tank **16074** via a pipe **16072**.

[00118] Material introduced into separation tank **16074** may be conveyed across a surface of the tank via any of a variety of conveyance mechanism, including for example, at least one transverse paddle wheel **16076**, a blower, a fluid current, or a combination thereof. Transverse paddle wheels **16076** may rotate and engage material on, near, or beneath the surface of the liquid in separation tank **16074**, so as to direct the material and/or liquid along a length of separation tank **16074**. In one embodiment, a plurality of paddle wheels **16076** may be oriented along the length of separation tank **16074**. In this manner, material on the surface of the liquid within separation tank **16074** may be conveyed from substantially one end of separation tank **16074** to another end of separation tank **16074**.

[00119] As material within separation tank **16074** is conveyed and agitated by transverse paddle wheels **16076**, materials with a density greater than the liquid within separation tank **16074** (e.g., water) will sink to the bottom of separation tank **16074**. Materials with a density less than the liquid within separation tank **16074** (e.g., water) will float at or near the surface of the liquid so as to be conveyed by transverse paddle wheels **16076**.

[00120] Materials that sink to the bottom of separation tank **16074** may be transferred via a conveyer system to a sink screener **16078**. The conveyer system may include any of a variety of conveyer systems, including for example an auger **16079**, a pump, and the like. Sink screener **16078** may further separate the liquid from materials that sink to the bottom of separation tank **16074**, such that these materials may be captured in a container and removed from system **1000**. Sink screener **16078** may strain the liquid from materials that sink to the bottom of separation tank **16074**. Materials that sink to the bottom of separation tank **16074** may be materials removed from decoated material within system **1000**. Materials that sink to the bottom of separation tank **16074** may not be recyclable and may be removed from system

1000. Materials that sink to the bottom of separation tank **16074** may simply be separated from materials that float in separation tank **16074**.

[00121] Alternatively, materials that are processed and/or dewatered by sink screener **16078** may be transferred to wash station **1034**. Materials may be transferred via any of a variety of conveyer systems, including via an auger **16080**, a conveyer belt, a pump and pipe, manually by a human or machine, and the like.

[00122] Materials with a density less than the liquid within separation tank **16074**, and which thus float upon the liquid, may continue across the surface of the liquid until the end of separation tank **16074** is reached. Materials that float in separation tank **16074** may be transferred via a conveyer system to a float screener **16082**. The conveyer system may include any of a variety of conveyer systems, including for example an auger **16083**, a pump, and the like. Float screener **16082** may separate the liquid from the materials that float in separation tank **16074**. Float screener **16082** may strain the liquid from materials that float in separation tank **16074**. The dewatered material may be transferred to a container for removal from system **1000**. The dewatered material may be transferred via a conveyer system. The conveyer system may include any of a variety of conveyer systems, including for example an auger **16084**, a conveyer belt, a pump and pipe, manually by a human or machine, and the like.

[00123] Alternatively, dewatered materials that float in the surface in separation tank **16074** may be transferred to wash station **1034** via a conveyer system, including for example, auger **16084**.

[00124] In one embodiment, the liquid within separation tank **16074** may be a water. In another embodiment, the liquid within separation tank **16074** may be a liquid other than water. The liquid in separation tank **16074** may have a density set by an operator of system **1000**. The density of the liquid within separation tank **16074** may be adjusted via any of a

variety of mechanisms. For example, salt may be added or removed from the liquid within separation tank **16074** to effect a change in the density of the liquid. In one embodiment, the liquid within separation tank **16074** may be a salt water, and the salinity levels of the salt water may be adjusted as required to obtain proper separation of decoated materials.

[00125] By adjusting the density of the liquid, an operator of system **1000** may control which materials float, and which sink, in water separation system **16070**. That is, the materials float, and sink, by virtue of the density of the material relative to the density of the liquid medium in which the materials are contained. Accordingly, raising the density of the liquid within separation tank **16074** may result in more materials floating within separation tank **16074**. Conversely, lowering the density of the liquid within separation tank **16074** may result in more materials sinking within separation tank **16074**. The density of the liquid may be adjusted to obtain a desired separation of decoated materials.

[00126] It is understood that materials that float in separation tank **16074** may be materials removed from the decoated material, may be decoated material of a lower density, or both. Likewise, it is understood that materials that sink in separation tank **16074** may be materials removed from the decoated material, may be decoated material of a higher density, or both.

[00127] In one embodiment, water separation system **16070** includes at least one of sink screener **16078** and float screener **16082**. Water separation system **16070** may include both sink screener **16078** and float screener **16082**.

[00128] To the extent that the term "includes" or "including" is used in the specification or the claims, it is intended to be inclusive in a manner similar to the term "comprising" as that term is interpreted when employed as a transitional word in a claim. Furthermore, to the extent that the term "or" is employed (e.g., A or B) it is intended to mean "A or B or both." When the applicants intend to indicate "only A or B but not both" then the term "only A or B but not both" will be employed. Thus, use of the term "or" herein is the inclusive, and not the

exclusive use. See Bryan A. Garner, A Dictionary of Modern Legal Usage 624 (2d. Ed. 1995). Also, to the extent that the terms "in" or "into" are used in the specification or the claims, it is intended to additionally mean "on" or "onto." To the extent that the term "substantially" is used in the specification or the claims, it is intended to take into consideration the degree of precision available or prudent in manufacturing. To the extent that the term "selectively" is used in the specification or the claims, it is intended to refer to a condition of a component wherein a user of the apparatus may activate or deactivate the feature or function of the component as is necessary or desired in use of the apparatus. To the extent that the term "operatively connected" is used in the specification or the claims, it is intended to mean that the identified components are connected in a way to perform a designated function. As used in the specification and the claims, the singular forms "a," "an," and "the" include the plural. Finally, where the term "about" is used in conjunction with a number, it is intended to include ± 10% of the number. In other words, "about 10" may mean from 9 to 11.

[00129] As stated above, while the present application has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art, having the benefit of the present application. Therefore, the application, in its broader aspects, is not limited to the specific details, illustrative examples shown, or any apparatus referred to. Departures may be made from such details, examples, and apparatuses without departing from the spirit or scope of the general inventive concept.

CLAIMS

1. A system for removing a coating material from another material, comprising:

a staging hopper;

a second elevator operatively connecting the staging hopper to the decoating mill;

a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank,

wherein the at least one rotary blade can translate horizontally and vertically;

a screen station having a dump hopper and a recovery tank;

a washer;

a dryer;

an aspirator;

a large waste water filter press;

at least one process water filter press;

a sanitary water filter;

a water separation system;

a staging tank;

a water heater; and

a process chemical feed system.

2. The system of claim 1, wherein the at least one rotary blade can translate about 45.7 cm relative to the decoating mill tank in a horizontal direction.

3. The system of claim 1, wherein the at least one rotary blade can translate about 121.9 cm relative to the decoating mill tank in a vertical direction.

4. The system of claim 1, wherein the at least one rotary blade includes three rotary blades.

5. The system of claim 1, a screen station further comprises a dewatering screen.

6. The system of claim 1, wherein the dump hopper and the recovery tank are separated from one another by a diagonally-extending wall.

7. The system of claim 1, further comprising a loading hopper operatively connected to the staging hopper by a first elevator.

8. The system of claim 1, wherein the process chemical feed system includes at least one scale.

9. The system of claim 1, wherein the staging hopper is operatively connected to an offloading system.

10. The system of claim 1, wherein the water separation system includes a separation tank having at least one transverse paddle wheel.

11. The system of claim 1, wherein the water separation system includes at least one of a sink screener and a float screener.

11. A system for removing a coating material from another material, comprising:

a staging hopper;

a second elevator operatively connecting the staging hopper to the decoating mill;

a decoating mill having a decoating mill tank and at least one rotary blade oriented within the decoating mill tank;

a screen station having a dump hopper, a recovery tank, and a dewatering screen,

wherein the dump hopper and the recovery tank are separated from one another by a diagonally-extending wall;

a washer;

a dryer;

an aspirator;

a large waste water filter press;

at least one process water filter press;

a sanitary water filter;

a water separation system;

a staging tank;

a water heater; and

a process chemical feed system.

12. The system of claim 11, wherein the at least one rotary blade can translate horizontally and vertically.

13. The system of claim 11, wherein the at least one rotary blade can translate about 45.7 cm relative to the decoating mill tank in a horizontal direction.

14. The system of claim 11, wherein the at least one rotary blade can translate about 121.9 cm relative to the decoating mill tank in a vertical direction.

15. The system of claim 11, wherein the at least one rotary blade includes three rotary blades.

16. The system of claim 11, further comprising a loading hopper operatively connected to the staging hopper by a first elevator.

17. The system of claim 11, wherein the staging hopper is operatively connected to an offloading system.

18. The system of claim 11, wherein the at least one rotary blade is operatively connected to a motor, the motor having about 300 hp.

19. The system of claim 11, wherein the water separation system includes a separation tank having at least one transverse paddle wheel.

20. The system of claim 11, wherein the water separation system includes at least one of a sink screener and a float screener.

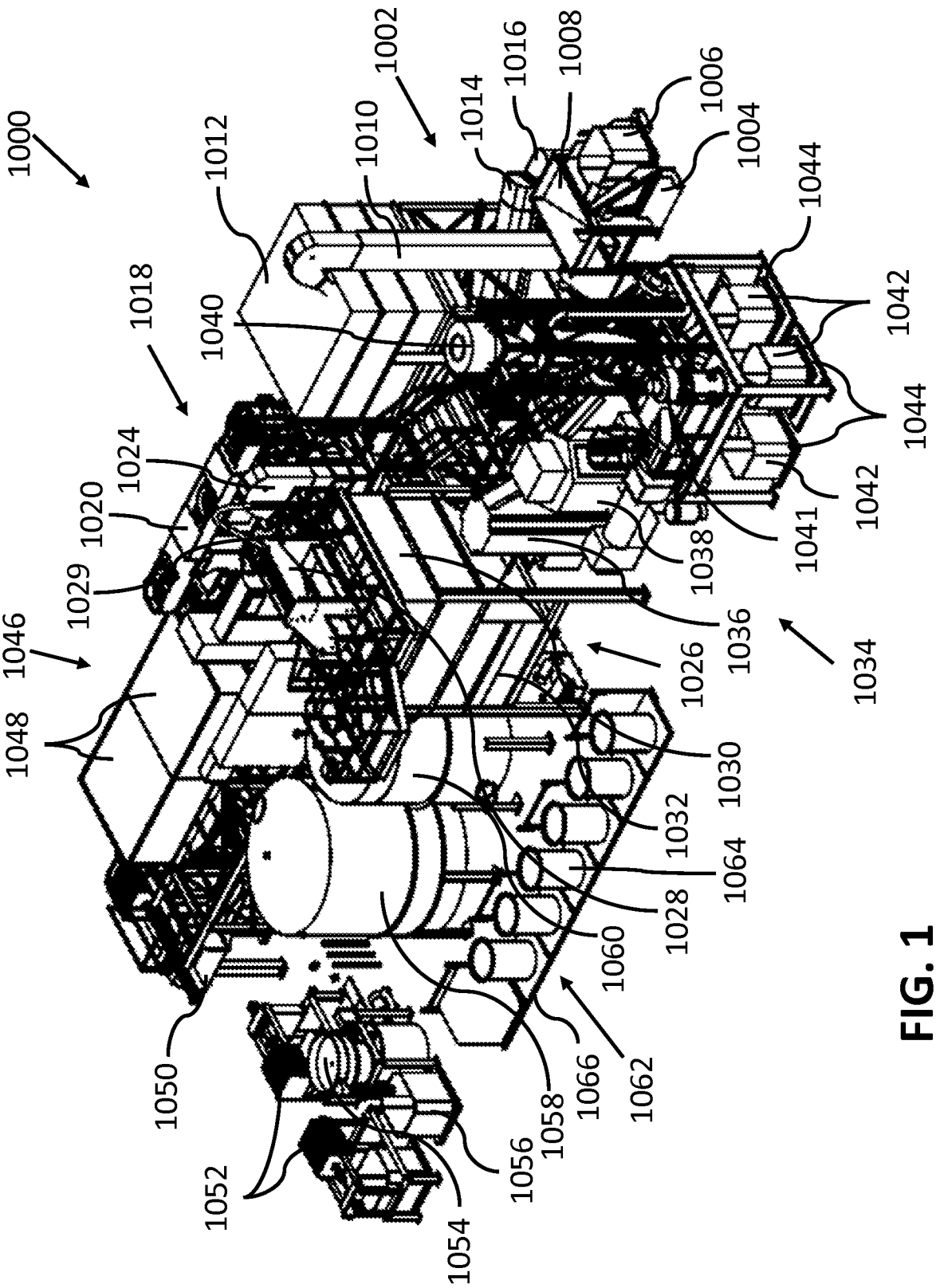
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FIG. 1

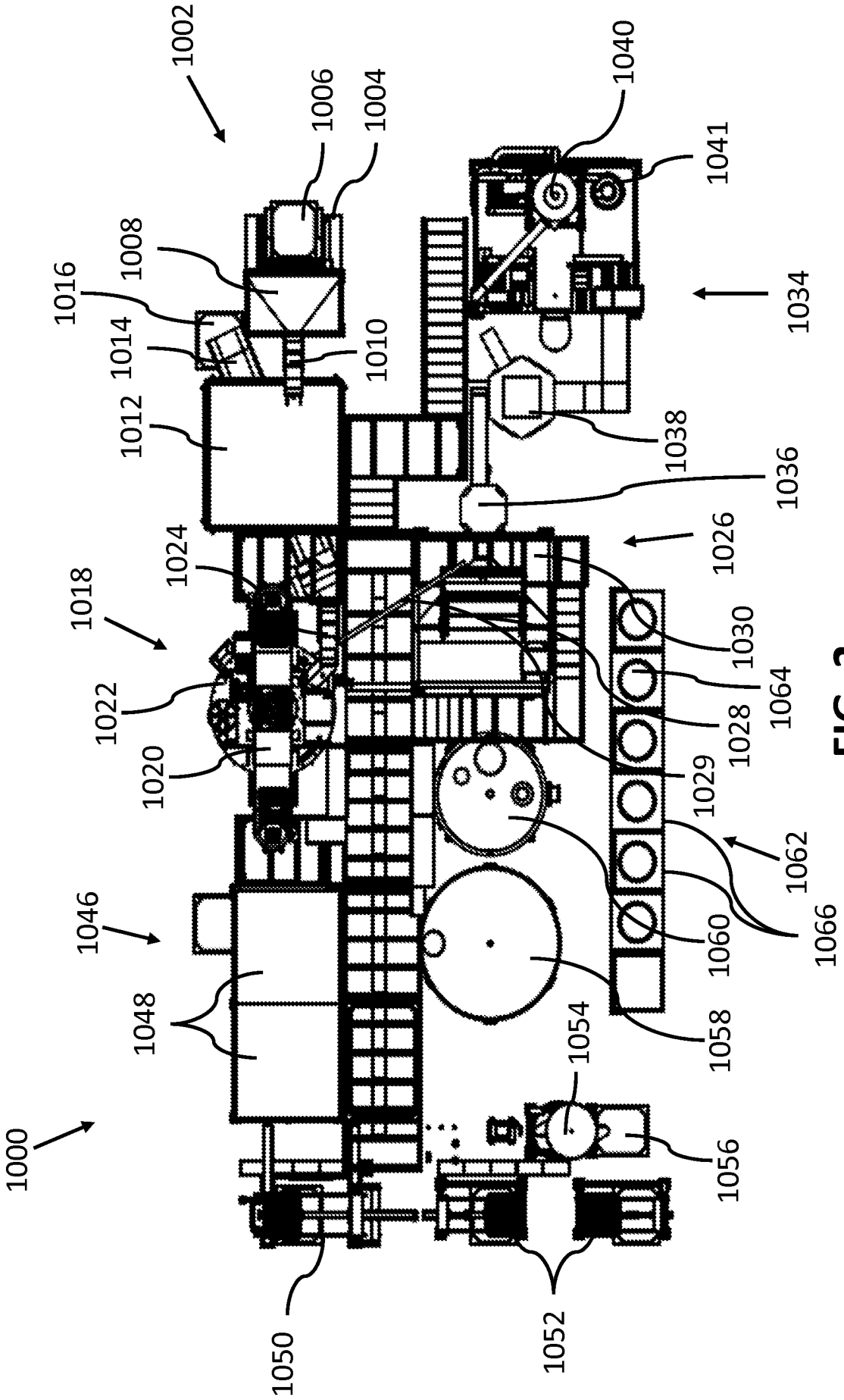
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FIG. 2

