

July 7, 1964

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3,139,904

MEANS FOR CIRCULATING A LIQUID THROUGH A PROCESSING APPARATUS

Filed June 12, 1963

3 Sheets-Sheet 1

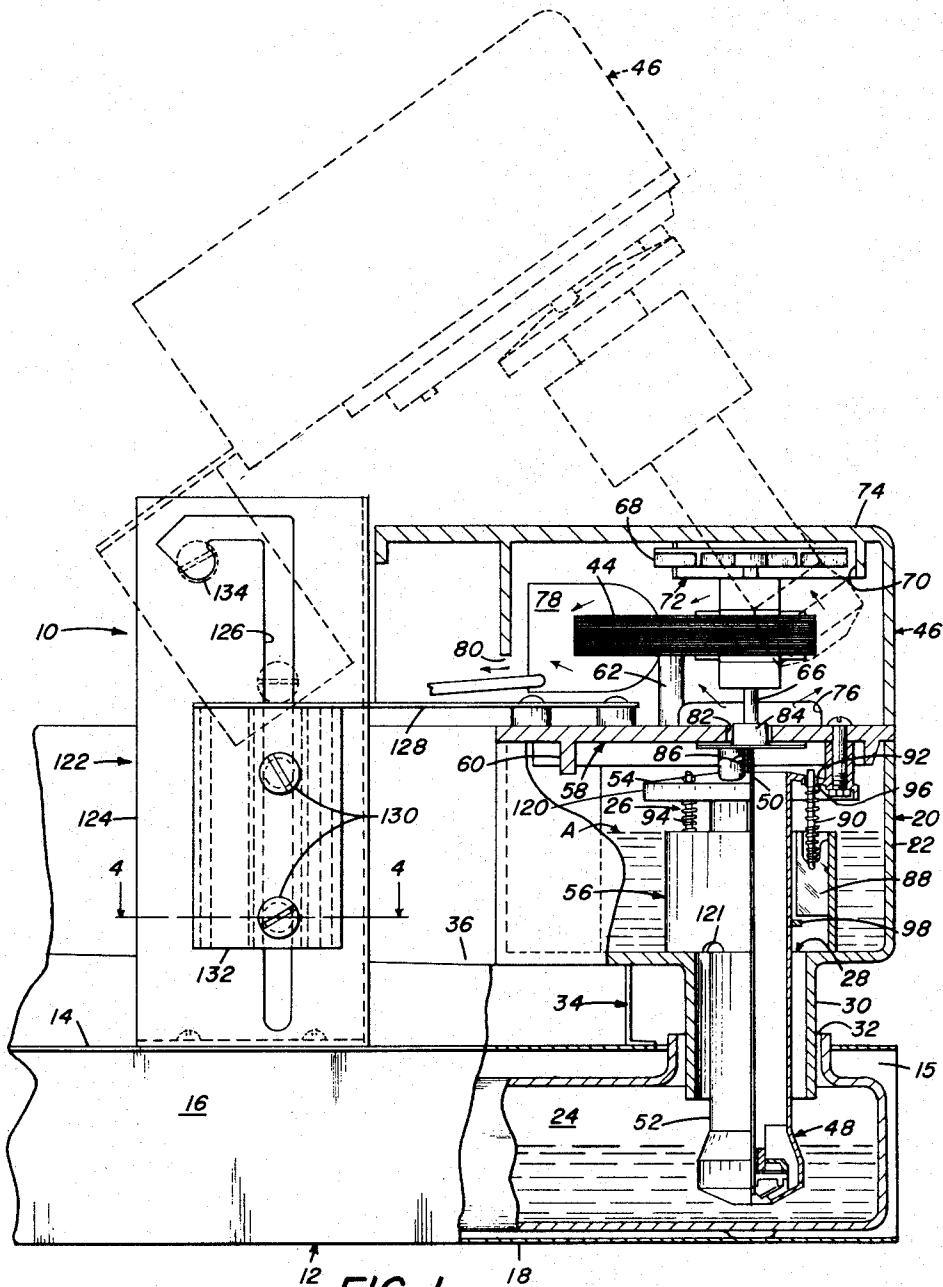


FIG. 1

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3 Sheets-Sheet 2

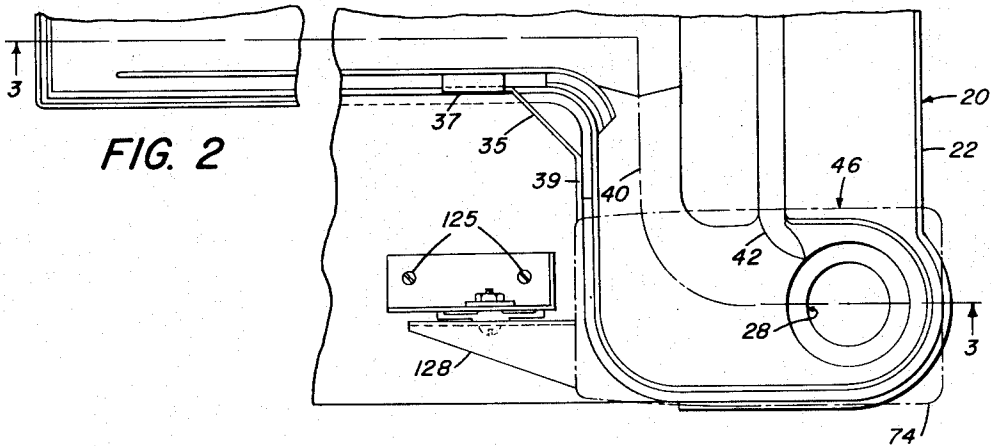
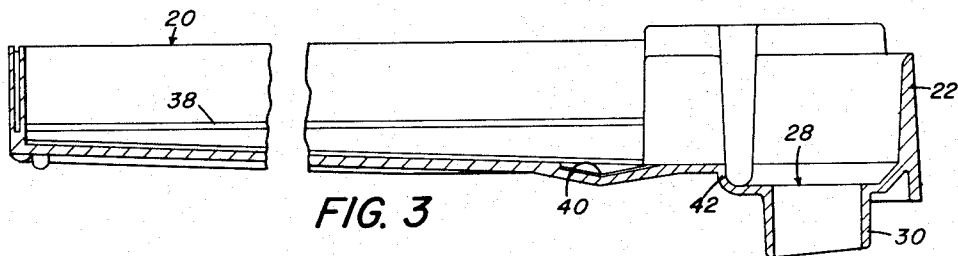
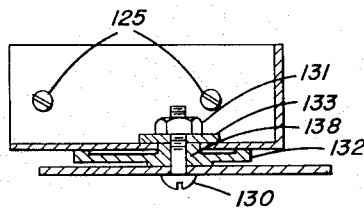


FIG. 4

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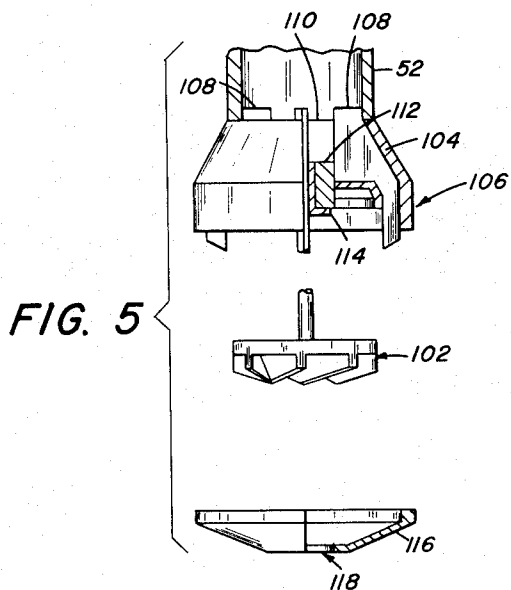
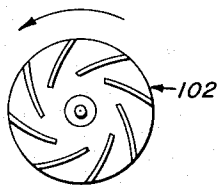
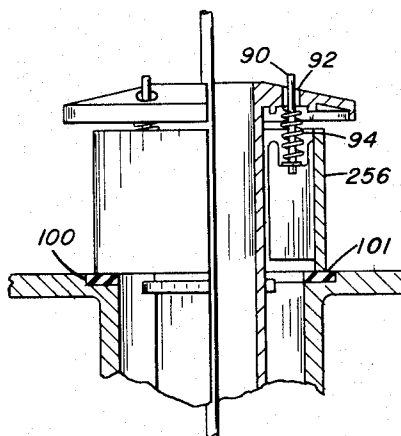
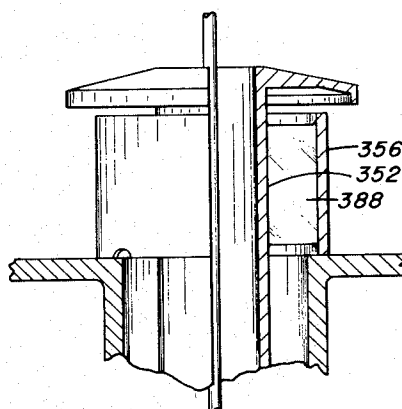
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MEANS FOR CIRCULATING A LIQUID THROUGH A PROCESSING APPARATUS

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3 Sheets-Sheet 3



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3,139,904

**MEANS FOR CIRCULATING A LIQUID THROUGH
A PROCESSING APPARATUS****Raymond W. Wengel, Rochester, N.Y., assignor to Eastman Kodak Company, Rochester, N.Y., a corporation of New Jersey****Filed June 12, 1963, Ser. No. 287,370****11 Claims. (Cl. 137—563)**

The present invention relates to an arrangement for circulating liquid through an apparatus, and is particularly directed to an arrangement for circulating processing liquid in a treating apparatus such as a photographic processing apparatus.

