



(86) Date de dépôt PCT/PCT Filing Date: 1993/08/27  
 (87) Date publication PCT/PCT Publication Date: 1994/03/17  
 (45) Date de délivrance/Issue Date: 2002/06/25  
 (85) Entrée phase nationale/National Entry: 1995/02/23  
 (86) N° demande PCT/PCT Application No.: SE 1993/000707  
 (87) N° publication PCT/PCT Publication No.: 1994/005436  
 (30) Priorité/Priority: 1992/08/31 (9202496-7) SE

(51) Cl.Int.<sup>6</sup>/Int.Cl.<sup>6</sup> B08B 9/08  
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(54) Titre : DISPOSITIF DE NETTOYAGE DANS UNE USINE DE TRAITEMENT DE PRODUITS ALIMENTAIRES  
 (54) Title: ARRANGEMENT DESIGNED TO BE A PART OF AN EQUIPMENT FOR CLEANING DIFFERENT OBJECTS  
 IN A FOOD PROCESSING PLANT

(57) **Abrégé/Abstract:**

The invention relates to an equipment for cleaning of different objects such as tanks, pipeline systems etc. in a plant for treatment of food, in which equipment there is an arrangement comprising means for conveying a liquid. This means is arranged to convey a variable controlled amount of liquid with a variable controlled flow rate. In series with this means there is a volume and/or flow rate metering means and a control means connected to the volume and/or flow rate metering means and receiving signals from the same. The control means is arranged to actuate the means for conveying liquid in dependence of this signal such that the desired amount of liquid is conveyed with a desired flow rate. The conveying means mentioned above and the volume and/or flow rate metering means are arranged in a conduit for supplying rinsing or cleaning liquid to one or several objects which are to be cleaned.



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b>  <b>B08B 9/08</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 94/05436</b>  <b>(43) International Publication Date:</b> 17 March 1994 (17.03.94)
<b>(21) International Application Number:</b> PCT/SE93/00707 <b>(22) International Filing Date:</b> 27 August 1993 (27.08.93)  <b>(30) Priority data:</b> 9202496-7                      31 August 1992 (31.08.92)                      SE  <b>(71) Applicant (for all designated States except US):</b> ALFA LAVAL AB [SE/SE]; S-147 80 Tumba (SE).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> LÖFDAL, Jan [SE/SE]; Norbergsgatan 5A, S-223 54 Lund (SE).  <b>(74) Agent:</b> CLIVEMO, Ingemar; Alfa Laval AB, S-147 80 Tumba (SE).		<b>(81) Designated States:</b> AU, BR, CA, FI, JP, KR, NO, NZ, PL, RU, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>  <div style="text-align: center; font-size: 2em; font-weight: bold;">2143195</div>
<b>(54) Title:</b> ARRANGEMENT DESIGNED TO BE A PART OF AN EQUIPMENT FOR CLEANING DIFFERENT OBJECTS IN A FOOD PROCESSING PLANT		
<b>(57) Abstract</b>  <p>The invention relates to an equipment for cleaning of different objects such as tanks, pipeline systems etc. in a plant for treatment of food, in which equipment there is an arrangement comprising means for conveying a liquid. This means is arranged to convey a variable controlled amount of liquid with a variable controlled flow rate. In series with this means there is a volume and/or flow rate metering means and a control means connected to the volume and/or flow rate metering means and receiving signals from the same. The control means is arranged to actuate the means for conveying liquid in dependence of this signal such that the desired amount of liquid is conveyed with a desired flow rate. The conveying means mentioned above and the volume and/or flow rate metering means are arranged in a conduit for supplying rinsing or cleaning liquid to one or several objects which are to be cleaned.</p>		

Arrangement designed to be a part of an equipment for cleaning different objects in a food processing plant.

The present invention relates to an arrangement designed to be a part of an equipment for cleaning different objects such as tanks, pipe line systems etc. in a plant for processing of foods.

