

[54] **AUTOMATIC LIQUID FEED INTERLOCK WITH WORKLOAD**

[75] Inventor: **George J. Lada**, Newport Beach, Calif.

[73] Assignee: **Allied Chemical Corporation**, New York, N.Y.

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2,630,002 3/1953 Converse et al. 68/207
3,130,076 4/1964 Gruber et al. 134/113
3,134,070 5/1964 Meyer 134/57 R

Primary Examiner—Harvey C. Hornsby
Assistant Examiner—James A. Niegowski
Attorney, Agent, or Firm—Jay P. Friedenson; Anthony J. Stewart

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134/48; 134/57 R; 134/113
[51] **Int. Cl.²** B08B 3/02; B08B 11/02
[58] **Field of Search** 134/46, 47, 48, 49, 50,
134/57 R, 75, 70, 77, 113, 83, 124, 125, 126,
130; 137/259, 389; 118/8, 2, 425; 68/207

[56] **References Cited**

UNITED STATES PATENTS

2,508,200 5/1950 Tarlton 118/8

[57]

ABSTRACT

An apparatus for processing an article wherein processing liquid is added to a process tank by an adding means responsive to a metered filling power circuit which is activated by a sensing device for determining when processing of articles through the process tank has been completed.

8 Claims, 2 Drawing Figures

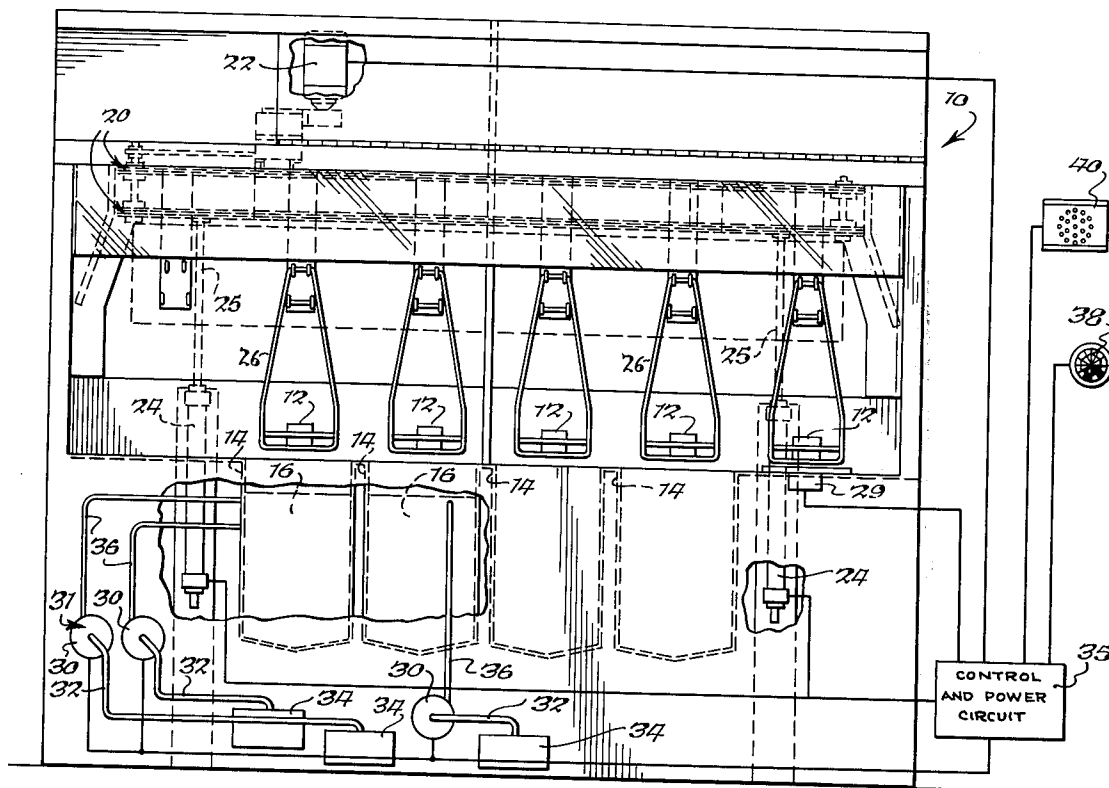
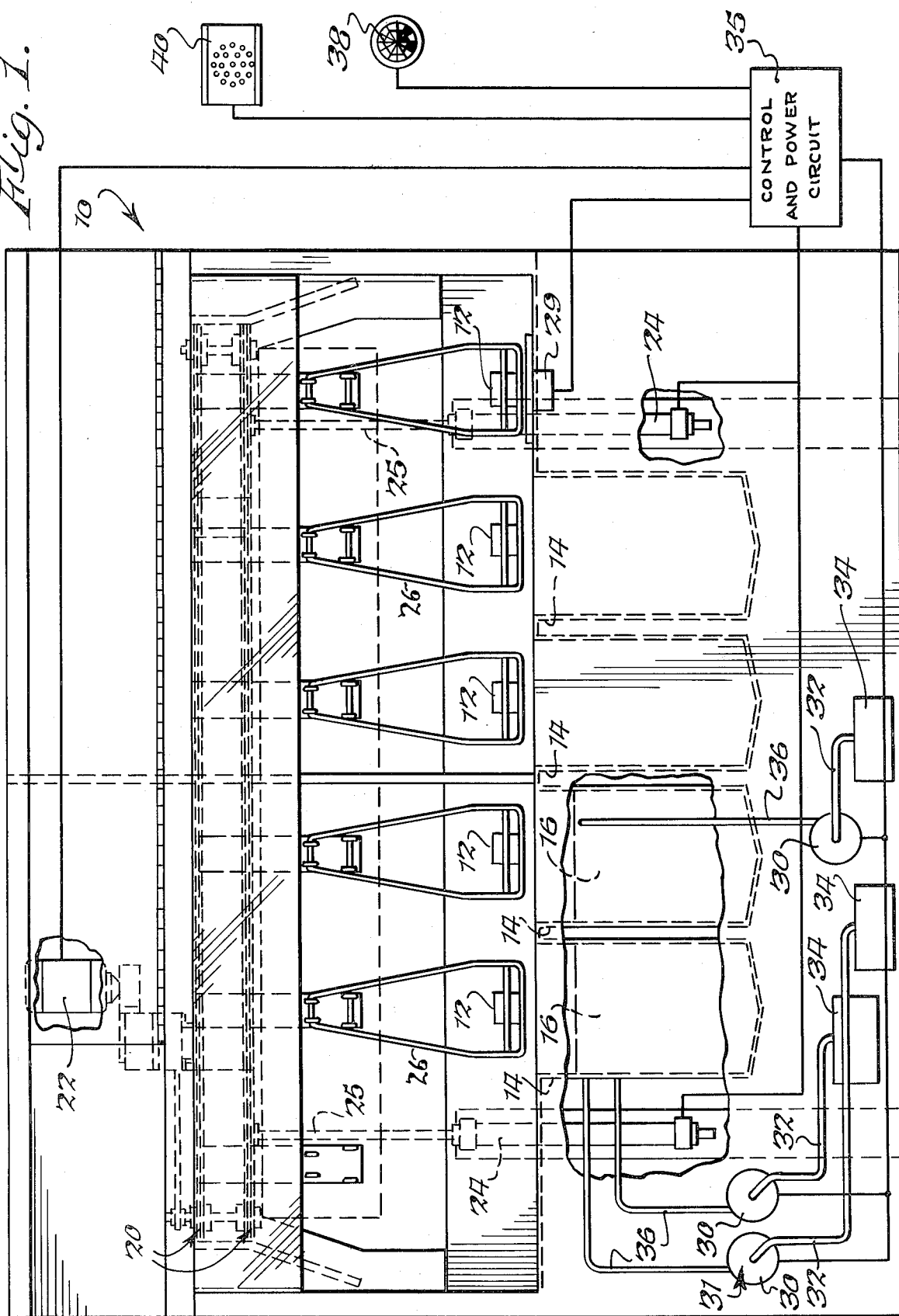


Fig. 1.