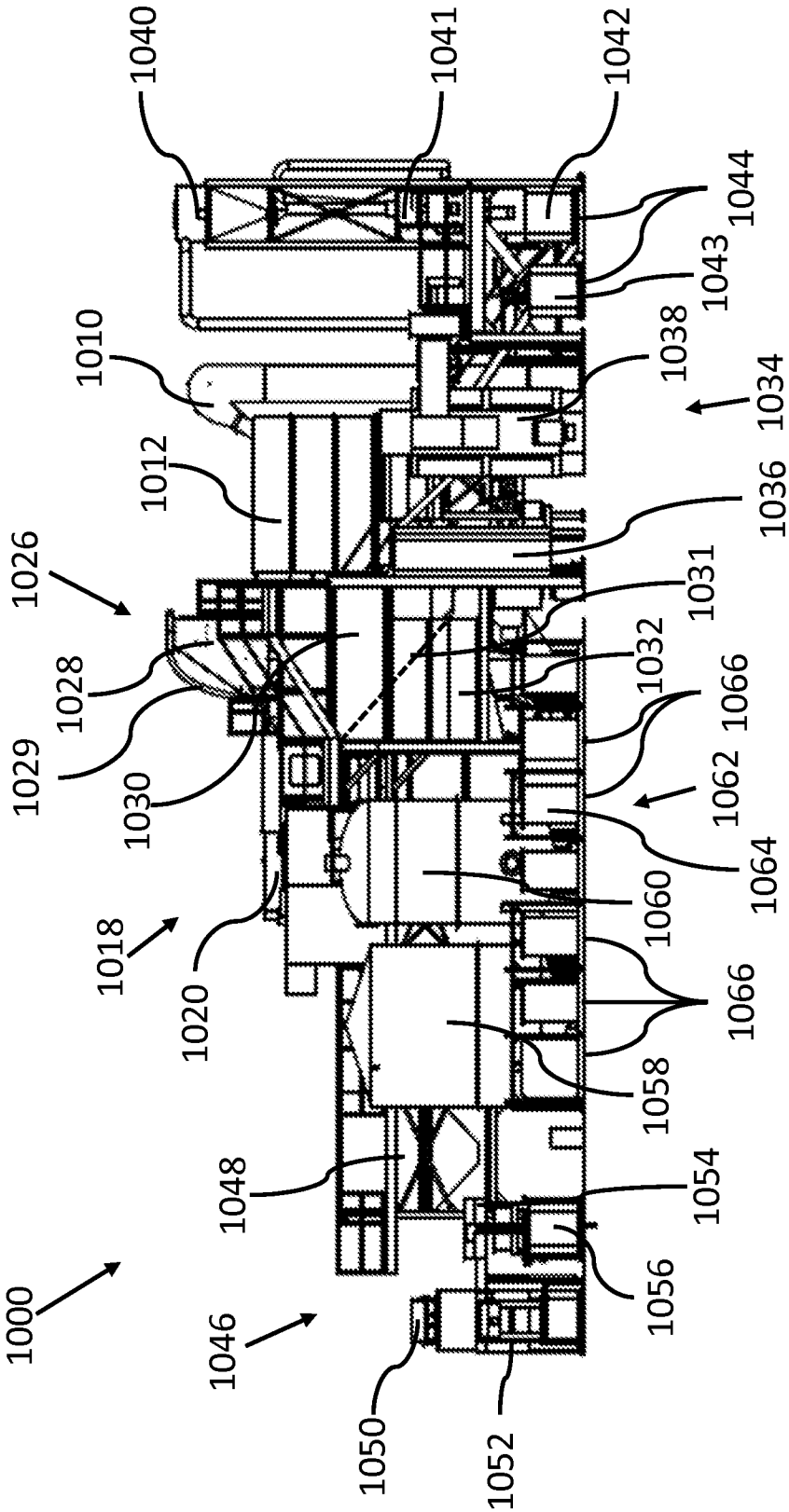
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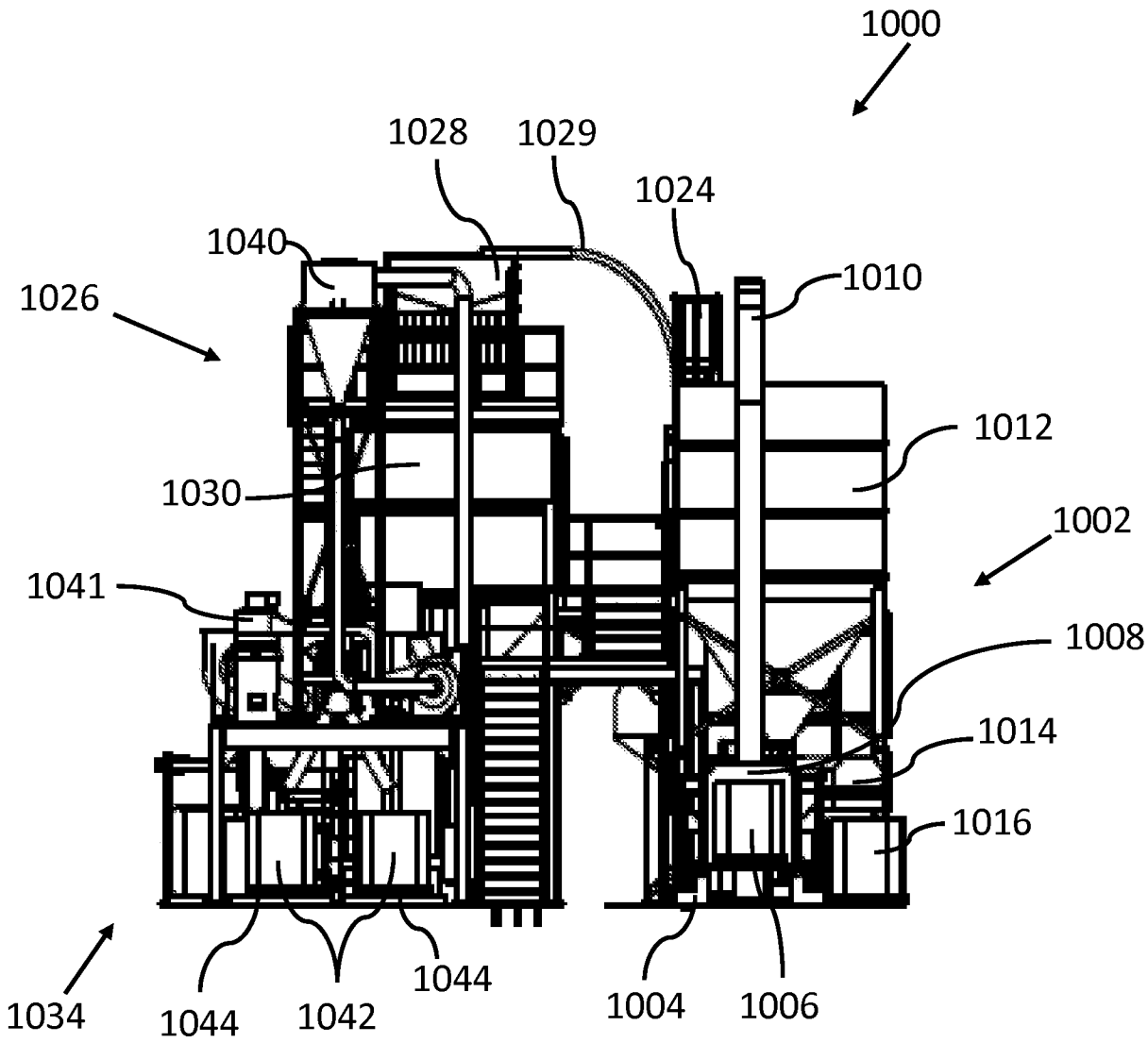
FIG. 3


1000
1028
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1024
1040
1010
1026
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1008
1014
1016
1034
1044
1042
1044
1004
1006

FIG. 4

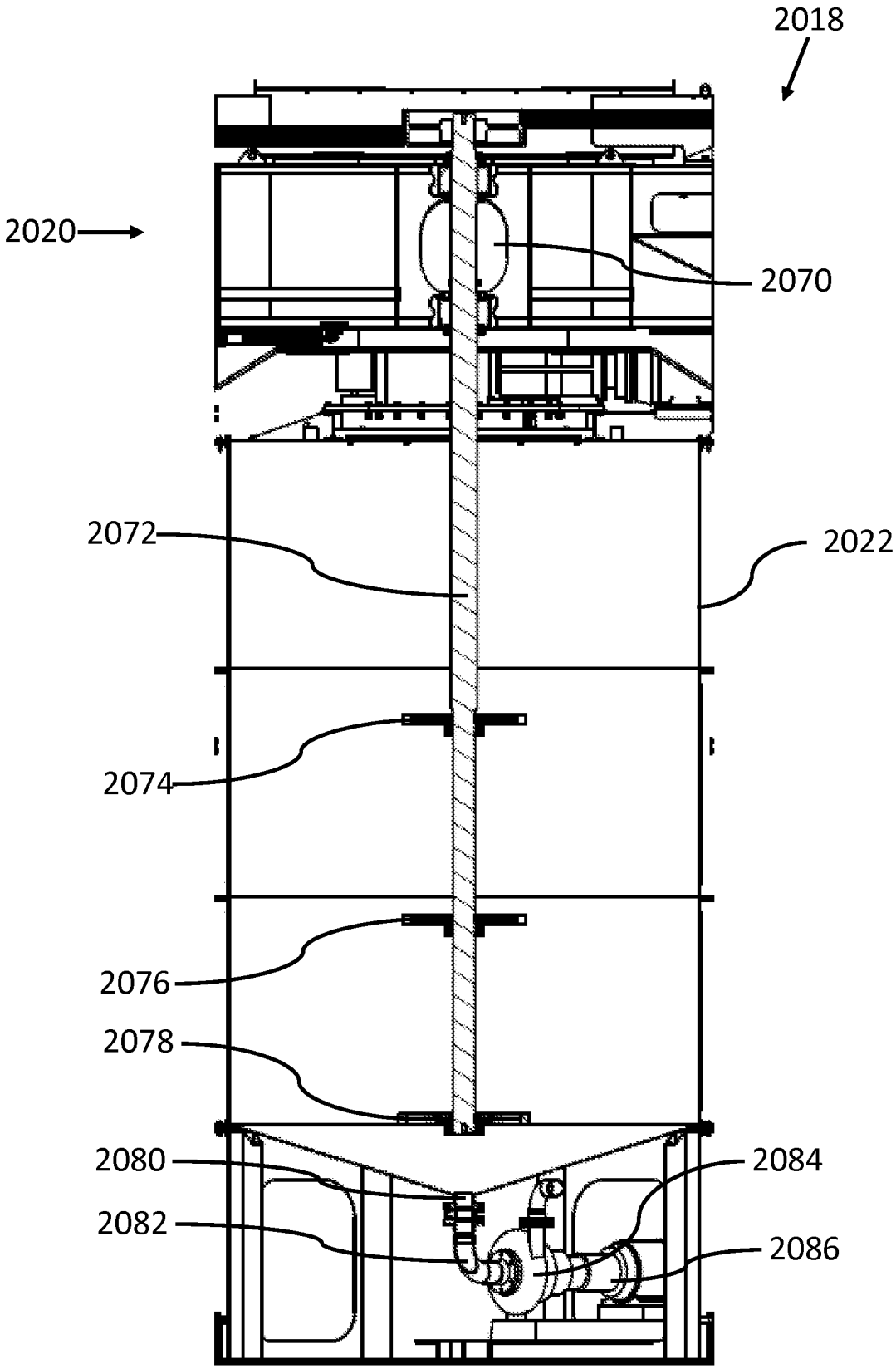


FIG. 5

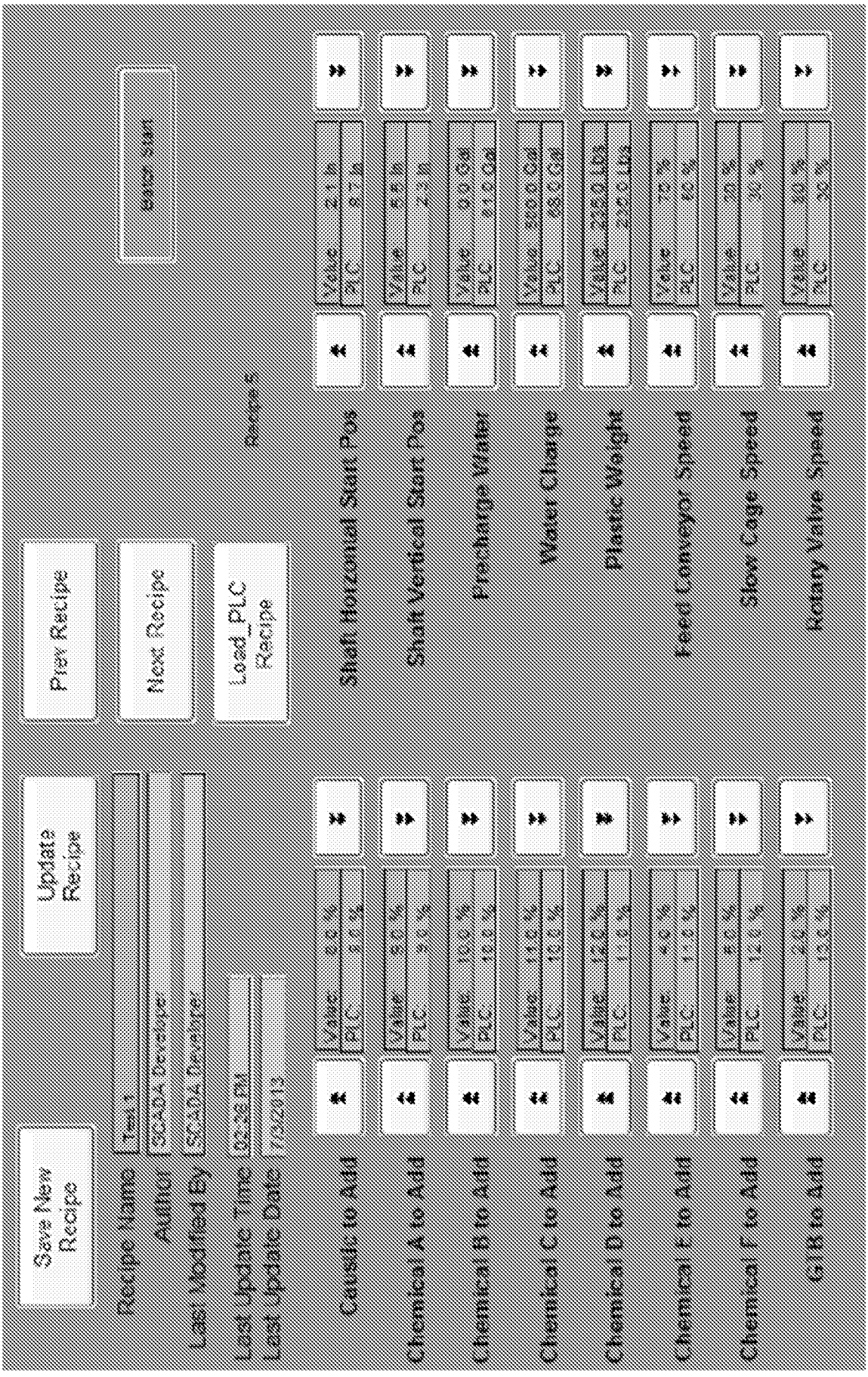

Save New Recipe
Update Recipe
Prev Recipe
Next Recipe
Load_PLC Recipe
Recipe Name
Author
Last Modified By
Last Update Time
Last Update Date
Recipe
Batch Start
Caustic to Add
Chemical A to Add
Chemical B to Add
Chemical C to Add
Chemical D to Add
Chemical E to Add
Chemical F to Add
GLR to Add
Shaft Horizontal Start Pos
Shaft Vertical Start Pos
Prechange Water
Water Charge
Plastic Weight
Feed Conveyor Speed
Slow Cage Speed
Rotary Valve Speed
Value
PLC