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Mechanical and often automatic methods are used today for cleaning equipment in food processing plants. The cleaning takes place in a circulation path without any needs for dismantling the equipment. CIP (Cleaning-in-place) may be defined as circulation of the rinsing and cleaning solutions through equipment and plant parts which are connected to a circulation path. When a cleaning solution passes past the surfaces which are to be cleaned chemical and mechanical working of the residues on the surfaces takes place which is a necessity for a good cleaning effect. Different objects with differing contaminations and objects demand varying cleaning programs in order to obtain a satisfactory cleaning result. A cleaning program mentioned as an example may comprise prerinsing during 5 minutes, circulation of alkaline detergent (lye) during 20 minutes, rinsing with warm water, circulation of acid solution during 15 minutes, rinsing with disinfectant during some minutes and post rinsing with water during 5 minutes.

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In the systems which are used today the cleaning program is controlled by time control, i.e. the pump which transports the rinsing or cleaning solution to or from the object works with a theoretical capacity during a certain time.

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As the flows are large this means that even if the pumps theoretically should have the same known capacity, deviations may occur which for example means that the

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tanks, when one changes from rinsing to cleaning with lye are not empty, as they should be. If an amount of water is left in the tank the cleaning solution will be diluted, which may cause an uncomplete cleaning in the preceding step. The use of unnecessary large amounts of water and cleaning solutions also implies unneeded expenses. Since the same cleaning centrals are used for tanks with different volumes it is difficult to adjust the cleaning programs to each separate tank arrangement.

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According to the invention an arrangement designed to be used in an equipment for cleaning of food processing plants is therefore proposed which arrangement avoids the problems mentioned above. The arrangement according to the invention comprises means for conveying a variable, controlled amount of liquid with a variable controlled flow rate, means for metering the volume or the flow rate connected in series with the conveying means and a control means connected to the volume and/or flow rate metering means and receiving signals from the same, which control means is arranged to actuate the means for conveying the liquid in dependence of this signal in such a way that a desired amount of liquid is conveyed with a desired flow rate, at which the conveying means and volume and/or flow rate metering means are arranged in a conduit for conveying rinsing- or cleaning liquid to one or several objects which are to be cleaned.

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According to the invention the means for conveying the liquid consists of an regulable pump, at which the control means is arranged to regulate the capacity of the pump. If it is suitable a pump with well defined volumetric qualities may be used instead, which pump is adjustable between different capacities.

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Another suitable combination consists of a pump and a regulating valve connected to the same, at which the control means is arranged to affect the through flow area of the regulating valve. This arrangement is, however, more expensive in purchase than the arrangement described above.

A preferable solution from economical point of view is to use a frequency controlled centrifugal pump for conveying the different solutions which are used in the cleaning program.

An arrangement according to the invention may, as has been mentioned, be used for several objects or pipe lines which are to be cleaned and which demand different cleaning flows and volumes. Each object has its own desired value of flow rate and amount for the respective step in the cleaning cycle. The desired value is used as a reference to control the system to give the right flow by forwarding a suitable signal to the pump or the regulating device.

The flow meter arranged in series with the pump senses the flow which passes the flow meter and gives a corresponding signal to a control means. If the desired flow rate deviates from the desired value the control means adjusts the number of revolutions of the pump in such a way that the desired value is obtained.

This possibility to obtain a carefully defined flow, the value of which is adjusted to each object which shall be cleaned and also to the desired function during a certain cleaning program, gives possibility to considerably savings both as regards the used amount of water, the consumption of energy when heating the

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cleaning solutions and also the used amounts of lye, acid and disinfectants.

5 The information from the flow/volume meter is used to control the borderline between different solutions used during the steps in the cleaning cycle. With knowledge about these borderlines the pump may be stopped during a certain period in order to hinder mixing of different solutions for example in a tank.

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Below there is described how the arrangement may be used during some of these steps which are part of a cleaning cycle.

15 A certain flow through the cleaning device which is situated in the upper part of the tank is needed for cleaning of tanks. The cleaning device sprays rinsing or cleaning solution into the tank. This flow is calculated for each combination of cleaning device and tank and in  
20 order to obtain a satisfactory cleaning of the tank this value must be obtained. Due to the careful control of the flow which may be obtained with the arrangement according to the invention, exactly the desired amount may be supplied to the tank. With techniques generally  
25 used today the flows through the plant fluctuate such that the result of the cleaning varies. This is compensated by a longer cleaning time which gives higher costs for the cleaning operation.