In the prior art relating to liquid photographic processing apparatus wherein a sheet of paper or other type of support for a sensitive layer is immersed in a treating container filled with processing liquid, the handling of the liquid presents certain problems. In many apparatuses it is necessary to mix the liquid before pouring it into the container which is an inconvenience and subject to the possibilities of spillages and getting the liquid on the hands and clothing of the operator. Similar possibilities exist in those apparatuses where it is only necessary to pour ready-mixed liquid from a bottle or other type container into the container. In both types of apparatuses it is also necessary to maintain a minimum level of liquid in the container to insure complete immersion of the sheet of stock to be developed because each sheet absorbs a portion of the liquid. Also since the liquid employed usually contains a volatile component, it will evaporate from the container if it is kept in the treating container for any length of time; this is especially true because of the large surface area presented by the container. Therefore, the liquid in the container has to be added to from time to time. Periodically, too, the container filled with the liquid has to be removed from the apparatus in order to pour out the old liquid, clean the container and refill with fresh liquid. This operation, also, is often subject to spillages.

An object of the present invention is to substantially eliminate these manual handling problems by providing an arrangement for automatically filling the container to a predetermined level from a supply reservoir upon energization of the processing apparatus, continuously circulating the liquid in a reservoir-to-apparatus-to-reservoir cycle while maintaining the predetermined level, and upon de-energization of the apparatus providing for drainage of the liquid from the container to the supply reservoir.

Other objects inherent in the nature of the arrangement disclosed will become apparent to those skilled in the art to which the arrangement is directed.

In the drawings which form a part of the disclosure of this invention:

FIG. 1 is an elevational view of the pertinent portion of the photographic processing apparatus illustrating the circulating system, partly broken away in cross section;

FIG. 2 is a fragmentary plan view of the treating container illustrating the side arm;

FIG. 3 is a view of the container taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged view of the pump guide bracket taken along line 4—4 of FIG. 1;

FIG. 5 is an exploded view showing the pump impeller assembly;

FIG. 6 is a bottom plan view of the impeller;

FIG. 7 is an elevational view, partly in cross section, of a modification of the overflow and level control ring; and

FIG. 8 is an elevational view, partly in cross section, of a further modification of the overflow and level control ring.

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It is to be understood that the invention is not limited to the particular embodiment and structural arrangement of photographic apparatus disclosed in the drawings, but may be applicable to any such apparatus which uses a liquid processing or treating agent. Accordingly, inasmuch as the operation of the different types of treating apparatus may vary in a number of respects, and in view of the fact that the particular type of a photographic apparatus shown is not included as part of the invention, only those structural details of the photographic apparatus will be shown and described which are necessary to provide for a complete disclosure of the invention and its relation to such type of apparatus.

The portion of the photographic apparatus illustrated is indicated in general at 10, and is suitably supported by a frame 12 having a top cover member 14, side members 16 (only one of which is shown) and a bottom member 18, all suitably secured to form a longitudinal channel-like structure. The circulating arrangement mounted on the frame 12 includes the treating container 20, a side arm 22 preferably integral with the container and located at the front and one side of the container in open communication therewith, a supply reservoir 24 slidable into the longitudinal channel-like structure through opening 15 and disposed below the container and sidearm, and a pumping assembly, indicated in general at 26, which in operative position is supported by and disposed partly within the side arm of the treating container and thus prevents the removal from the apparatus of the container and the reservoir.

The container 20, the side arm 22 and reservoir 24 are preferably formed from noncorrosive materials, such as suitable plastics. As is shown in FIG. 3 the container 20 slopes downwardly from the rear of the container to the side arm 22 so that liquid will drain toward a drain opening 28 provided in the side arm and out through a drain spout 30, the latter projecting downwardly from the opening and preferably being formed integrally with the side arm. The drain opening 28 and spout 30 are in communication with an opening 32 provided in the top of the reservoir 24 and the spout is adapted to extend into the reservoir opening to form a conduit therewith when the container and reservoir are in their installed positions. Thus the drain spout 30 and the reservoir opening 32 have a common axis and are concentrically disposed relative to each other. Sufficient clearance is provided between the inside surfaces of the reservoir opening and the outside surfaces of the drain spout in order to permit the spout to be readily inserted into and retracted from the reservoir opening so that the reservoir may be removed when desired.