FIG. 6A

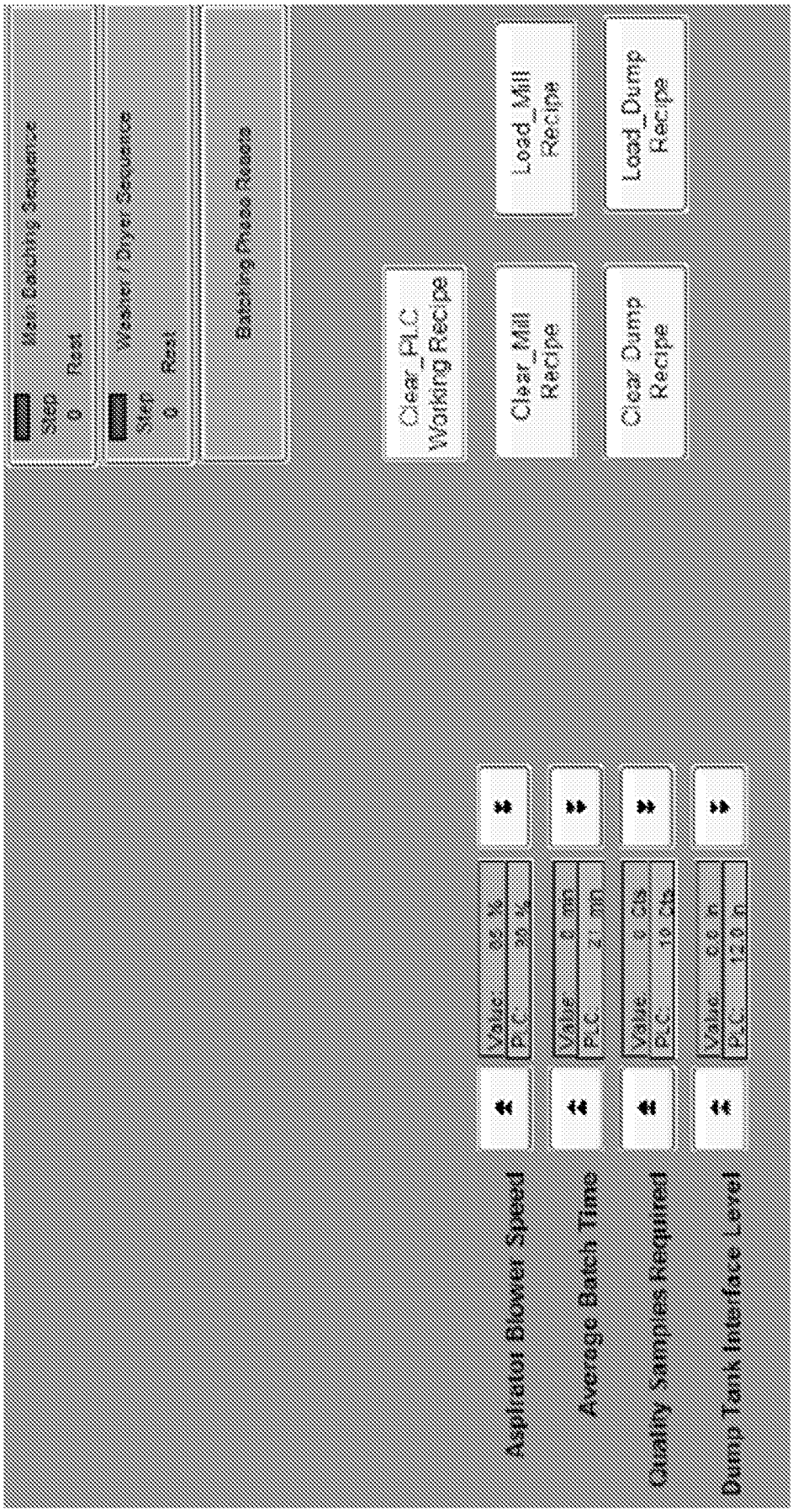

Wet Loading Sequence
Step
0
Reel
Water Dryer Sequence
Step
0
Reel
Batching Phase Recipe
Clear_PLC Waking Recipe
Clear_Mill Recipe
Clear Dump Recipe
Load_Mill Recipe
Load_Dump Recipe
Agitator Blower Speed
Value
P.C.
Average Batch Time
Value
P.C.
Quality Samples Required
Value
P.C.
Dump Tank Interface Level
Value
P.C.

