

**Method for dosing a solid detergent, detergent dispenser
and use of method and dispenser**

5 This invention generally relates to a method for dosing of a pre-determined quantity of a solid detergent from a solid detergent reservoir by dissolving some of the solid detergent in the reservoir in a rinsing liquid to form a detergent solution according to the preamble of claim 1, to a detergent dispenser for such dosing task according to the preamble of claim 18 as well as to specific use of such method and dispenser according to claim 17 or claim 40 for cleaning/or
10 disinfecting a milking equipment, system, or parlour.

Dosing of a pre-determined quantity of a detergent from a detergent reservoir to achieve a specific detergent solution is a widely accepted praxis. The present invention relates to dosing of a pre-determined quantity of a solid detergent.
15 Solid within the scope of the present invention means bulk material like powder or granulate material as well as solid block-like material which may be produced by pressing of a powder or by casting or other manufacturing methods. However, solid detergent within the scope of the present application as well means semi-solid material like gel with high viscosity which will not flow from the solid
20 detergent reservoir on its own motion but only if pre-dissolved in part by a rinsing liquid.

The term "detergent" in the present application means any kind of cleaning product for washing, rinsing, dish washing, laundry washing, as well as for
25 cleaning soiled equipment. The term detergent further covers disinfectants used for all kinds of applications.

Rinsing liquid within the scope of the present invention means any liquid able to dissolve a specific solid detergent to achieve a detergent solution. In particular,
30 however, rinsing liquid means water.

The invention relates in particular to the field of milking equipment, system, or parlour as a specifically interesting field of use of such method.

35 Where a solid detergent from a solid detergent reservoir shall be used to form a detergent solution, the prior art forming the starting point of the invention

(EP 0 229 038 A2; a similar detergent dispenser can be obtained from US 5,549,875 A) proposes an automatic dispenser for dispensing solid chemicals used in cleaning process. This prior art gives an overview of the background of automatic dispensing of a solid detergent from a solid detergent reservoir and of dispensing of detergents in general. This prior art defines two basic categories based upon their method of controlling the amount of detergent dispensed, namely time controlled dispensers, and conductivity measurement dispensers.

The prior art mentioned above proposes a conductivity measurement dispenser for a solid detergent. This detergent dispenser comprises a solid detergent reservoir, a supply line for supplying water as rinsing liquid to the solid detergent reservoir, and a rinsing liquid dispensing means in the form of a water spray nozzle system below the solid detergent in the solid detergent reservoir and connected to the supply line, so that water can be sprayed toward the solid detergent to dissolve some of it to form the solution. A solution conduit is mounted below the solid detergent reservoir and is collecting detergent solution dripping off the solid detergent block or powder container and carries the detergent solution away from this reservoir towards the utilization point which in this embodiment is a washing machine. A conductivity sensing means as well as a temperature sensing means is operatively connected to the solution conduit to measure on the one hand the conductivity of the detergent solution flowing in the conduit, on the other hand its temperature. Both measuring means are connected to an electronic control means that controls the operation of the detergent dispenser in total.

A flow regulating means is cooperatively connected to the water supply line for maintaining a constant flow rate of the water. The electronic control means calculates the total amount of detergent dispensed into the utilization point based upon the defined constant water flow rate, the length of the measuring period and the measured conductivity of the detergent solution. In a modified mode of operation a number of dispensing periods is provided and the total amount of detergent dispensed into the utilization point is calculated by summing the periodic amounts thereof.

Altogether, in this prior art system the quantity (e.g. in grams) of a solid detergent transferred to the utilization point in the form of the detergent solution is measured.

5 This specific method and dispenser take into account the requirement of specific utilization systems, in particular a milking equipment which requires a specific total quantity of a specific detergent for a complete cleaning or disinfecting cycle. In an example that may be 200 g of a specific milking equipment disinfecting chemical measured into an inlet chamber of the milking equipment
10 and sucked with a large amount of water through the milking equipment by the vacuum in the milking equipment or system.

In this regard reference is additionally made to prior art describing a milking equipment and specific problems in cleaning and disinfecting such equipment
15 (US 5,345,890 A).

Further reference is made to WO 00/28879 A which relates to a method for detecting the quantity of a solid product dissolved in a solution flow of known flow rate and unknown or variable concentration. Such method can be used
20 together with a detergent dispenser as disclosed in EP 0 229 038 A that forms the starting point of the invention.

The problem with the measurement of concentration by measurement of conductivity in a continuous flow of detergent solution is the questionable
25 precision of the conductivity measurement. This is particularly true if the utilization point shows strong variations in back pressure, flow rate etc. as it is the case in a milking equipment, system, or parlour. In result overdosing of detergent in the detergent solution is the usual thing done by the end-user of such chemical product to be on the safe side.

30 An approach which promises higher accuracy and less overdosing is to use a mixing and storage tank for a ready-to-use detergent solution (US 4,463,582 A). This apparatus for supplying a dry detergent concentrate for a laundry plant uses a measuring probe within the detergent solution in the tank to check the
35 concentration of detergent in the solution. This kind of method is used with a weighing system below the storage tank.

Within the last years truly solid detergents in particular in the form of a solid block are more frequently used. The advantage of a solid block of detergent is a small size and weight compared to a liquid product (for example 4 kg in a small block compared to a 20 l container of ready to use detergent solution). The solid product is less dangerous in application, less dangerous when transported and much cheaper for transportation.