The container 20 is supported above the top of the frame 12 by an inverted U-shaped channel member 34 which has a top surface 36 that slopes downwardly from the rear of the frame to provide a suitable supporting surface for the sloping container. As shown in FIG. 2, a restraining guide member 35 is suitably secured to the frame of the apparatus and is provided with a side guide surface 37 for guiding the container as it is slid into and out of position on the apparatus, and a front guide surface 39 which abuts the side arm 22 of the container and thus limits the extent to which the container is slid rearwardly on the apparatus. A similar restraining guide member (not shown) is suitably secured to the frame for the opposite side of the container. In the particular embodiment of the container shown in the drawings, it is usually provided with a top shelf 38, which supports the paper stock (not shown) to be used in the photographic apparatus and beneath which is that portion of the container which serves to contain the processing liquid when the apparatus is energized for operation. In a manner well-known in this type of photographic appara-

tus provision is made at the front of the container for receiving a transfer mechanism (not shown), which will not be described, as it is not necessary for an understanding of the invention. Such may be of the type shown in U.S. Patent No. 2,666,384, issued to Yutzy et al. A pair of drain channels 40 and 42, as shown in FIG. 2 are provided in the bottom of the side arm 22 which respectively lead to the drain opening 28 from the main part of the container 20 and from that portion of the container which will contain the transfer mechanism so as to facilitate drainage.

The pumping assembly 26 includes a motor 44 and motor housing 46, a pump unit indicated generally at 48, a drive shaft 50 interconnecting the motor and pump unit, a liquid intake tube member 52 through which the drive shaft extends for connection with the pumping unit at one end thereof, a deflector member 54 at the other end of the intake tube member for directing the pumped liquid into the side arm 22 and tray 20, and an overflow and level control ring 56 operatively connected to the deflector member and encompassing the intake tube member 52 in radially spaced relation therefrom.

The pumping assembly is supported by a cover plate 58 which interfits on top of the side arm 22, and the intake tube member 52 and pump unit 48 extend downwardly through the drain opening 28, spout 30 and reservoir opening 32 to the vicinity of the bottom of the reservoir. The overflow and level control ring 56 in the operative position of the pumping assembly is adapted to engage the bottom surface of the side arm about the drain opening preventing liquid from readily flowing from the container back to the reservoir until the liquid lifted or pumped to the container reaches the top of the ring, the desired level being shown at A, at which level excess liquid will spill over the top of the ring and return to the reservoir via a conduit formed by the drain opening, spout and reservoir opening. Sufficient clearance is provided between the outside surface of the intake tube member and the inside surface of the drain opening and spout so as to permit drainage at the pumping rate.

The motor housing 46 includes the aforementioned cover plate 58 to which the other elements of the pumping assembly 26 are connected, and which in turn is adapted to interfit over the side arm 22 of the container 20 by means of a downwardly extending continuous flange 60, as shown in FIG. 1, which fits within and in contiguous relation to the walls of the side arm. A pair of posts 62 (only one shown in FIG. 1) support the motor 44 above the cover plate and the motor is secured thereto by suitable screws (not shown) which project through an aperture (not shown) in the frame of the motor for threaded connection to the posts.

The shaft 66 of the motor extends downwardly therefrom for connection with the drive shaft 50 and extends upwardly from the top of the motor to drive an impeller disc 68 of a centrifugal blower to supply cooling air to the motor. A flanged cavity 70 having a gap 72 therein is provided within the cover 74 for the motor housing 46, which cover is suitably secured to the cover plate 58. As the impeller disc 68 rotates within the cavity 70 the air circulated by the impeller enters the cover through slots 76 (only one shown in FIG. 1) at the side of the cover adjacent the forward end and, rises over the motor to enter the flange cavity 70. The air is discharged through the gap 72 in the flange cavity over the stator winding 78 and passes out from the cover through a slot 80 at the rearward end of the cover. The circulation is indicated by the arrows in FIG. 1.

The cover plate 58 is provided with a hole 82 through which the drive shaft 50 extends for connection with the pump unit 48. In order to minimize the possibility of any liquid being drawn up into the motor housing through the hole 82, a rubber-like seal 84 or "slinger" is fastened to the drive shaft for rotation therewith. The hub of the slinger extends upwardly through the hole 82 allowing

sufficient clearance between the hub and the sides of the hole so as to not interfere with the rotation of the shaft. The disc-like base of the slinger is preferably integral with the hub and is located below but in closely spaced relation to the hole and the surrounding undersurface of the cover plate. The hub may be tapered in the manner shown so as to present a conical surface. If any moisture should enter the housing, it will be driven by centrifugal force towards the greater diameter of the hub and between the disc-like base and the undersurface of the cover plate.

The intake tube member 52, deflector member 54 and overflow and level control ring 56 are formed from non-corrosive material, such as a suitable plastic, and the intake tube and deflector members are also preferably formed as an integral unit. The intake tube member and deflector member are connected to and suitably spaced from the cover plate by preferably three spaced posts 86 (only two shown in FIG. 1) which extend downwardly from the undersurface of the cover plate.

The overflow and level control ring or cylindrical sleeve 56 is located below the deflector member 54 and is concentrically disposed about and radially spaced from the intake tube member 52. The ring is preferably connected to the deflector member for floating adjustment relative to the deflector and intake tube members. A plurality of vanes 88 extend radially from the inside surface of the ring toward but spaced from the outer surface of the intake tube member 52 for a loose sliding fit therewith. Each vane is provided with a vertical extension or rod 90, which may be formed integrally with the vane or separately formed and connected to the upper end thereof for sliding projection through an aperture 92 in the deflector 54. The vertical extension or rod is a support for a spring 94 which reacts against and between the deflector member and vane to push the level control ring 56 downwardly. A flanged seat 96 is provided on the undersurface of the deflector member for receipt of the upper end of each spring.