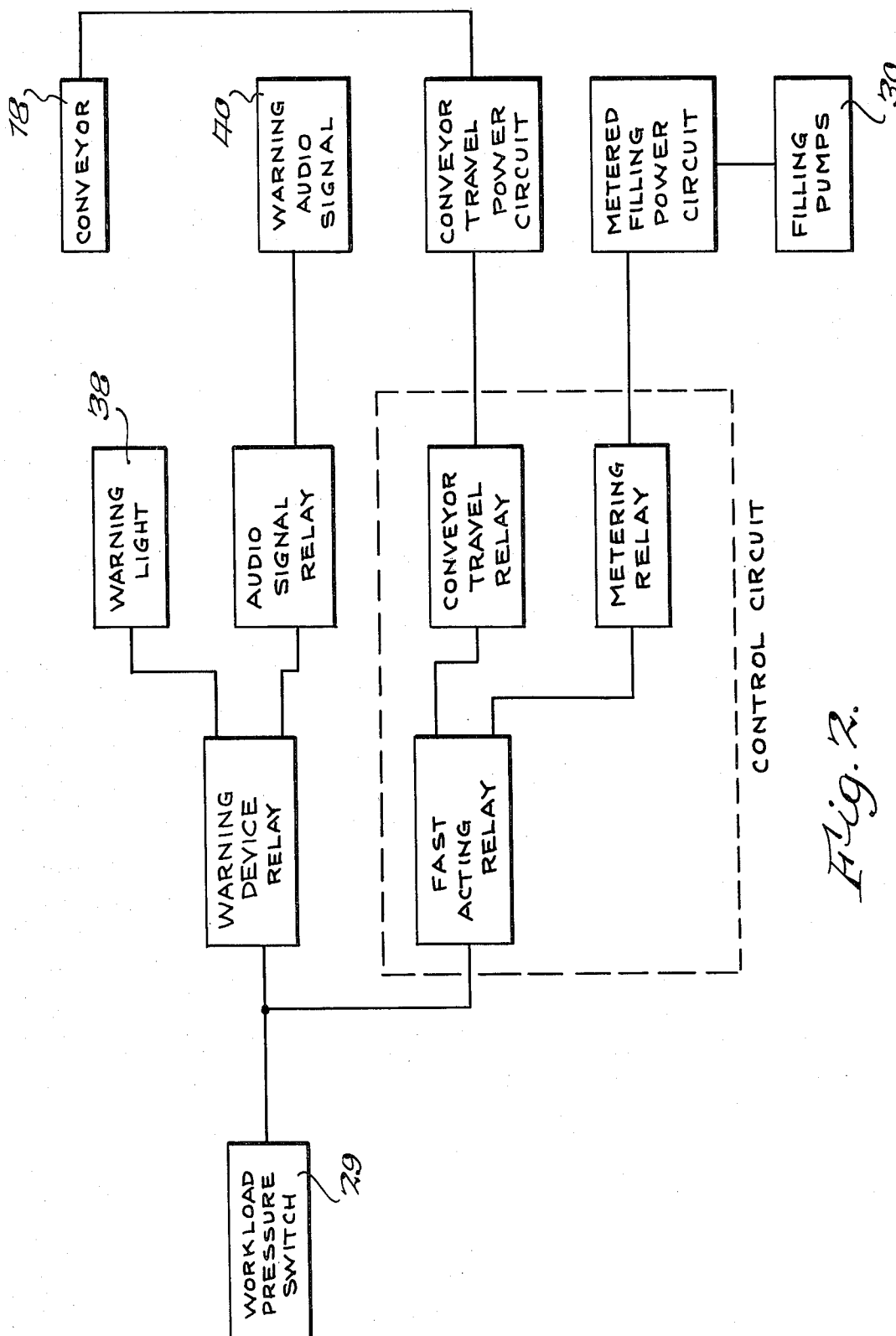


Fig. 2.

AUTOMATIC LIQUID FEED INTERLOCK WITH WORKLOAD

BACKGROUND OF THE INVENTION

This invention relates to automatic equipment for processing articles by means of immersing the articles into a process tank containing processing liquid. More particularly this invention relates to a means for maintaining the proper processing liquid level in a process tank used for processing articles and to a means for automatically stopping the processing operation when it is necessary for processed articles to be removed from the apparatus before processing continues. In the prior art apparatus for processing articles through a process tank containing processing liquid either did not automatically compensate for processing liquid removed from the processing tank by the article or relied upon complex sensing devices and electronic circuits for detecting the level of liquid in the process tank.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of the preferred apparatus of the invention and FIG. 2 is a diagram showing the relationship of the sensing device (workload pressure switch), control circuit, metered filling power circuit, filling pump, conveyor travel power circuit, conveyor, warning device relay, warning light, audio warning relay and audio warning device.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with this invention an apparatus is provided for processing an article wherein processing liquid is added to a process tank by an adding means responsive to a metered filling power circuit actuated by a sensing device for determining when processing of articles through the process tank has been completed.