FIG. 6B

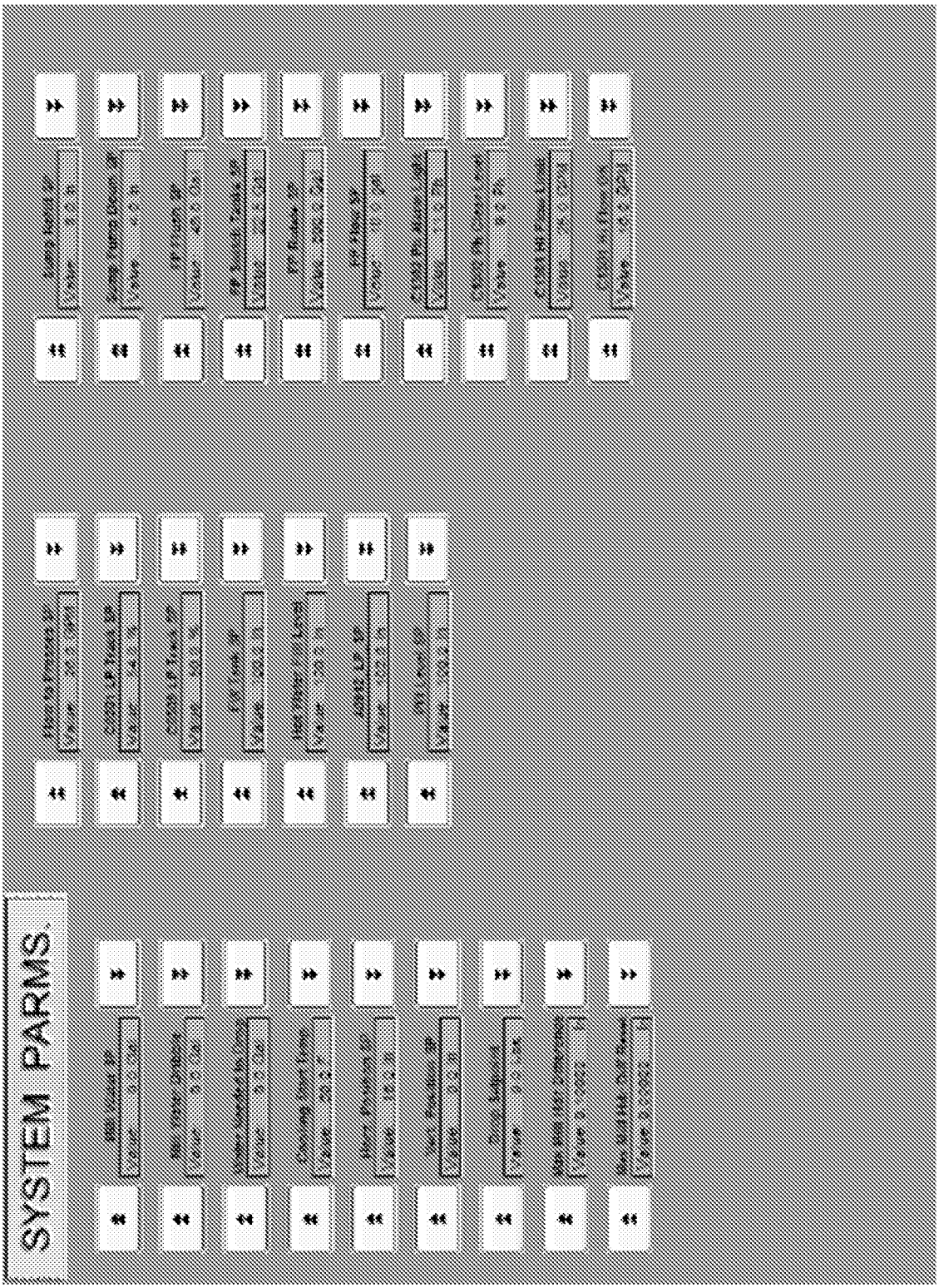


FIG. 7A

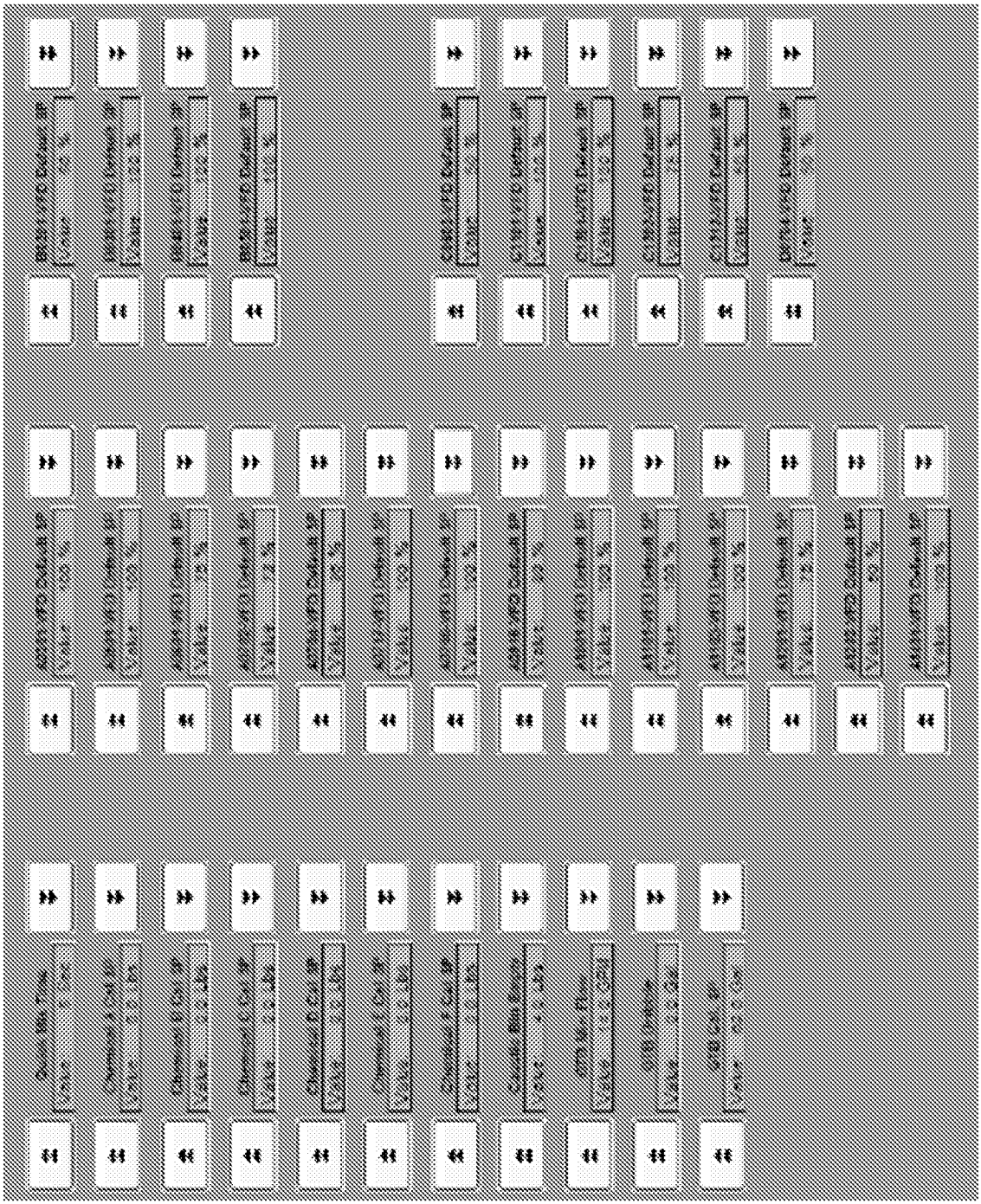


FIG. 7B

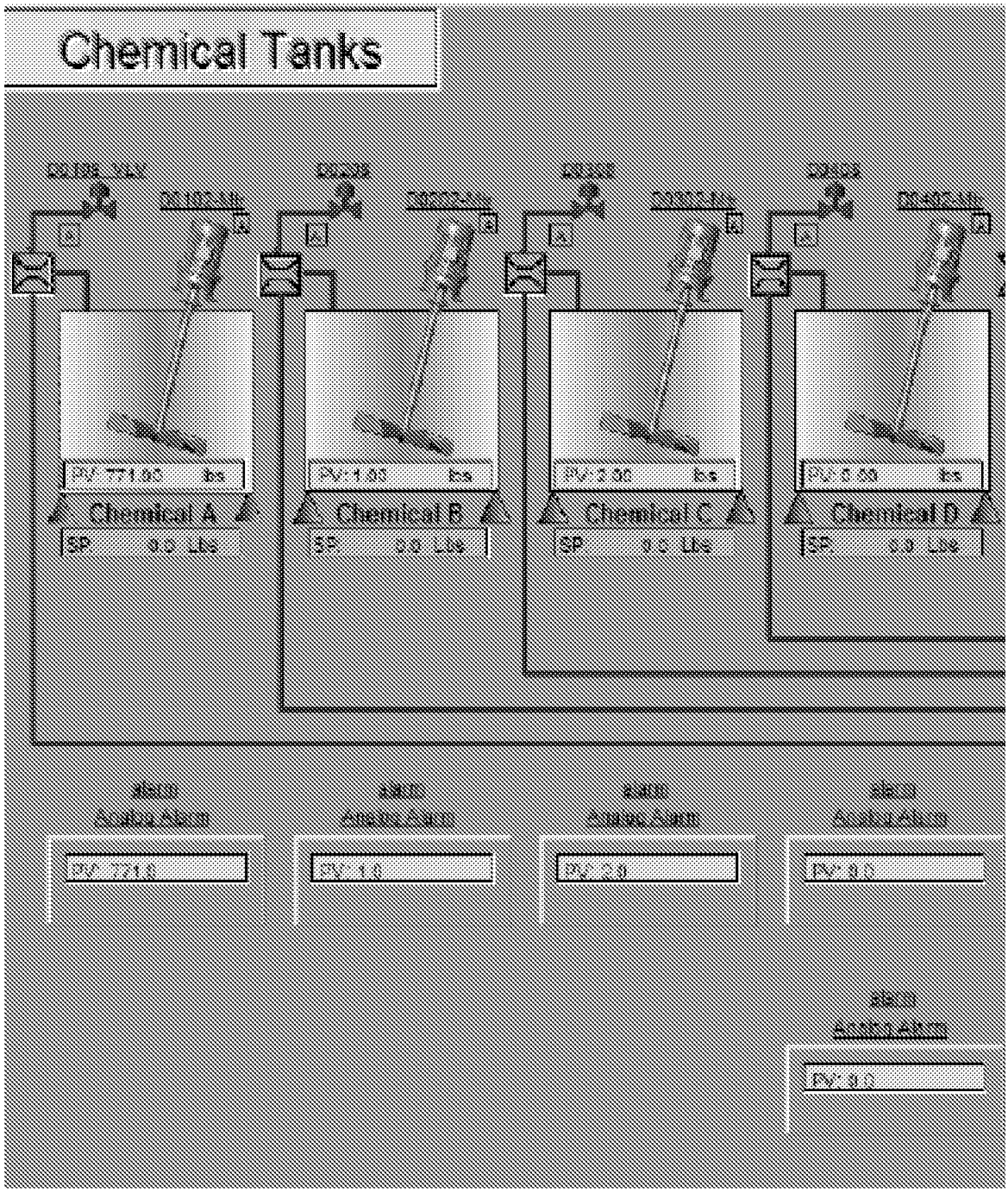


FIG. 8A

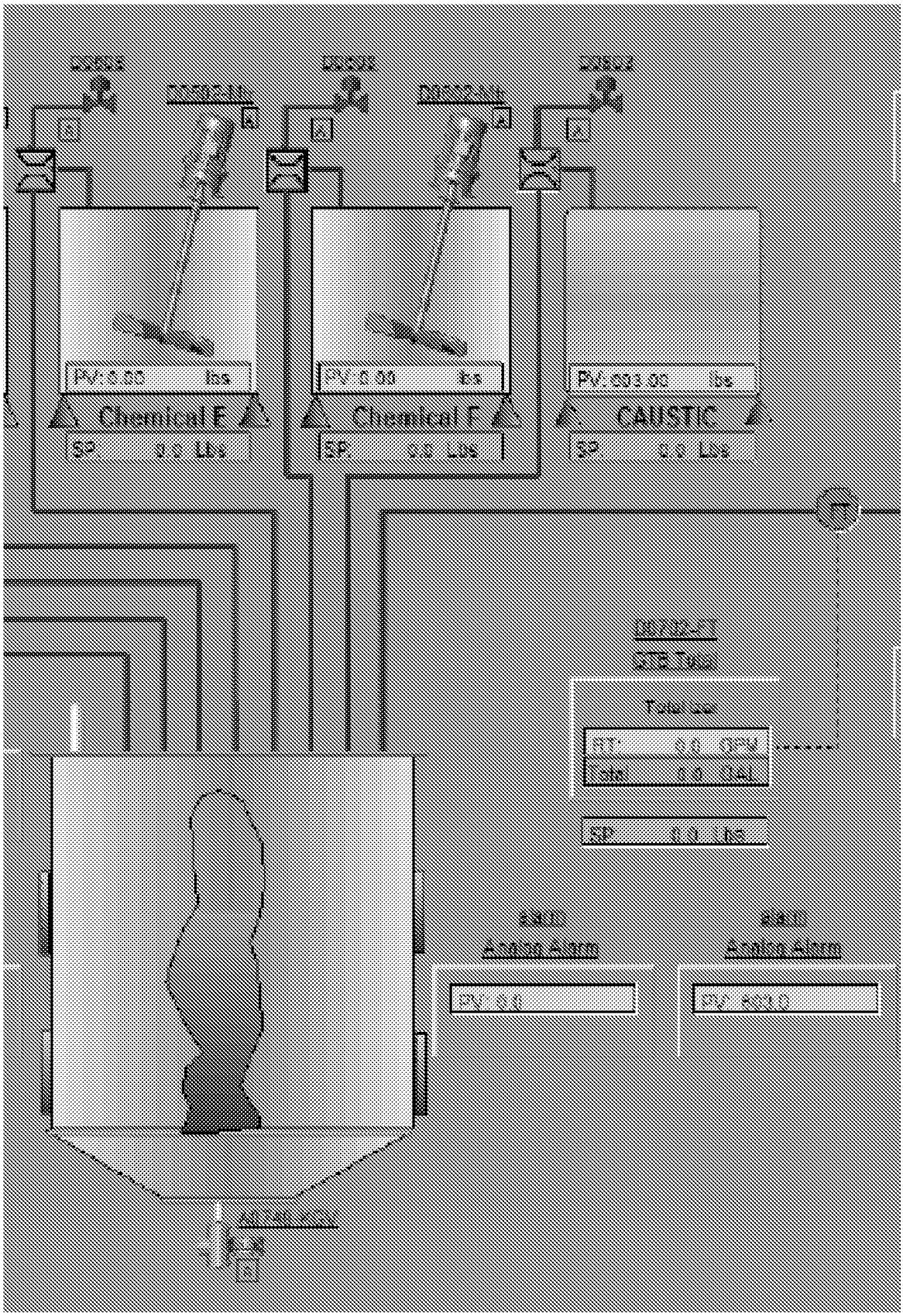


FIG. 8B

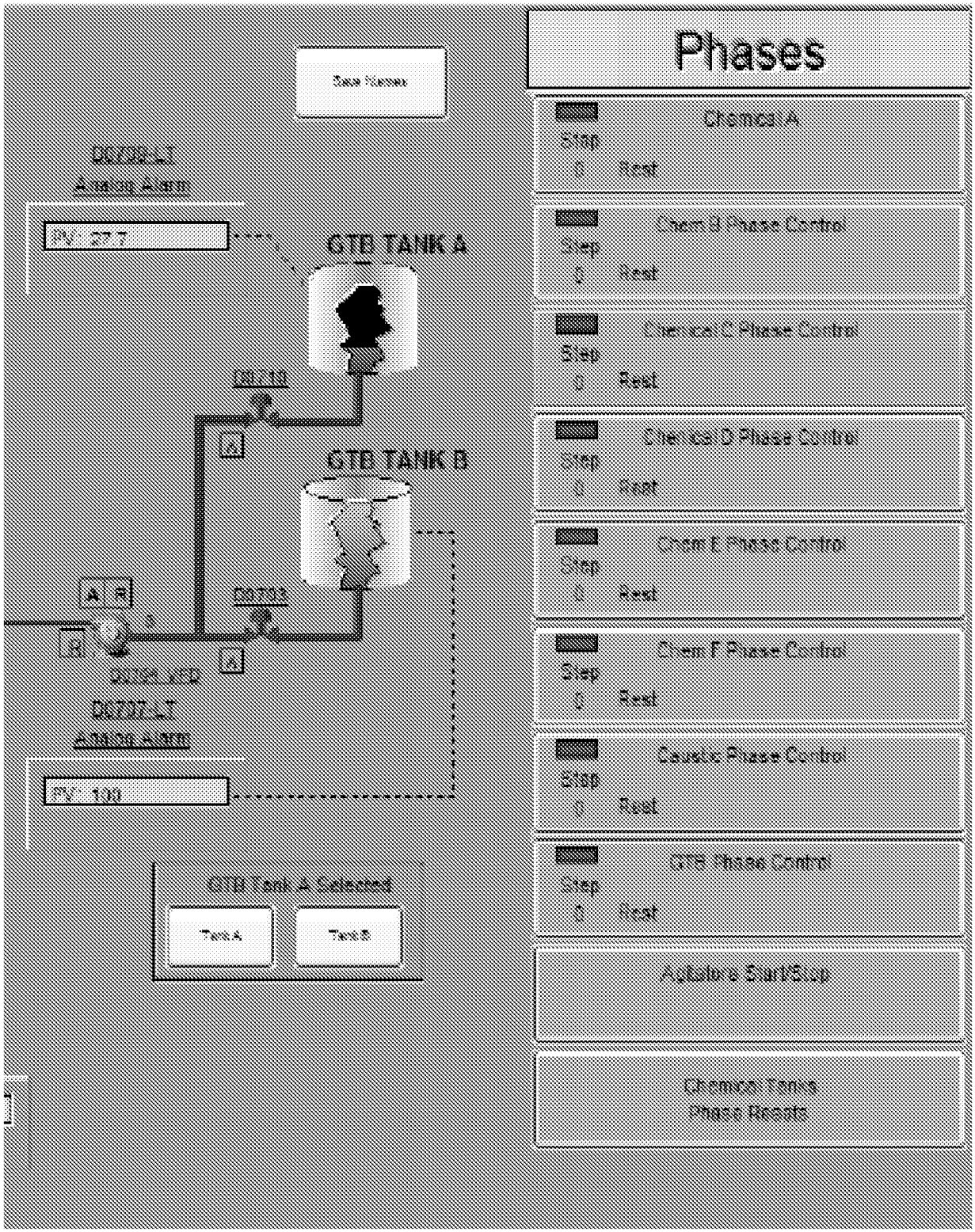

Phases
GTD TANK A
GTD TANK B
Chemical A
Step
0
Reset
Chem D Phase Control
Chemical C Phase Control
Chemical D Phase Control
Chem E Phase Control
Chem F Phase Control
Caustic Phase Control
GTB Phase Control
Automate Start/Stop
Chemical Tanks
Phase Resets