An annular shoulder 98 preferably integrally formed on the outer surface of the intake tube member serves as an abutment for the bottom edges of the radial vanes 88 on the level control ring 56 to prevent the latter from dropping off the lower end of the intake tube member 52.

In FIG. 7 a modification of the overflow and level control ring or cylindrical sleeve 256 is disclosed wherein a counterbore 100 is provided about the drain opening, which counterbore is fitted with a suitable gasket 101 which in cooperation with the level control ring provides a liquid tight seal.

In FIG. 8 a further modification of the overflow and level control ring or cylindrical sleeve 356 is disclosed wherein the vanes 388 on the ring may radially extend from the inside surface of the ring to the outside surface of the intake tube member 352 for securement thereto.

The pump unit 48 is preferably of the impeller type, the impeller 102 having what is known as a "backward curve blade" as shown in FIGS. 5 and 6 and which is generally used for pumping liquids because it has less tendency to cause foaming of the developing liquid. The pump unit thus constitutes an impeller assembly and is located within the bottom end of the intake tube member 52 and as shown in FIG. 5 comprises a hollow cylindrical-conical housing 104 constituting the pump stator 106 and containing a plurality of radial vanes 108, the latter serving to stop the rotation of the liquid discharged from the impeller and redirect its motion upward into the intake tube member 52. The vanes 108 join with the inner wall of the stator at their outer edges and may be formed integral therewith. Their radial inner edges form a seat in which a bearing support 110 and impeller backing plate 112 are seated. The latter two elements may also be formed integral with the vanes, if desired. A Teflon bushing 114 is pressed through the central aperture provided in the impeller backing plate and functions as a bearing for the drive shaft 50; the upper and lower ends of the vanes

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project respectively beyond the top and bottom of the housing or stator to serve as locating guides to facilitate assembly with the intake tube member and the stator cap 116. The stator cap is provided with a centrally disposed opening 118 through which the liquid is drawn upwardly by the impeller 102 into the intake tube member.

In operating the circulating arrangement, the container 20 and reservoir 24 are positioned within the supporting frame 12, in the manner disclosed in FIG. 1, and are interconnected by a conduit formed by the drain opening and spout of the side arm and the opening of the reservoir. The pumping assembly 26 is placed in operative position so that the cover plate 58 interfits with the top of the side arm, as heretofore described, and the intake tube member and pumping unit are inserted downwardly through the drain opening 28, spout 30 and reservoir opening 32 into the vicinity of the bottom of the reservoir. The overflow and level control ring 56 automatically makes a floating adjustment about the drain opening and in contact with the bottom surface of the side arm so as to prevent liquid from readily draining from the container through the drain opening.

The motor of the apparatus is energized and the pump unit draws the liquid from the reservoir up through the opening 118 in the stator cap opening 116 and into the intake tube member 52 and out its upper end over the deflector member 54 and into the container. The deflector member 54 radially extends outwardly to a greater diameter than the overflow and control ring so as to prevent the pumped liquid from directly entering the opening in the top of the ring. An annular vertical flange 120 is provided on the outer edge of the deflector member in order to prevent the pumped liquid from curling under the edges of the deflector member and pouring through the top opening in the ring back to the reservoir.

When the pumped liquid fills the container and side arm to a predetermined height as indicated by level A, which is to the top of the overflow and level control ring, the excess liquid then flows over the top of the ring and back to the reservoir through the conduit interconnecting the container and reservoir. In this manner the liquid is always kept at a predetermined level in the container during operation of the apparatus, and thus by the character of this operation, the liquid retains its freshness for a longer operating life before it becomes necessary to change the reservoir for a new supply of processing liquid.

Inasmuch as the processing liquid is subject to evaporation, provision is made for the liquid to drain completely from the container and return to the reservoir when the motor and thus the apparatus has been de-energized for a predetermined period of time. A small semi-circular notch or aperture 121 may be provided in the lower edge of the overflow and level control ring which will allow slow and continuous drainage therethrough. The small notch does not interfere with the filling of the container to the predetermined height, even though there is continuous drainage therethrough when the apparatus is in operation since the drainage is considerably slower than the pumping rate, and if the apparatus is shut down for a period less than the predetermined time for total drainage through the notch, then it will not be necessary for the operator to wait as long for the pump unit to fill the container as would be true when the container is entirely empty.