In accordance with this invention the apparatus for processing an article comprises at least one processing tank for containing processing liquid, a conveyor for transporting the article to the tank, for immersing the article in the processing liquid, for removing the article from the processing liquid and for transporting the article away from the processing tank. The conveyor is operated by a conveyor travel power circuit. The apparatus further comprises a sensing device for determining when processing of the article through the process tank has been completed. Means is provided for adding liquid to the process tank to replace liquid removed from the tank by the processed article. Power is provided to the adding means by a metered filling power circuit which metered filling power circuit also controls the amount of liquid added to the process tank by the adding means. A control circuit connected to the sensing device is provided for activating the metered filling power circuit when the sensing device determines that processing of the article to the process tank has been completed thus causing the adding means to replace liquid removed from the process tank by the article. The control circuit comprises a fast acting relay activated by the sensing device and a metering relay connected with and activated by the fast acting relay which metering relay activates the metered filling power circuit.

PREFERRED EMBODIMENT OF THE INVENTION

In the preferred embodiment of the invention the sensing device determines when processing of the arti-

cle by the apparatus has been completed and the control circuit further comprises a conveyor travel relay connected with and activated by the fast acting relay, which activated conveyor travel relay deactivates the conveyor travel circuit thus stopping movement of the conveyor until the processed article is removed from the apparatus.

The sensing device may be any suitable detecting means such as a photoelectric cell or a feeler switch; however, in the preferred embodiment of the invention the sensing device is a pressure sensitive switch activated by deposit of a carrier containing the processed article upon the switch by the conveyor. The switch is deactivated by removing the carrier containing the article from the apparatus thus deactivating the control circuit and the metered filling power circuit which prevents addition of more liquid to the process tank than was removed by the carrier and the article. Deactivation of the control circuit reactivates the conveyor travel power circuit permitting the conveyor to continue processing articles through the apparatus.

The apparatus preferably further comprises at least one warning device for indicating the processing of the article by the apparatus is complete. The warning device is activated by a warning device relay which in turn is activated by the pressure sensitive switch. In the preferred embodiment of the invention both a warning light and an audio warning signal, preferably in the form of a warning buzzer, are activated by the warning device relay. The warning device relay directly activates the warning light and indirectly activates the audio warning signal through an audio warning relay. The warning device relay preferably is a time delay relay to allow time for the person operating the apparatus to remove processed articles from the apparatus before the warning light and audio warning signal are activated.

The adding means for adding liquid to the process tank to replace liquid removed from the tank by the processed article is preferably a pump for transferring liquid from the reservoir to the process tank.

As illustrated by the drawings in the preferred embodiment of the invention, the apparatus 10 for processing an article 12 comprises at least one and generally a plurality of process tanks 14 for containing a processing liquid 16. The apparatus further comprises a conveyor 18 for transporting article 12 to tank 14, for immersing article 12 in processing liquid 16, for removing article 12 from processing liquid 16 and for transporting article 12 away from process tank 14. In the preferred embodiment conveyor 18 comprises a horizontal sprocket and chain 20 driven by electric motor 22. The horizontal sprocket and chain 20 and electric motor 22 is supported by air cylinders 24 and pistons 25. Attached to horizontal sprocket and chain 20 is at least one carrier 26 for holding article 12. Article 12 is transported to process tank 14 by horizontal movement of sprocket and chain 20 which transports carrier 26 to a position above process tank 14. Carrier 26 holding article 12 is immersed in processing liquid 16 by downward movement of pistons 25 and carrier 26 and article 12 is removed from processing liquid 16 by upward movement of pistons 25. Article 12 is then transported away from process tank 14 by continued horizontal movement of sprocket and chain 20. The apparatus further comprises a sensing device 29 which emits a signal when processing of article 12 by apparatus 10 has been completed. Means for adding processing liquid 16

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to process tank 14 to replace processing liquid 16 removed from tank 14 by processed article 12 is provided. In the preferred embodiment the adding means is at least one pump 30 having an inlet 32 connected with a processing liquid reservoir 34. A discharge 36 from pump 30 is connected to process tank 14. Conveyor 18 is activated by a conveyor travel power circuit (FIG. 2) which provides power to electric motor 22 and air cylinders 24 thus permitting actuation of electric motor 22 and air cylinders 24 so that sprocket and chain 20 will horizontally move carrier 26 and article 12 and pistons 25 will vertically move carrier 26 and article 12. The conveyor travel power circuit contains the appropriate interlocking switches and timing devices so that horizontal movement of carrier 26 and article 12 is stopped at the appropriate position above process tank 14 and air cylinders 24 are then actuated so that pistons 25 permit horizontal sprocket and chain 20, carrier 26 and article 12 to be lowered so that article 12 is immersed in processing liquid 16. After the appropriate processing time interval air cylinders 24 are again actuated thus raising pistons 25, horizontal sprocket and chain 20, carrier 26 and article 12 thus removing article 12 from the processing liquid. Electric motor 22 is then reactivated by the conveyor travel power circuit so that horizontal sprocket and chain 20 continues to horizontally transport carrier 26 and article 12.