FIG. 8C

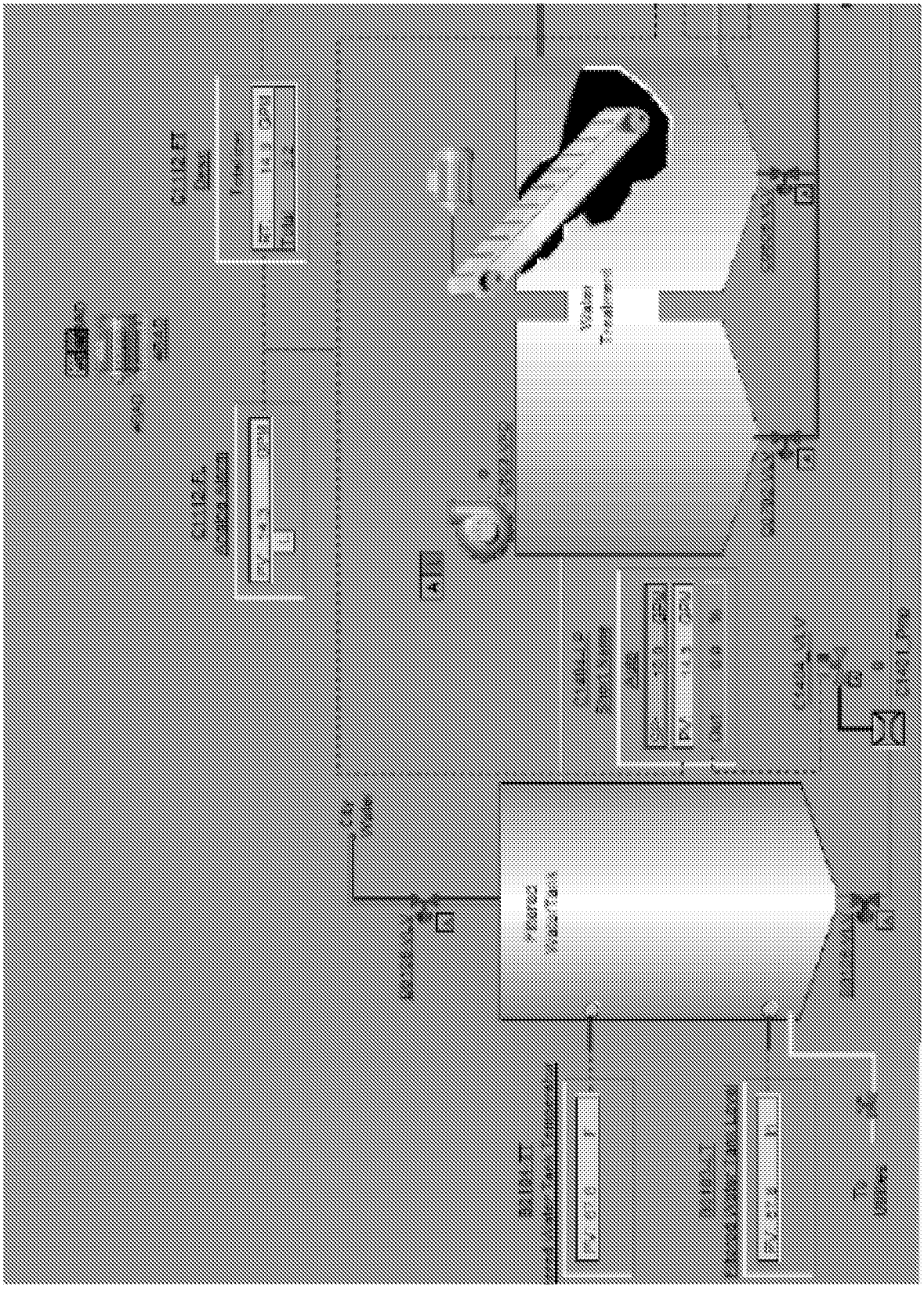


FIG. 9A

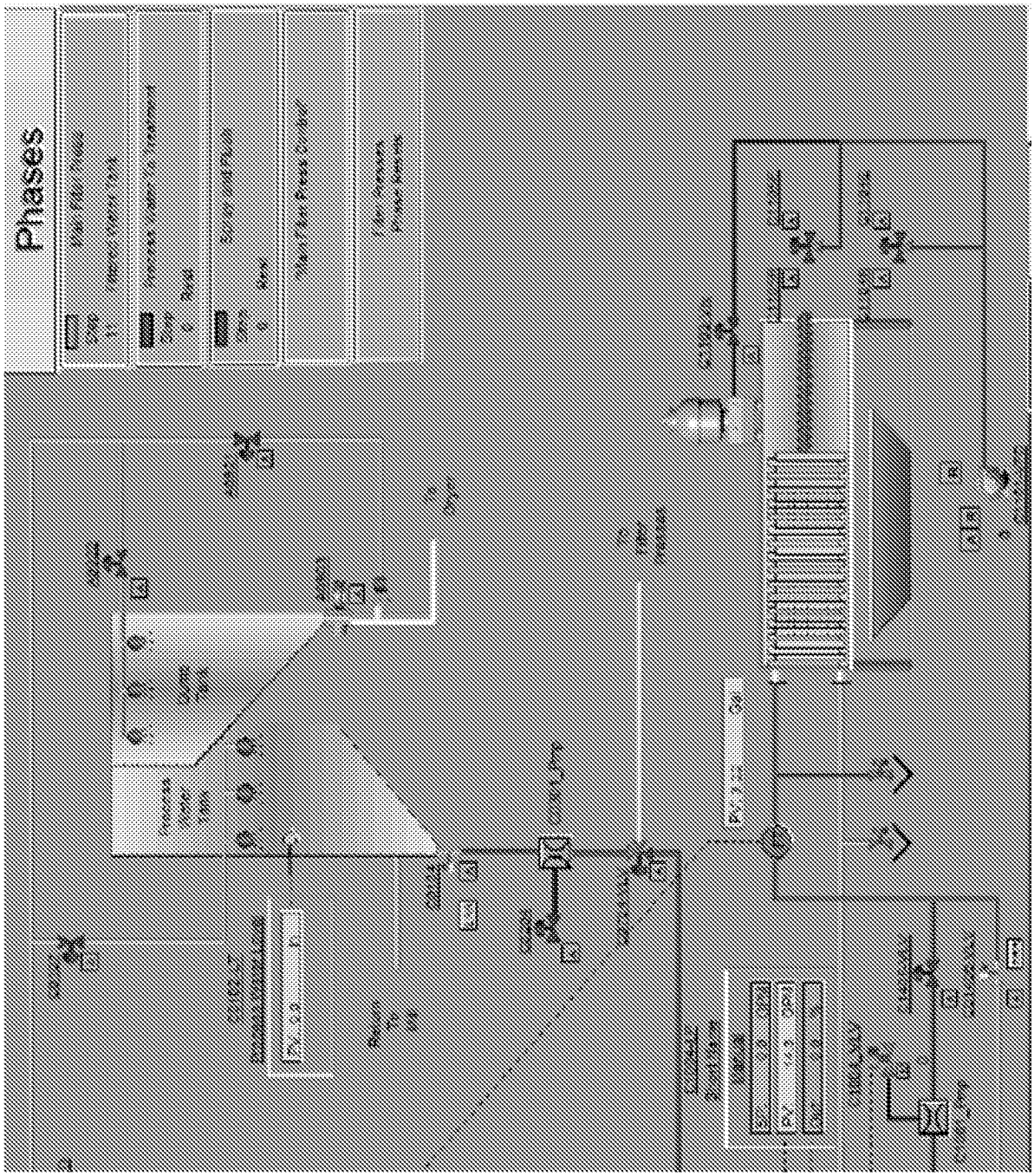


FIG. 9B

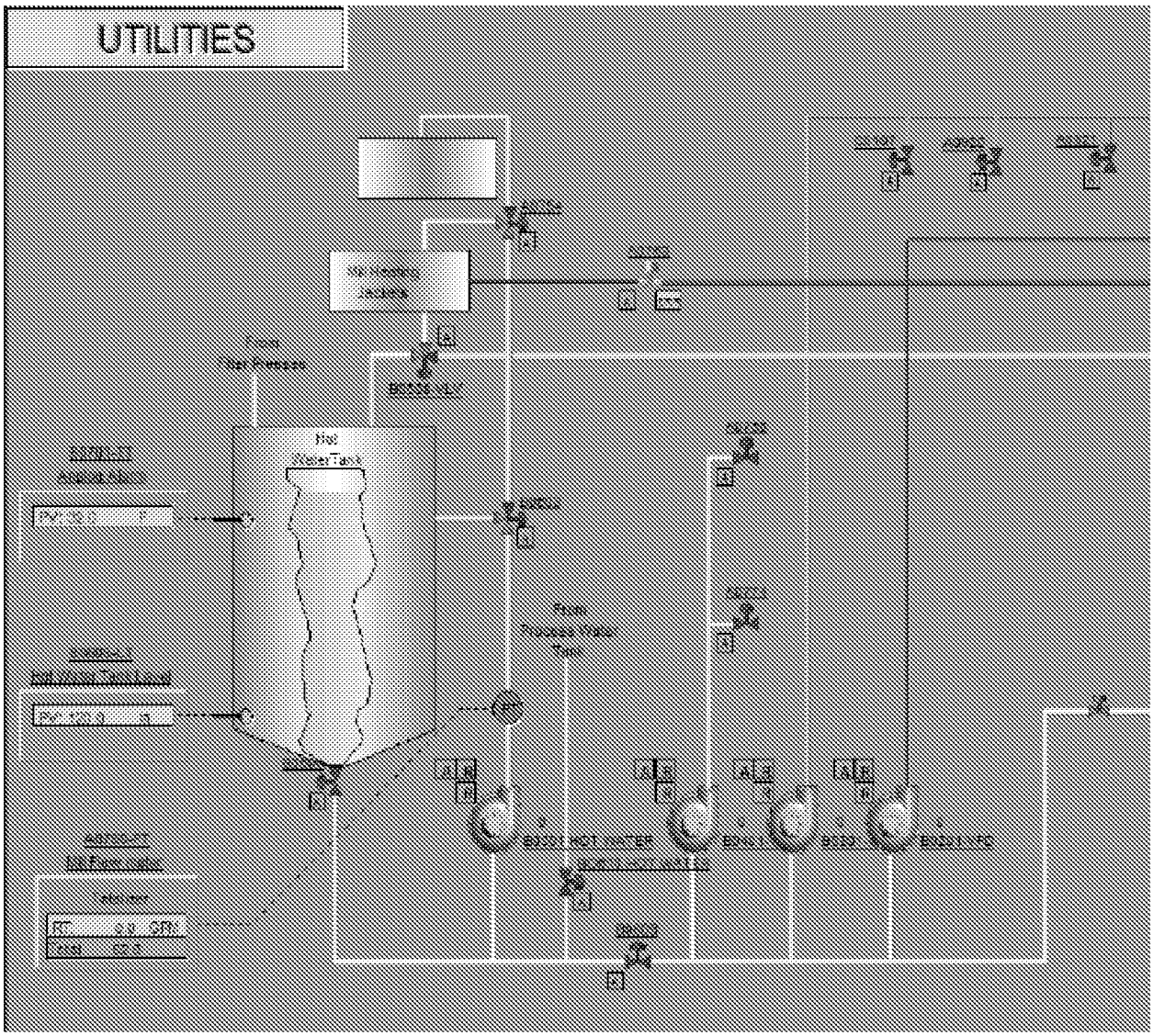


FIG. 10A

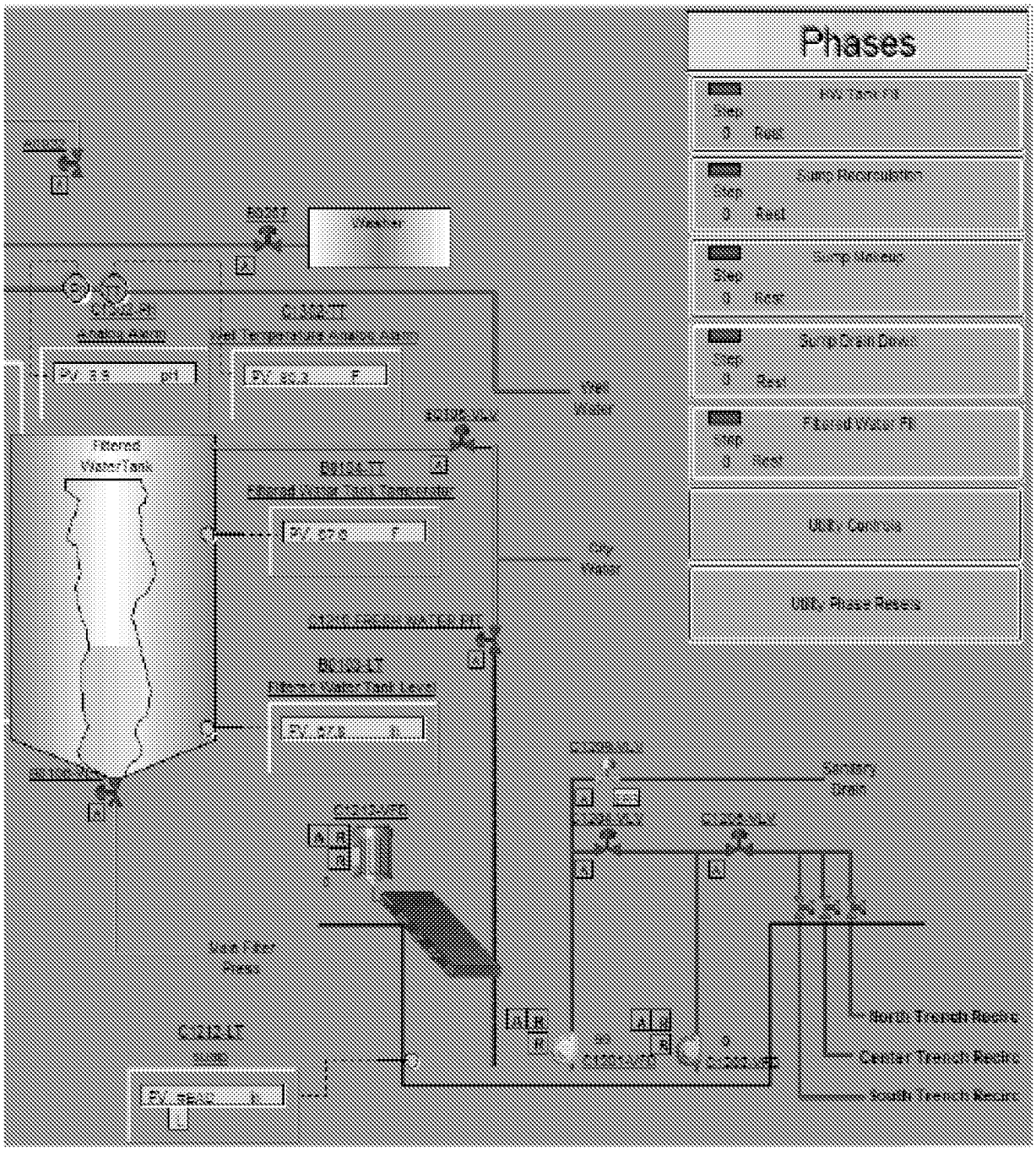

Phases
Step
Step
Step
Step
Step
Utility Controls
Utility Phase Resets
Water
Water
Sanitary Drain
North Trench Recirc
Center Trench Recirc
South Trench Recirc