When it is desired to empty the container completely and quickly, the cover 74 to the motor housing 46 of the pumping assembly 26 may serve as a handle by which the assembly may be lifted as a unit. This movement of the pumping assembly also lifts the overflow and level control ring out of engagement about the drain opening, thereby permitting rapid and complete drainage of the liquid from the container to the reservoir through an interconnecting conduit. As is apparent from the drawings and particularly in FIGS. 1, 7 and 8, the lifting movement only has to be sufficient to break the sealing effect of the

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overflow and level control ring about the drain opening, and after complete drainage, a matter of a few seconds, the pumping assembly may be repositioned in interengagement with the side arm of the container.

In order to empty the container for purposes of removing and cleaning and/or for slidably removing the reservoir and inserting a new reservoir containing fresh processing liquid, and in order also to avoid inadvertently damaging any of the elements of the pumping assembly by bringing them into contact with the sides of the conduit as the assembly is being raised, a guiding and supporting structure indicated generally at 122 is provided by which the pumping assembly may be lifted into an inoperative position out of the reservoir and the side arm 22 of the container, as illustrated by the dotted line position of the pumping assembly in FIG. 1. A vertical frame 124 having a guide channel 126 established therein is attached to the upper surface of the frame 12 to the rear of and spaced from the side arm by bolts 125. A cooperating bracket member 128 attached to and projecting rearwardly from the cover plate 58 on the pumping assembly is connected to the vertical frame 124 for sliding movement within the guide channel by means of bolts 130, nuts 131, cooperating guide shoe 132 and plate washer 133. The guide shoe and plate washer are preferably formed from a suitable plastic, such as nylon, to provide minimal friction. One of the plates is interposed between the bracket member and vertical frame, while the plate washer is disposed on the opposite side of the vertical frame as shown in FIG. 4. The guide shoe is provided with integral bosses 138 which ride in the channel in sliding relation therewith. The guide channel extends in a vertical up-and-down direction and the channel changes direction and extends rearwardly at a slight incline terminating in a notch 134 wherein the pumping assembly is guided for support in an inoperative position inclined relative to the side arm on the container. In this position the intake tube member and pump unit are clear of the side arm of the container and the incidental dripping of the wetted surfaces of the pumping assembly falls back into the opening of the side arm for return to the reservoir through the conduit.

In the modification shown in FIG. 8, because the overflow and level control ring 356 is integrally formed with the intake tube member by means of the radially extending vanes 388, there is no floating adjustment of the ring with the bottom surface of the side arm about the drain opening.

In the modification of FIG. 9 no aperture or semi-circular notch is provided in the bottom edge of the overflow and level control ring because it is intended by this modification to maintain a liquid-tight seal. It is possible, if desired, to de-energize the pumping assembly after the container is filled, thereby only energizing the pumping assembly whenever the level of the liquid in the container and side arm fall below the minimum necessary to insure complete immersion of a sheet of paper inserted into the container. If complete drainage is desired at the end of a particular operation, but there is no intention of removing and cleaning the container and/or reservoir, then it is only necessary to lift the pumping assembly to an extent sufficient to break the seal between the overflow and level control ring and the gasket until the liquid is drained.

It will now be apparent that the arrangement disclosed for circulating liquid through the treating apparatus is economical in the sense that it is compact, occupying a smaller space, and is capable of filling and draining the container through the same opening through which the pumping assembly extends. For the purpose of claiming the invention, the side arm 22 is considered to be part and parcel of the container.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as

described hereinabove and as defined in the appended claims.

I claim:

1. An arrangement for circulating a liquid in a treating apparatus comprising:
 - a treating container for receiving the liquids;
 - a substantially closed liquid supply reservoir disposed below the container;
 - a conduit means providing a drainage connection from the container to the reservoir, said conduit means including a drain opening in the bottom of the container and an opening in the top of the reservoir;
 - a pumping assembly having an operative position in which it extends from the container through the conduit means into the reservoir to pump liquid from the reservoir upwardly through said conduit means into the container, said assembly including:
 - (a) tubular means for carrying liquid being pumped from said reservoir into the container,
 - (b) overflow sleeve means disposed about and spaced from the tubular means and providing an upward extension of said drainage connection through which the liquid overflows to the reservoir upon reaching a predetermined level when the pumping assembly is in said operative position;
 - and means mounting said pumping assembly for movement to an inoperative position in which said overflow sleeve means is moved away from said drainage connection, whereupon liquid below said predetermined level drains from the tray to the reservoir.
2. An arrangement for circulating a liquid in a treating apparatus comprising:
 - a treating container for receiving the liquid and having a drain opening in the bottom thereof;
 - a substantially closed liquid supply reservoir disposed below the drain opening of the container and having an opening in the top thereof;
 - means connecting the reservoir and drain openings and providing a drainage connection from the container to the reservoir;
 - and a pumping assembly disposed above the treating container and having an operative position and including intake means which in said operative position extends downwardly through the drain opening, connecting means and the opening in the reservoir, said pumping assembly adapted for lifting the liquid upwardly through the intake means into the container and including:
 - (a) means for lifting the liquid through the intake means,
 - (b) and a hollow cylindrical overflow seal means in engagement with the bottom of the container about the drain opening and providing an upward extension of said drainage connection through which the liquid overflows to the reservoir upon reaching a predetermined level when the pumping assembly is in said operative position;
 - said pumping assembly when moved from said operative position being adapted to be raised upwardly to lift said seal means from engagement with the bottom of said container and provide for drainage of liquid below said predetermined level from the container to the reservoir.
3. An arrangement for circulating a liquid in a treating apparatus comprising:
 - a treating container for receiving the liquid and having a drain opening in the bottom thereof and a spout extending downwardly from the opening;
 - a substantially closed liquid supply reservoir disposed below the container and having an opening in the top thereof in interconnection with the spout of the container;

a pumping assembly comprising:

- (a) intake tube means,
 - (b) a pumping means disposed at one end of the intake tube means,
 - (c) means for driving the pump means,
 - (d) and an overflow ring means disposed about said drain opening and adjacent the other end of the intake tube means and radially spaced therefrom;
- and means for movably mounting said pumping assembly above the container to move between an operative position in which said intake tube means and pump means extend through the spout into the reservoir and said overflow ring means provides an upward extension of said spout through which the liquid overflows to the reservoir upon reaching a predetermined level, and an inoperative position in which said intake tube means and pump means are lifted out of the reservoir end of the spout and the overflow ring means is moved away from said drain opening to provide for drainage of liquid below said predetermined level from the container to the reservoir.
4. An arrangement for circulating the liquid in a treating apparatus comprising:
 - a treating container for receiving the liquid and having a drain opening in the bottom thereof;
 - a substantially closed liquid supply reservoir disposed below the drain opening of the container and having an opening in the top thereof;
 - means interconnecting the drain and reservoir openings and providing a drainage connection from the container to the reservoir;
 - and a pumping assembly disposed above the treating container and movable to and from an operative position and comprising:
 - (a) intake means which in said operative position extends downwardly through the drain opening and interconnecting means and into the reservoir and is adapted for conducting the liquid upwardly into the container,
 - (b) means for lifting the liquid through the intake means,
 - (c) hollow cylindrical overflow seal means which in said operative position is adapted to be axially adjustable relative to the intake means for substantial sealing engagement with the bottom of the container about the drain opening and extending above the container bottom to a predetermined height so that liquid in excess of said height spills over through said seal means in return to the reservoir;
 - (d) and deflector means at the upper end of the intake means and extending radially beyond the overflow seal means for directing liquid downwardly past the latter and into the container;
 - said pumping assembly when moved from said operative position being lifted upwardly as a unit to lift said overflow seal means from engagement with the bottom of said container and thereby provide for drainage of liquid below said predetermined height from the container to the reservoir.
 5. An arrangement for circulating a liquid in a treating apparatus comprising:
 - a treating container for receiving the liquid and having a drain opening in the bottom thereof;
 - a substantially closed liquid supply reservoir disposed below the drain opening of the container and having an opening in the top thereof;
 - means interconnecting the drain and reservoir openings and providing a drainage connection from the container to the reservoir;
 - a pumping assembly movable to and from an operative position and disposed above the treating container and including:
 - (a) intake means which in said operative position

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extends downwardly through the drain opening, interconnecting means and into the reservoir and is adapted for conducting the liquid upwardly into the container,

(b) means for lifting the liquid through the intake means,

(c) and a hollow cylindrical overflow seal means; a resilient gasket disposed within the bottom surface of the container about the drain opening;

said hollow cylindrical overflow seal means adapted to be axially adjustable relative to the pumping assembly for cooperative engagement with the resilient gasket and providing an upward extension of said drainage connection through which the liquid overflows to the reservoir upon reaching a predetermined level when the pumping assembly is in said operative position; said pumping assembly being adapted to be lifted upwardly as a unit and thereby provide for drainage of liquid below said predetermined level from the container to the reservoir.

6. An arrangement for circulating a liquid in a treating apparatus comprising:

a treating container for receiving the liquid;

a reservoir disposed below the treating container for holding a supply of the liquid;

first and second conduit means interconnecting the container and reservoir;

pump means at one end of one of said conduit means for pumping liquid from the reservoir upwardly to the container;

means in the container at the upper end of the other of said conduit means for controlling the level of the liquid in the container and movable for draining the liquid in the container back to the reservoir;

and means for guiding the movable controlling means to a position out of the container.

7. An arrangement for circulating a liquid in a treating apparatus comprising:

a treating container for receiving the liquid and having a drain opening;

a reservoir for holding the liquid in supply for the apparatus and disposed below the treating container and having an opening for interconnection with the drain opening of the treating container;

first passage means interconnecting the drain opening and the reservoir opening for returning the liquid from the treating container to the reservoir;

second passage means concentrically disposed relative to the first passage means and adapted for directing the liquid upwardly from the reservoir to the container;

means extending through the second passage means for drawing the liquid therethrough;

and means annularly disposed relative to one of the passage means for closing the drain opening and for maintaining a predetermined level of liquid in the tray and including means therein adjacent the drain opening for continuously and slowly passing the liquid from the container downwardly through the first passage means to the reservoir.