A metered filling power circuit is provided for providing power to adding means 31 and for controlling the amount of processing liquid 16 added to process tank 14 by adding means 31 when the metered filling power circuit is activated. A control circuit is provided for deactivating the conveyor travel power circuit thus stopping movement of conveyor 18 until article 12 is removed from apparatus 10 in response to sensing device 29. In addition the control circuit activates the metered filling power circuit causing adding means 31 to replace processing liquid 16 removed from process tank 14 by article 12. Preferably the control circuit comprises a fast acting relay activated by a sensing device 29 in the form of a workload pressure switch. The control circuit additionally comprises a conveyor travel relay connected with and activated by the fast acting relay, which activated conveyor travel relay deactivates the conveyor travel circuit. In the control circuit a metering relay is connected with and activated by the fast acting relay which metering relay activates the metered filling circuits thus causing adding means 31 to add processing liquid 16 to process tank 14.

The sensing device 29 shown in the form of a workload pressure switch in FIG. 2 is activated by deposit of carrier 26 containing processed article 12 upon the pressure switch by conveyor 18 thereby activating the control circuit 35. The control circuit is deactivated by removal of carrier 26 and article 12 from the workload pressure switch thus permitting conveyor travel power circuit to again provide power to conveyor 18 and which deactivates the metered filling power circuit which prevents the metered filling power circuit from adding more processing liquid 16 to process tank 14 than was removed from process tank 14 by carrier 26 and article 12.

In the preferred embodiment apparatus 10 further comprises at least one warning device for indicating that processing of article 12 by apparatus 10 is complete and wherein the warning device is activated by a warning device relay which is activated by workload

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pressure switch 29. In the preferred embodiment apparatus 10 includes both a warning light 38 and an audio warning device or signal 40 which are activated by the warning device relay. As shown in FIG. 2 the warning device relay directly activates warning light 38 and indirectly activates audio warning device 40 through an audio warning relay. In the preferred embodiment the warning device relay is a time delayed relay which permits an operator of apparatus 10 to remove carrier 26 holding processed article 13 before the warning light and audio warning device are activated.

For convenience all relays and power circuits shown in FIG. 2 are indicated in FIG. 1 as control and power circuits 35.

I claim:

1. An apparatus for processing an article comprising: at least one process tank containing processing liquid;
 - a conveyor for transporting the article to the tank, for immersing the article in the processing liquid, for removing the article from the processing liquid and for transporting the article away from the process tank;
 - a sensing device for determining when processing of the article through the process tank has been completed;
 - means for adding liquid to the process tank to replace liquid removed from the tank by the processed article;
 - a conveyor travel power circuit for providing power for operating the conveyor;
 - a metered filling power circuit for providing power to the adding means and for controlling the amount of liquid added to the process tank by the adding means; and
 - a control circuit connected to the sensing device for activating the metered filling power circuit when the sensing device signals that processing of the article through the process tank has been completed thus causing the adding means to replace liquid removed from the process tank by the article;
- wherein the control circuit comprises a fast acting relay activated by the sensing device, and a metering relay connected with and activated by the fast acting relay which metering relay activates the metered filling power circuit.

2. The apparatus of claim 1 wherein the sensing device determines when processing of the article by the apparatus has been completed and the control circuit further comprises a conveyor travel relay connected with and activated by the fast acting relay, which activated conveyor travel relay deactivates the conveyor travel circuit thus stopping movement of the conveyor until the processed article is removed from the apparatus.

3. The apparatus of claim 2 wherein the sensing device is a pressure sensitive switch activated by deposit of a carrier containing said processed article upon said switch by said conveyor.

4. The apparatus of claim 3 wherein said pressure switch is deactivated by removing the carrier containing the article from the apparatus.

5. The apparatus of claim 4 wherein the apparatus further comprises at least one warning device for indicating that processing of the article by the apparatus is complete and wherein the warning device is activated by a warning device relay which is activated by said pressure sensitive switch.

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6. The apparatus of claim 5 wherein both a warning light and an audio warning device are activated by the warning device relay.

7. The apparatus of claim 6 wherein the warning device relay is a time delay relay.

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8. The apparatus of claim 7 wherein the adding means is a pump for transferring liquid from a reservoir to the process tank.

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