FIG. 10B

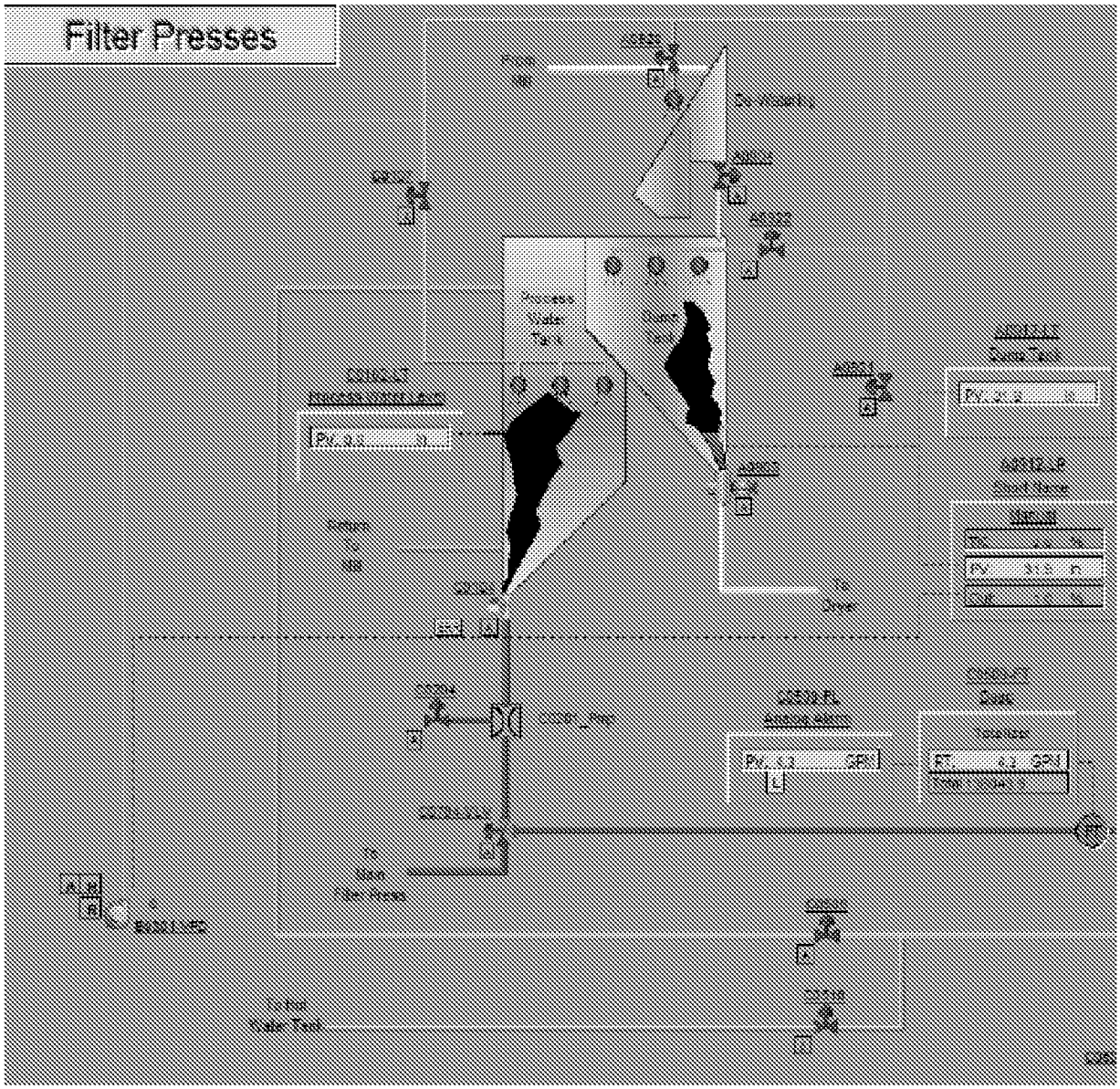


FIG. 11A

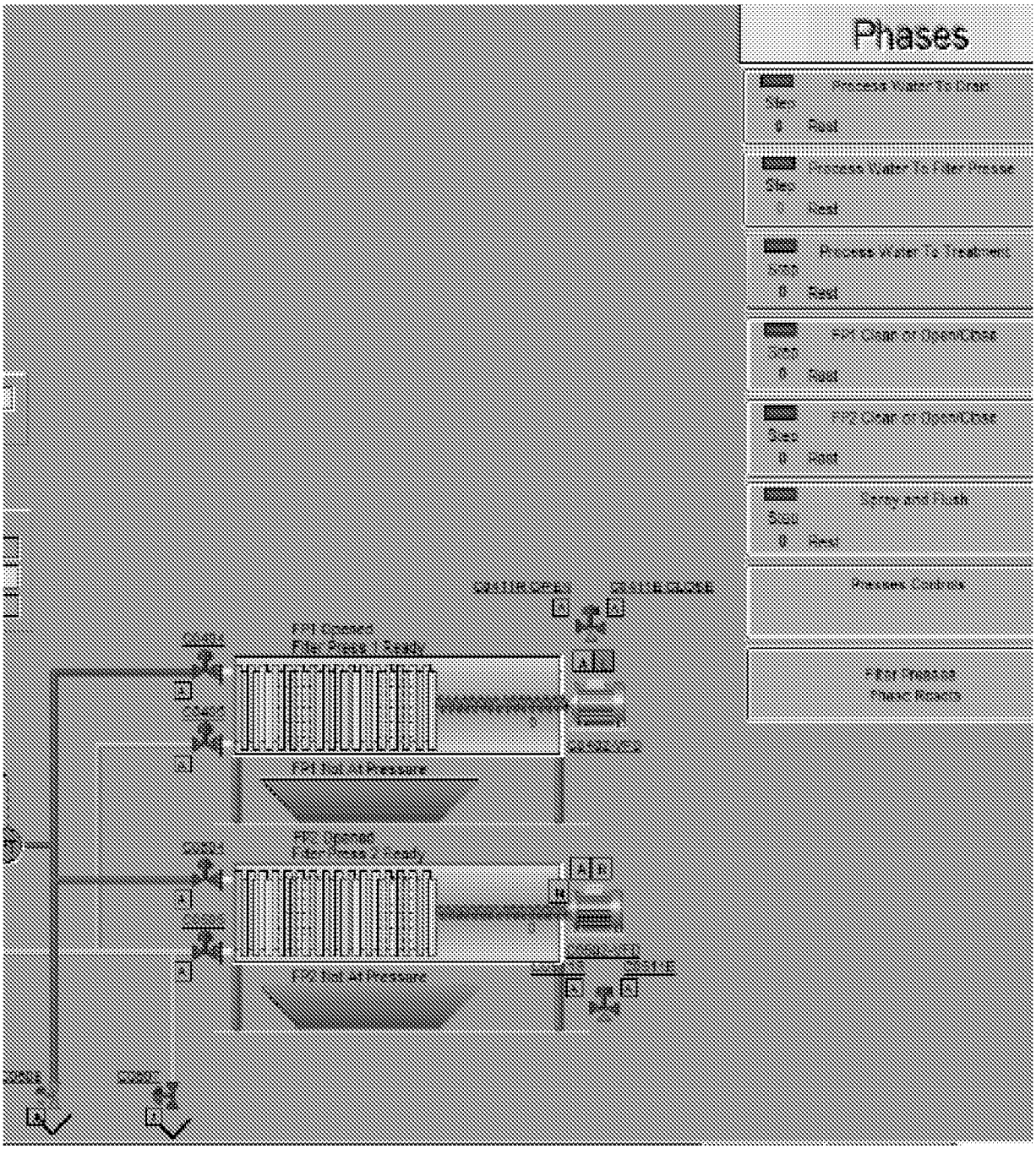


FIG. 11B

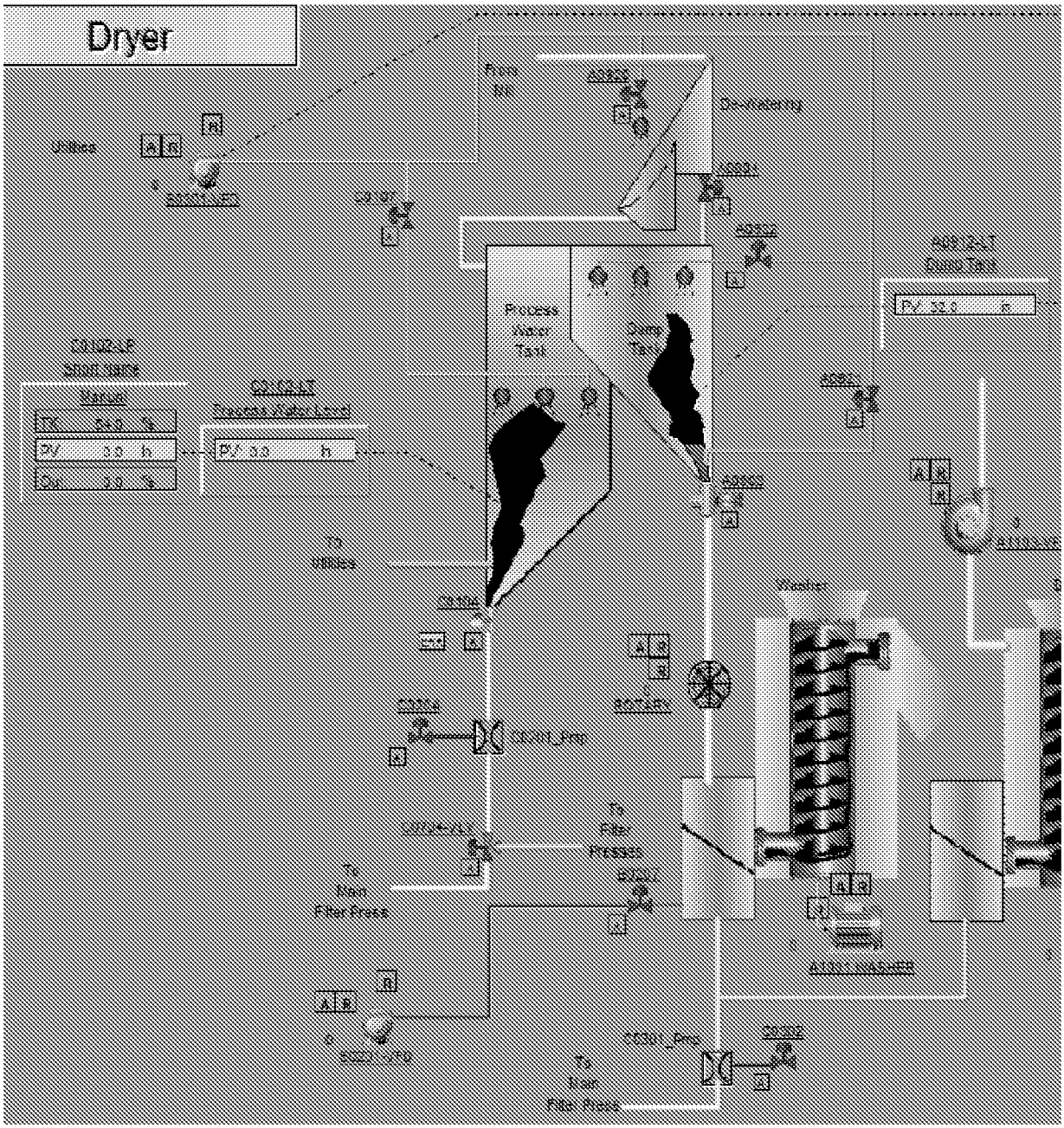


FIG. 12A

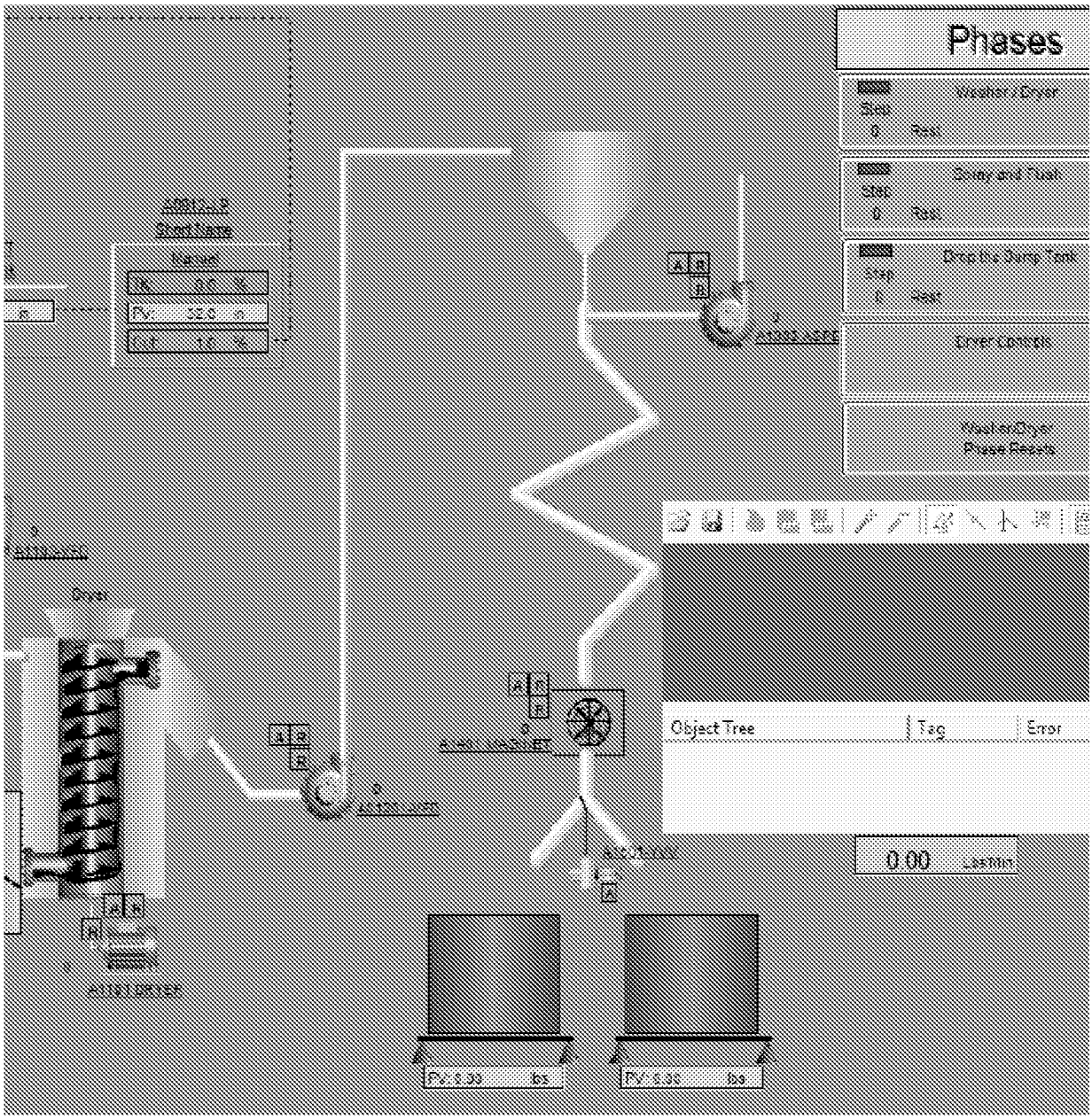


FIG. 12B

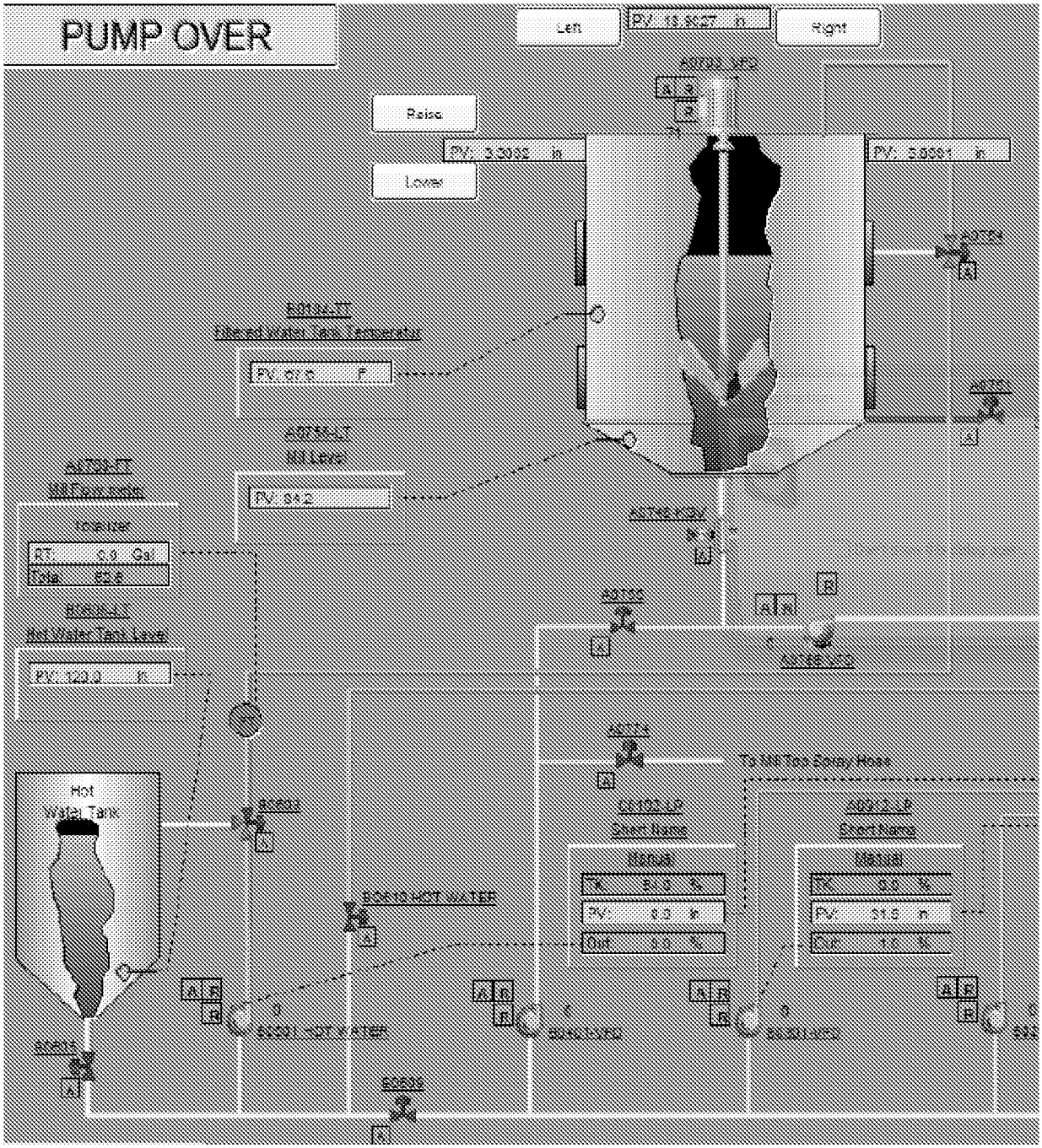

PUMP OVER
Left
Right
Raise
Lower
Hot
Water Tank
Manual
Manual

FIG. 13A

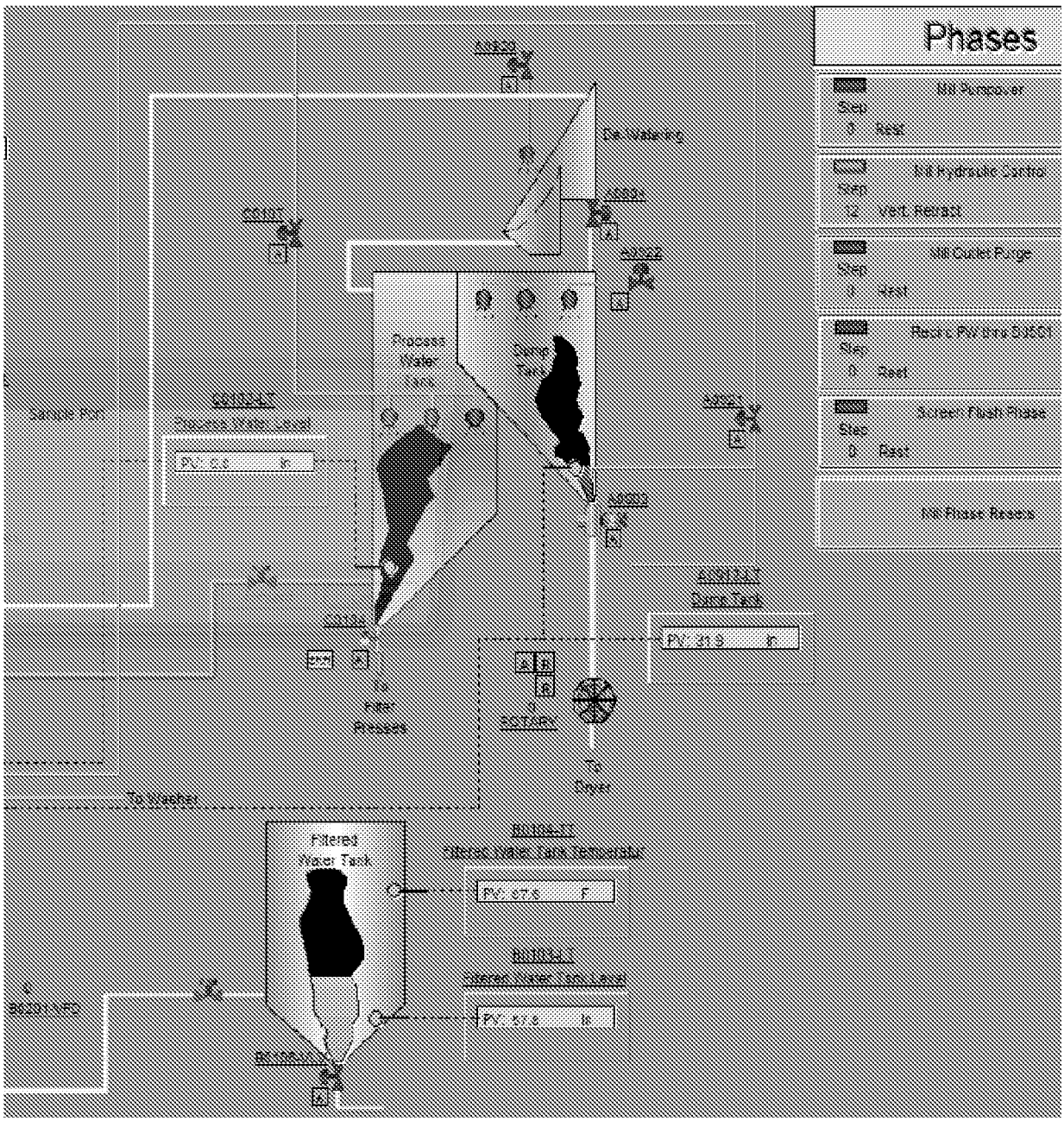

Phases
Process Water Tank
Surge Tank
Filtered Water Tank
To Dryer
To Filter Presses
To Sludge