8. An arrangement for circulating a liquid in a treating apparatus comprising:

a treating container for receiving the liquid and having a drain opening in the bottom thereof;

a substantially closed liquid supply reservoir disposed below the drain opening of the container and having an opening in the top thereof;

means interconnecting the drain and reservoir openings and providing a drainage connection from the container to the reservoir;

a pumping assembly movable to and from an operative position and disposed above the treating container and including:

(a) intake means which in said operative position extends downwardly through the drain opening, interconnecting means and into the

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reservoir and is adapted for directing the liquid upwardly into the container,

(b) means for lifting the liquid through the intake means,

(c) a hollow cylindrical overflow seal means in engagement with the bottom of the container about the drain opening and providing an upward extension of said drainage connection through which the liquid overflows to the reservoir upon reaching a predetermined height when the pumping assembly is in said operative position;

said pumping assembly being adapted to be lifted upwardly as a unit thereby providing for drainage of liquid below said predetermined height from the container to the reservoir;

and means attached to the apparatus for guiding the pumping assembly to a raised position and including holding means for supporting the pumping assembly in a position above and at an incline with respect to the container.

9. An arrangement for circulating a liquid in a treating apparatus comprising:

a treating container for receiving the liquid and having an opening;

a substantially closed liquid supply reservoir disposed below the processing tray and having an opening in the top thereof;

first cylinder means extending between and in connection with the openings of the container and reservoir and located on one side of the container;

second cylinder means located on the other side of the container and adjacent one end of the first cylinder means in coaxial alignment therewith and with the container opening and forming an extension of the first cylinder means;

third cylinder means extending from a point beyond the first cylinder means within the container and through the first and second cylinder means to a point beyond the second cylinder means within the reservoir;

and means for drawing liquid from the reservoir through the third cylinder means into the container until the liquid level in the container reaches the top of the second cylinder means wherein the liquid in excess of said liquid level returns from the container through the first and second cylinder means to the reservoir;

one of the first and second cylinders being axially movable relative to the other and to the container opening for drainage of the liquid from the container.

10. An arrangement for circulating a liquid in a treating apparatus having a longitudinal channel with an opening thereto at one end, comprising:

a treating container slidably received in such apparatus for receiving the liquid; a substantially closed liquid supply reservoir disposed below the container and being slidable into said longitudinal channel through said opening;

conduit means providing a drainage connection from the container to the reservoir, said conduit means including a drain opening in the bottom of the container and an opening in the top of the reservoir;

a pumping assembly movable to and from an operative position in which it extends through the container and the conduit means into the reservoir to pump liquid from the reservoir upwardly into the container and to prevent removal of the container and the reservoir from the apparatus, said assembly including:

(a) tubular means for carrying liquid being pumped from said reservoir into the container,

(b) overflow sleeve means disposed about and spaced from the tubular means and providing an upward extension of said drainage connection through which the liquid overflows to the

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reservoir upon reaching a predetermined level when the pumping assembly is in said operative position;

and means on said apparatus for guiding said pumping assembly for movement to an inoperative position in which said overflow sleeve means is moved away from said drainage connection, whereupon liquid below said predetermined level drains from the tray to the reservoir and the container and the reservoir may be slidably removed from the apparatus. 5 10

11. An arrangement for circulating a liquid in a treating apparatus comprising:

a treating container for receiving the liquid;
a substantially closed liquid supply reservoir disposed below the container; 15
one of said container and reservoir being removable from the apparatus;
conduit means providing a drainage connection from the container to the reservoir, said conduit means including a drain opening in the bottom of the container and an opening in the top of the reservoir; 20
a pumping assembly movable to and from an operative position in which it extends through the container and the conduit means into the reservoir to pump liquid from the reservoir upwardly into the container 25
and to prevent removal of said one of said container

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and reservoir from the apparatus; said assembly including:

(a) tubular means for carrying liquid being pumped from said reservoir into the container,
(b) overflow sleeve means disposed about and spaced from the tubular means and providing an upward extension of said drainage connection through which the liquid overflows to the reservoir upon reaching a predetermined level when the pumping assembly is in said operative position,

and means on said apparatus for guiding said pumping assembly for movement to an inoperative position in which said overflow sleeve means is moved away from said drainage connection, whereupon liquid below said predetermined level drains from the tray to the reservoir and one of said container and reservoir may be removed from the apparatus.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,139,904

July 7, 1964

Raymond W. Wengel

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 22, after "and" insert -- to --; column 4, line 33, for "is" read -- in --; column 5, lines 2 and 3, for "startor", each occurrence, read -- stator --; column 6, line 6, after "cleaning" insert -- the container --; column 7, line 6, for "liquids" read -- liquid --; line 9, strike out "a", first occurrence.

Signed and sealed this 12th day of January 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents

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