30 It is not only the possibility to optimize the amount of solution during a certain step in the program which is valuable. During cleaning of tanks the return pump arranged in the bottom of the tank is used to pump out the amount of rinsing or cleaning solution from the  
35 tank. This pump is usually self priming and works with a

certain capacity. When a step in the cleaning program has been ended there is, if the right relation prevails between the capacity of the cleaning pump and the capacity of the return pump, only a limited volume of liquid left in the tank. The next step in the cleaning program adds new medium, for example lye solution. If the tank is mainly empty, i.e. only contains the known limited volume of liquid, a minimal dilution of the lye solution takes place. If a larger amount of liquid from the preceding step is left in the tank, the lye solution firstly pumped out from the tank will be so diluted that it must be conveyed to waste or concentration.

In a well functioning cleaning system the used cleaning solutions, i.e. the lye and acid solutions, are returned to the supply tanks when the cleaning program has been carried through and the same solutions may be used during some or several weeks.

The arrangement according to the invention may also with advantage be used in the case where rinsing with a disinfectant is part of the ending step in the cleaning program. The disinfectant is then pumped directly into the system by means of a concentrate pump. The capacity of the pump which is part of the arrangement or where appropriate the regulating device is adapted to the capacity of the concentrate pump in such a way that the right concentration of the disinfecting solution is obtained.

With an arrangement according to the invention there is also obtained a control of the amount of energy that has been used in the cases where the rinsing or cleaning solutions are heated by passing a heat exchanger connected before the inlet to the object which shall be

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cleaned. Due to the fact that the flow of incoming rinsing or cleaning solution is known, the amount of heat which shall be added from a medium giving off heat may be exactly calculated.

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The arrangement according to the invention may be used for preparation av e.g. lye or acid solutions in the same way as has been described for the preparation of disinfectant solutions. In this way earlier used  
- burdensome preparations which have involved addition of  
10 water, addition of concentrate, mixing, measuring of the concentration, a possible new addition of concentrate, new mixing and so on may be avoided entirely.

**C L A I M S:**

1. A cleaning system for cleaning food treating equipment comprising conveying means for transporting a variable, controlled amount of liquid at a variable controlled flow rate to said equipment, metering means connected in series with said conveying means for measuring the volume and flow rate of liquid transported by said conveying means and generating signals representative thereof, and control means connected to said metering means for receiving signals from said metering means, said control means being connected to said conveying means to insure that a desired amount of liquid is conveyed to said equipment at a desired flow rate, said conveying means and metering means being arranged in a conduit for conveying rinsing or cleaning liquid to said equipment.

2. The system according to claim 1, wherein the means for conveying the liquid, comprises a regulatable pump, said control means being arranged to regulate the capacity of the pump.

3. The system according to claim 2, wherein the pump is a frequency controlled centrifugal pump.

4. The system according to claim 1, wherein the means for conveying liquid comprises a pump and a regulating valve connected to said pump, said control means being arranged to affect the flowthrough area of the regulating valve.

5. An arrangement for an apparatus for treatment of food for use in cleaning at least one part of the apparatus, the arrangement comprising a conduit for conducting a liquid supplied from a liquid source to the apparatus during a cleaning operation, and adjustable flow controlling means connected in the conduit to control the rate of liquid flow through the conduit, wherein metering means are connected in the conduit in series with the flow controlling means to sense and to signal the volume of liquid flow and the rate of liquid

flow through the flow controlling means, and a control means coupled to the metering means and to the flow controlling means responsive to signals received from the metering means to adjust the flow controlling means to establish a desired rate of flow of liquid through the conduit to the apparatus being cleaned, whereby a desired amount of liquid is supplied to the apparatus.

6. The arrangement according to claim 5, wherein the control means is arranged to adjust the flow controlling means to establish a plurality of different desired flow rates during cleaning of different parts of the apparatus.

7. The arrangement according to claim 5, wherein the control means permits different amounts of liquid to pass through the conduit during cleaning of different parts of the apparatus.

8. The arrangement according to claim 5, wherein the flow controlling means comprises a regulatable pump, the control means being arranged to regulate the capacity of the pump.

9. The arrangement according to claim 8, wherein the pump is a frequency controlled centrifugal pump.

10. The arrangement according to claim 5, wherein the flow controlling means comprises a pump and a regulating valve connected thereto, the control means being arranged to influence the through flow area of the regulating valve.