FIG. 13B

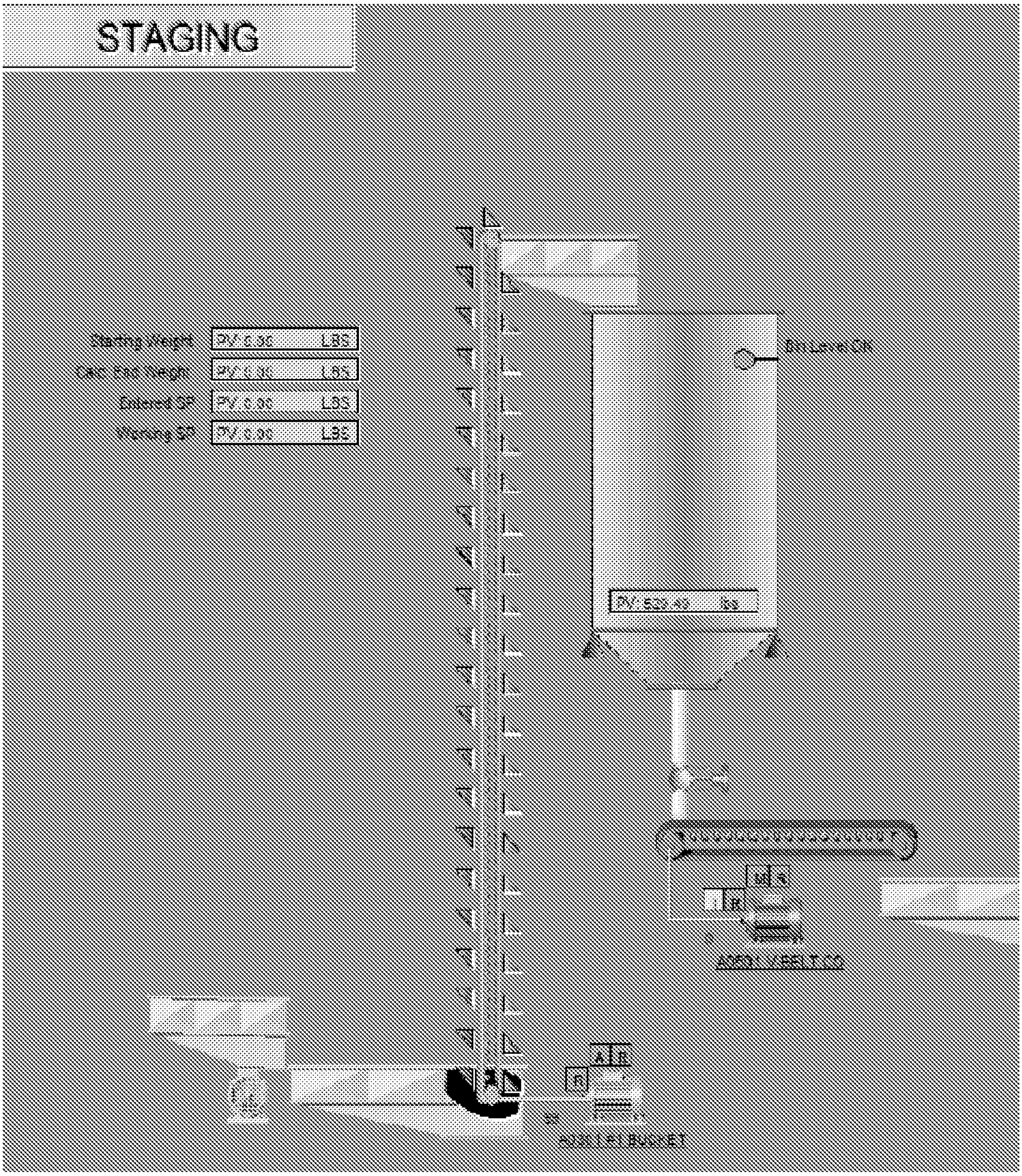


FIG. 14A

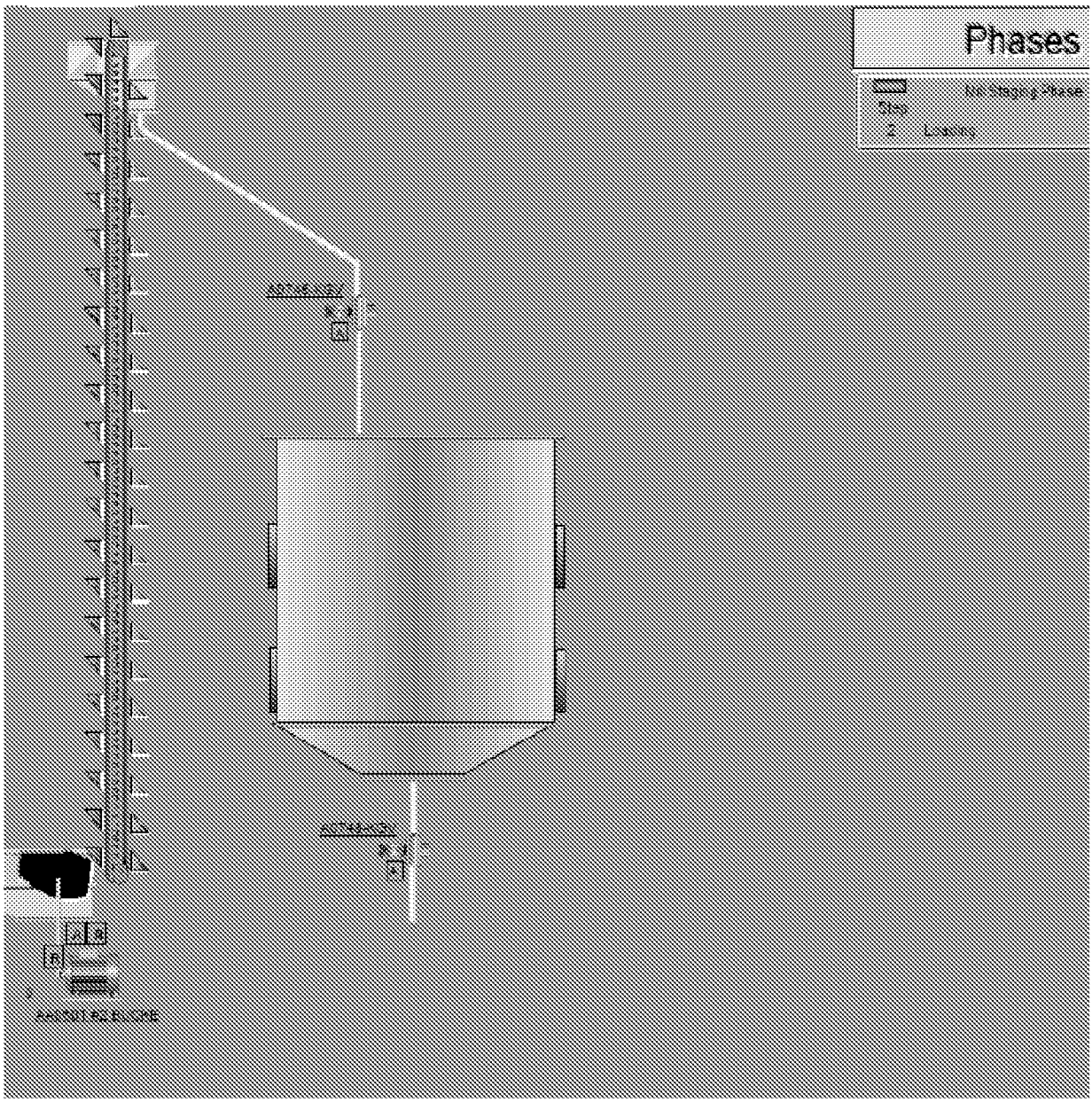


FIG. 14B

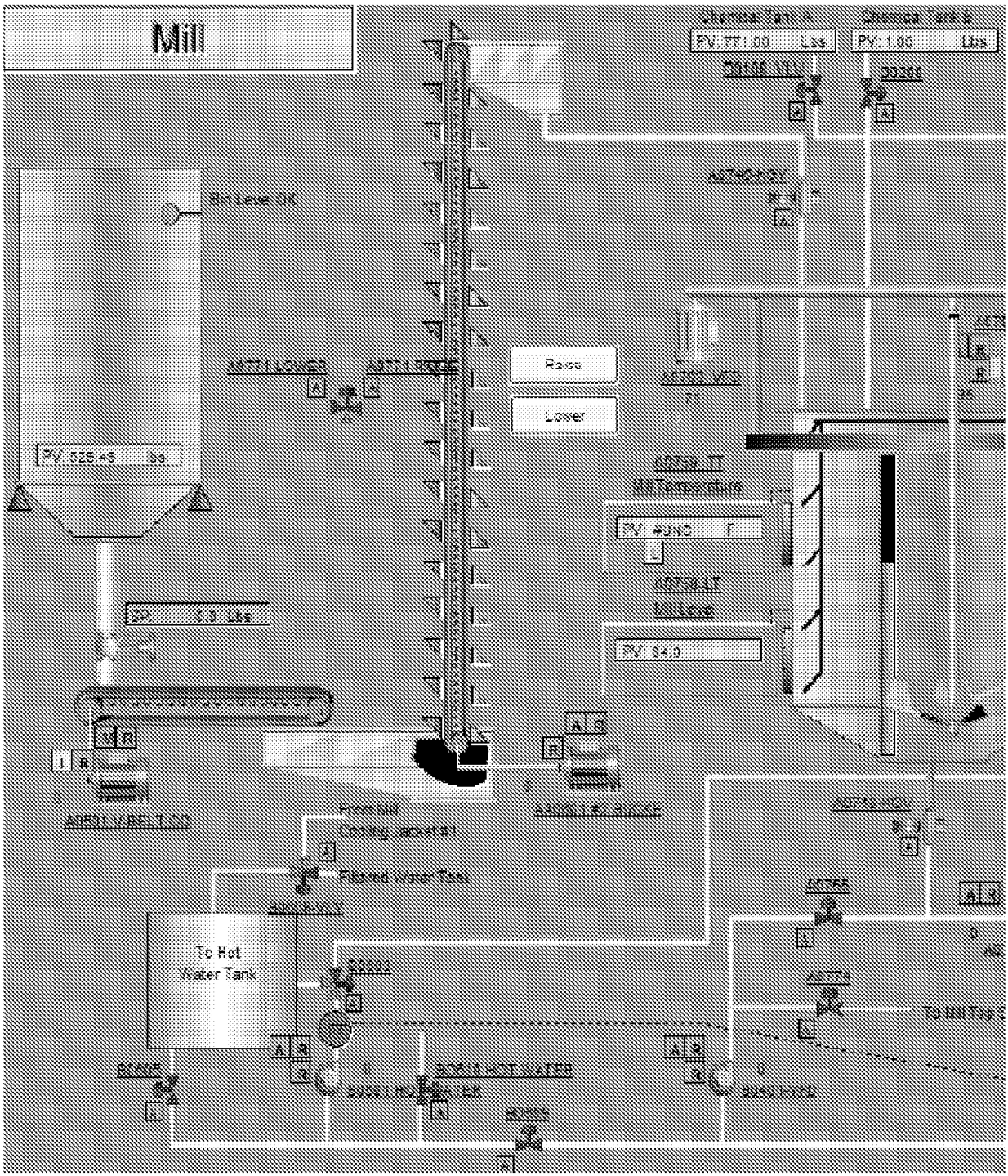

Mill
Chemical Tank A
Chemical Tank B
Raise
Lower
To Hot
Water Tank
Filtered Water Tank

FIG. 15A

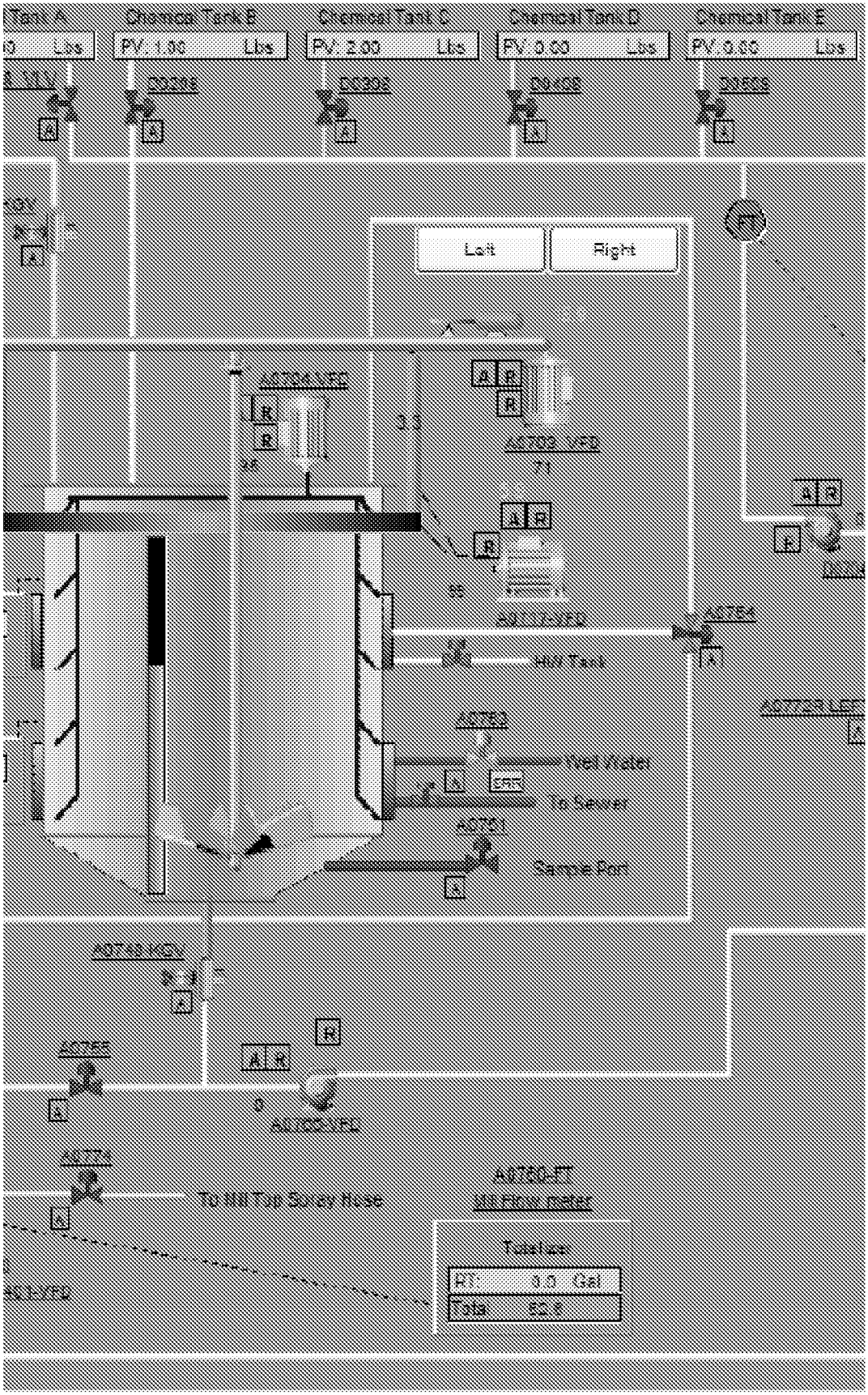

Tank A
Chemical Tank B
Chemical Tank C
Chemical Tank D
Chemical Tank E
Left
Right
Hot Tank
Wet Water
To Sewer
Sample Port
To Hot Tub Spray Hose
Totalizer

FIG. 15B

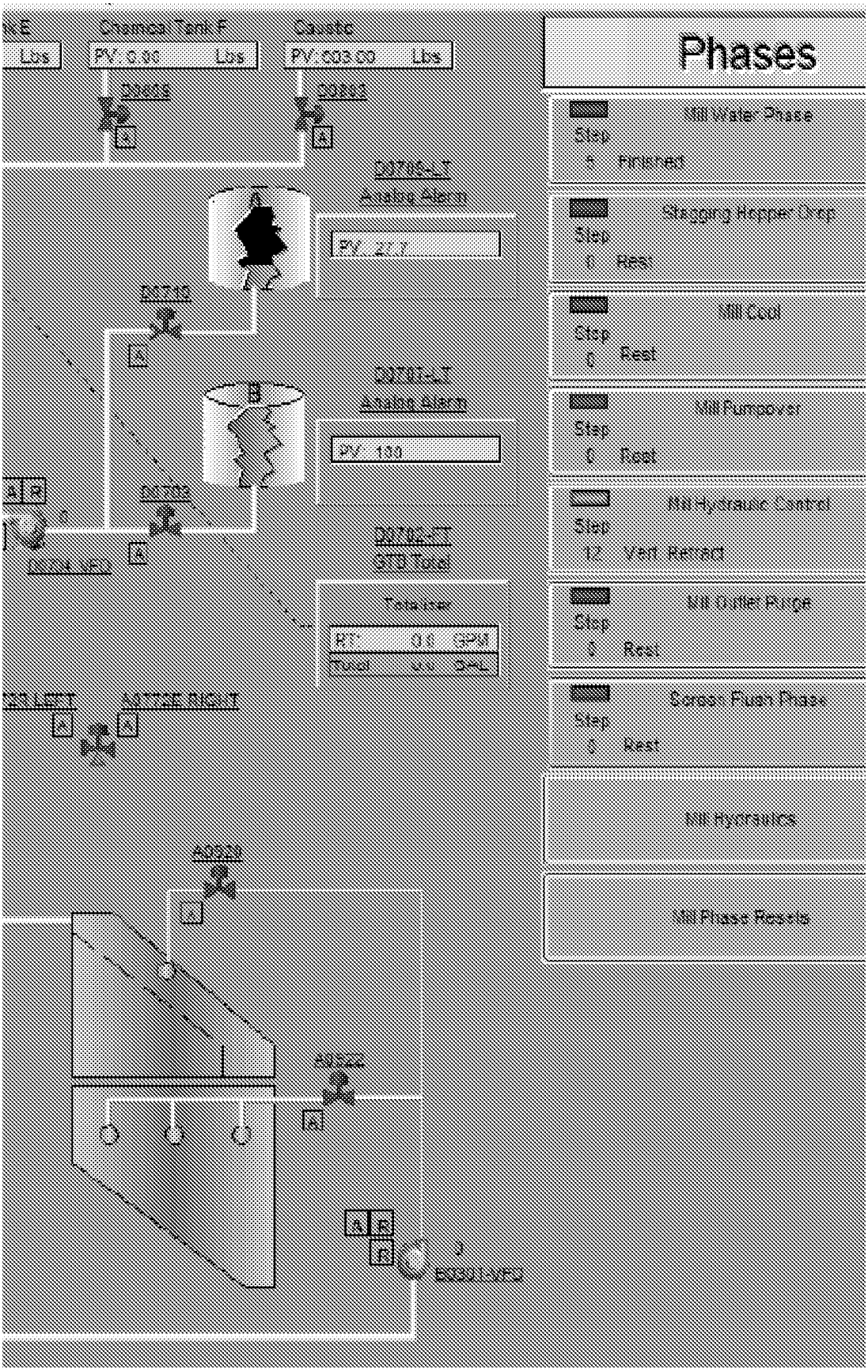
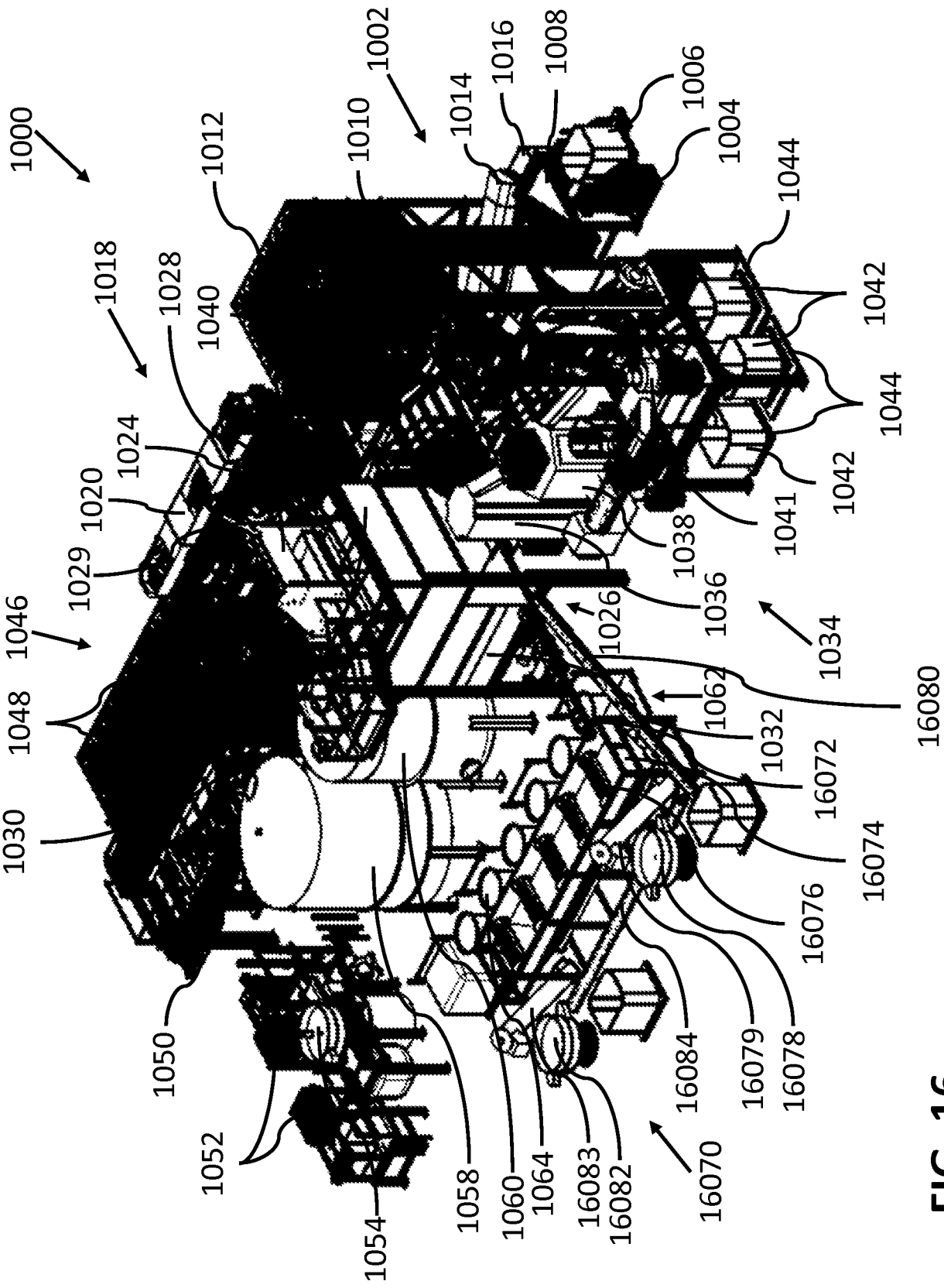

Phases
Mill Water Phase
Step
Staging Hopper Drop
Step
Rest
Mill Cool
Step
Rest
Mill Pumpover
Step
Rest
Mill Hydraulic Control
Step
Vent Reload
Mill Outlet Purge
Step
Rest
Screen Flush Phase
Step
Rest
Mill Hydraulics
Mill Phase Resets

FIG. 15C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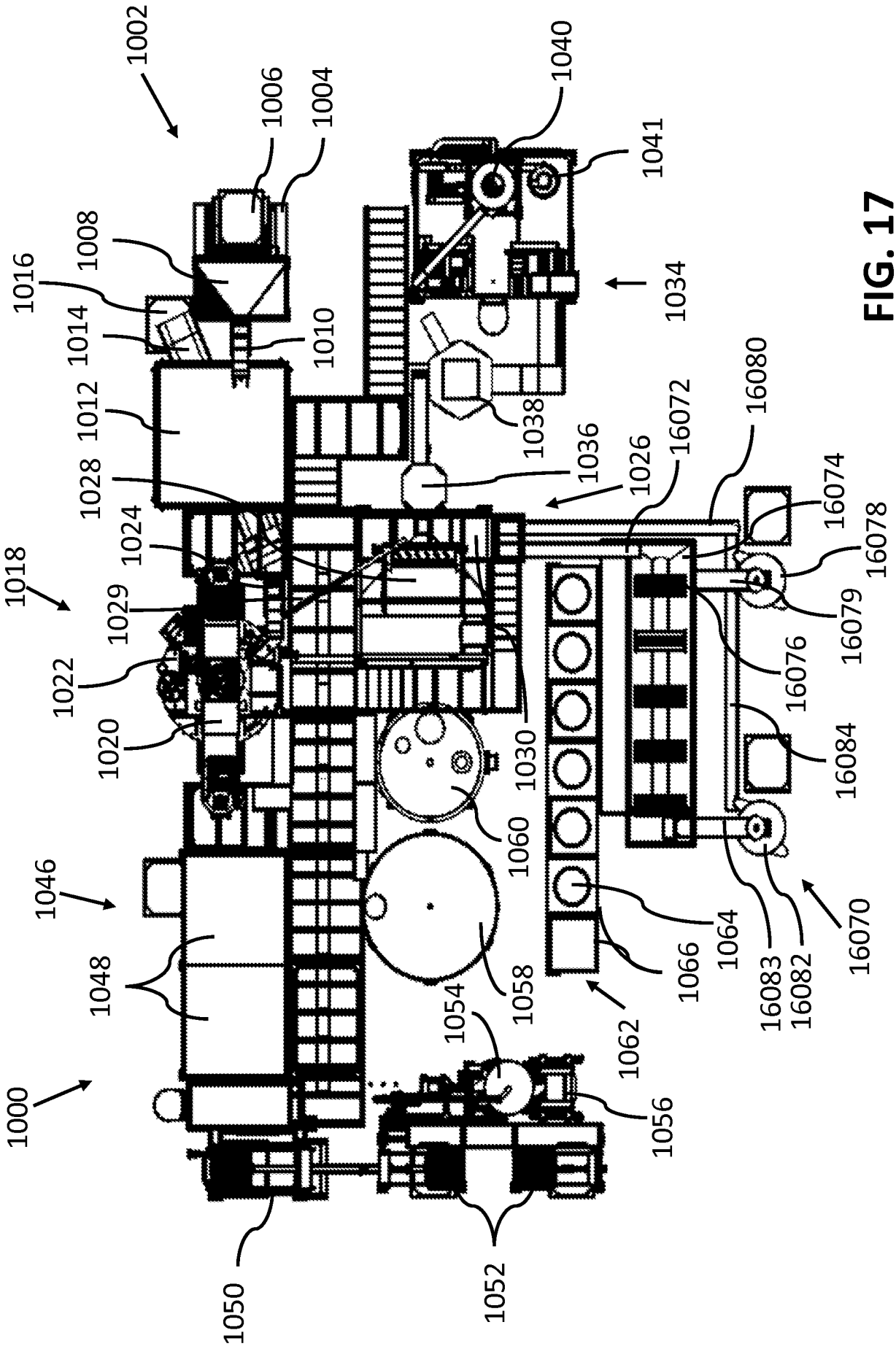
16070
16072
16074
16076
16078
16079
16080
16082
16083
16084

FIG. 16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16079
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16076
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16084
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FIG. 17

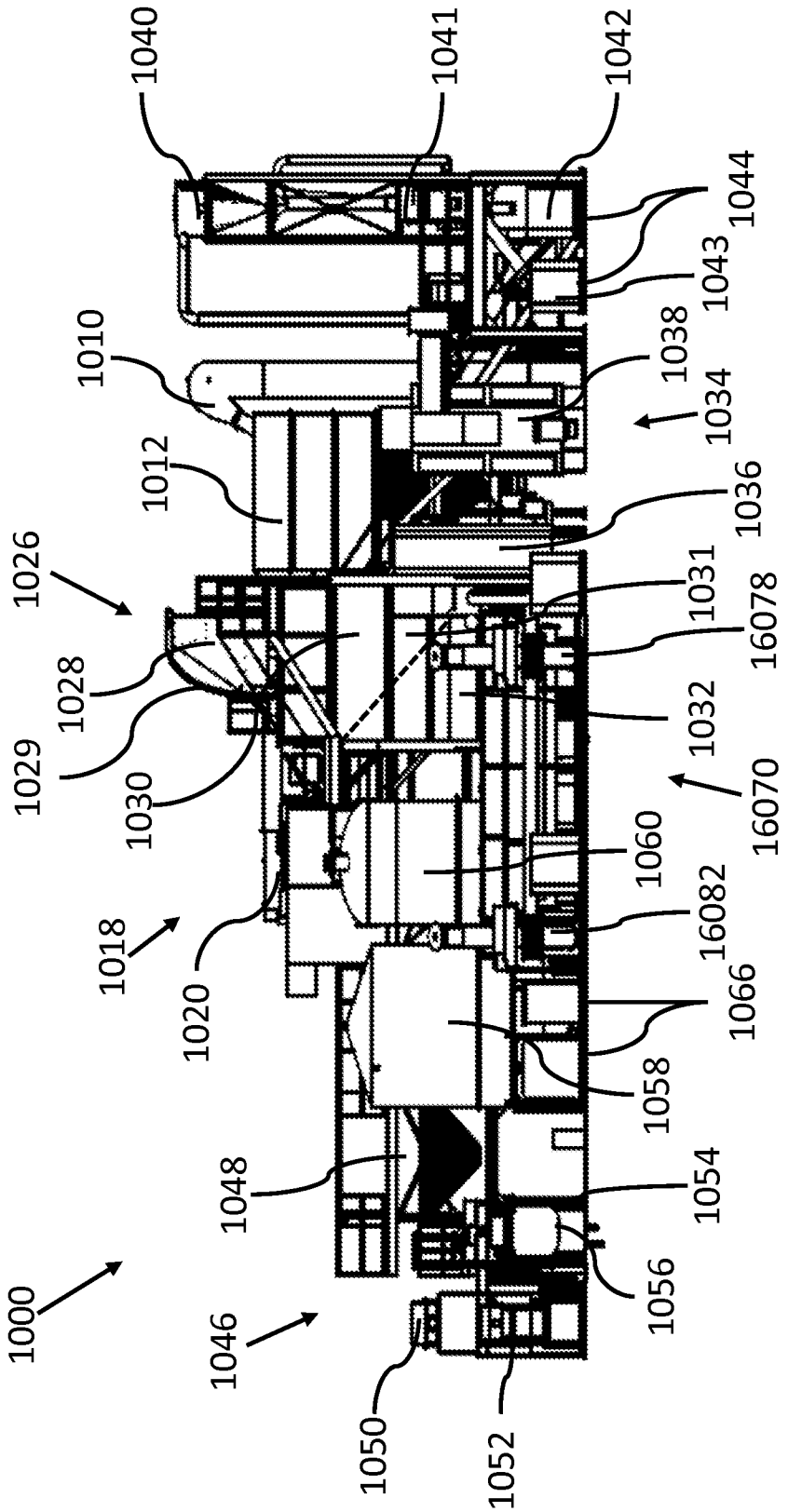
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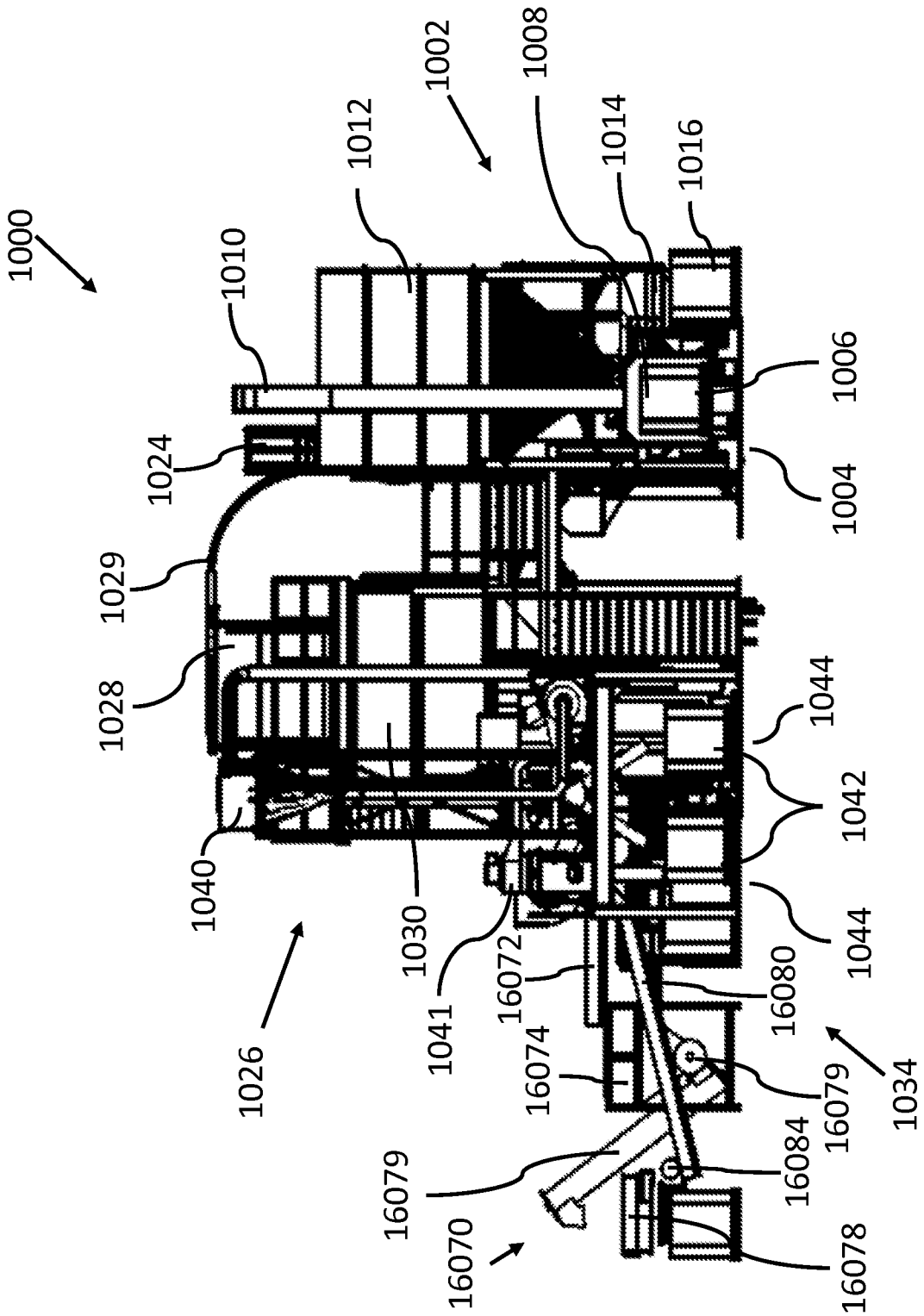
FIG. 18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1041
1042
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1044
16070
16072
16074
16078
16079
16079
16080
16084

FIG. 19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 15/45932

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B02C 21/00; B03B 9/00; B29B 17/00, 17/02 (2015.01)
CPC - B03B 9/00, 9/06
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B02C 21/00; B03B 9/00; B29B 17/00, 17/02 (2015.01)
CPC - B03B 9/00, 9/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - B02C 21/00; B29B 17/00, 17/02, 2017/0217; Y02W 30/521, 30/62, 30/622

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Patbase; Google Patents; Google Scholar; Google Web; Espacenet; Search Terms: adjust*, auger*, bin*, blade*, chemical*, coat*, covey*, decoat*, deink*, dry*, dump*, dye*, elevator*, evap*, feed*, heat*, hopper*, horizontal*, impeller*, ink*, mesh*, mix*, propeller*, reciprocat*, remov*, rota*, screen*, separat*, sieve*, tank*, translat*, treat*, va

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,138,929 A (Montgomery) 31 October 2000 (31.10.2000), Fig. 1, col. 4, ln. 54 - col. 6, ln. 33	1-10, 11A, 11B, 12-20
A	US 8,186,872 B2 (Bartholomew et al.) 29 May 2012 (29.05.2012), Claim 13	1-10, 11A
A	US 5,277,758 A (Brooks et al.) 11 January 1994 (11.01.1994), ol. 7, ln. 67 - col. 8, ln. 53	1-10, 11A, 11B, 12-20
A	US 5,331,087 A (Menges) 19 July 1994 (19.07.1994), Fig. 1, col. 2, ln. 45-65	1-10, 11A, 11B, 12-20

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search	Date of mailing of the international search report
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