However, there is still a substantial need for a dosing method for a solid detergent and a corresponding detergent dispenser which allows dispensing a desired quantity (mass) of a solid detergent, however in the form of a detergent solution towards a utilization point with high precision and in a safe, simple and accurate way. In particular there is the need for a corresponding method and detergent dispenser which is particularly useful for a milking equipment, system or parlour taking into consideration the pressure variations and other system features of such specific equipment.

The present invention solves above mentioned problem by means of a method for dosing of a pre-determined quantity of a solid detergent having the features of claim 1. Preferred embodiments of this method are the subject matter of dependent claims 2 to 16.

A preferred use of a method according to the invention is that for cleaning and/or disinfecting a milking equipment, system or parlour as claimed in claim 17.

The above mentioned object is further achieved with a detergent dispenser with the features of the preamble of claim 18 that is further specified by the features of the characterizing part of claim 18.

Preferred embodiments of the detergent dispenser according to the invention are the subject matter of dependent claims 19 to 39.

A preferred use of a detergent dispenser according to the invention for cleaning and/or disinfecting a milking equipment, system or parlour is the subject of claim 40.

The invention describes a method and detergent dispenser which is appropriate for metering a solid detergent rapidly and with high precision however without the necessity to have a conductivity measurement in a flowing detergent solution. The amount of solid detergent that in the end shall be metered towards the utilization point can be entered into the electronic control means as a mass quantity (e.g. in grams). This will be reached largely independent of the ambient conditions.

The rinsing rate with solid detergents depends on several ambient conditions, inter alia the temperature of the rinsing liquid, in particular the rinsing water, temperature of the solid detergent in the solid detergent reservoir, liquid pressure, specific solubility of the solid detergent, distance between spray nozzle for the rinsing liquid and the lowest level of the solid detergent reservoir, time interval between dosing cycles (re-solidification of the solid detergent), etc.

The method according to the invention as well as the detergent dispenser allows wide variations of above mentioned conditions without any impairment of metering accuracy. In fact only the solid detergent that already has been dissolved and is present as detergent solution in the dissolving tank is determined by the calculation stored in the electronic control means. Whereas the overall amount of detergent solution that is transporting the pre-determined quantity of detergent may vary as a result of varying ambient conditions, the quantity of detergent as such is precisely defined.

In fact with the above mentioned example of 200 g of solid detergent the overall volume of detergent solution may e.g. vary between 3,5 l and 6,0 l depending on above mentioned ambient conditions. Normally this is not a problem for the following utilization point, in particular the equipment or system to be cleaned and/or disinfected, because the specific pre-determined quantity of detergent will there be deleted once more and to a much larger extent (e.g. up to 60 to 100 l). However, if a precise correction of different volumes of detergent solution should be required, a corresponding correction could be applied using a volume flow meter at the delivery outlet or downstream thereof.

Now, details of the method as well as the detergent dispenser according to the invention will be explained following a detailed description of a preferred em-

bodiment of the invention with reference to the drawing. In the drawing the single figure shows a schematic display of a detergent dispenser with two solid detergent reservoirs.

- 5 In general the present invention is related to a method for dosing of a pre-determined quantity of a solid detergent from a solid detergent reservoir by dissolving some of the solid detergent in the reservoir in a rinsing liquid to form a detergent solution, comprising the following steps:
- 10 a) continuously or discontinuously feeding detergent solution generated at the detergent reservoir into a dissolving tank,
 - b) measuring the amount of rinsing liquid supplied to form the detergent solution that is fed to the dissolving tank, as well as any amount of rinsing liquid directly supplied to the dissolving tank,
 - 15 c) measuring the detergent concentration of the detergent solution in the dissolving tank,
 - d) calculating the quantity of detergent in the detergent solution in the dissolving tank by multiplication of the results of the measurements in steps b) and c),
 - 20 e) feeding the amount of detergent solution representing the required quantity of detergent from the dissolving tank to a utilization point, in particular an equipment or system to be cleaned and/or disinfected.

This method has the advantages already explained in the introductory parts of the description.

- 25 In a further step it may be provided that the feeding of detergent solution into the dissolving tank is terminated when calculation in step d) has reached the pre-determined quantity of detergent. Following this termination of feeding the detergent solution in the dissolving tank is ready to be fed to the utilization point, namely the equipment or system that is to be cleaned and/or disinfected. However, such utilization point may be a dishwashing machine, a laundry washing machine or the like as well.

- 35 Although of course some kind of level supervision in the dissolving tank is necessary for safety reasons, the volume of detergent solutions in the dissolving tank is not what is measured as the essential characteristics. Of course, the

supply of rinsing liquid to the dissolving tank is measured, but with the aim to determine the quantity of solid detergent now contained in the detergent solution in the dissolving tank.

5 In a further specification of the inventive method, measuring the detergent concentration in the dissolving tank is done by measuring the conductivity of the detergent solution within the tank. However, as conductivity is widely temperature-dependent it is advisable that in addition to measuring the concentration, the temperature of the detergent solution in the tank or a related
10 temperature is measured.

The way to calculate the quantity of solid detergent in the detergent solution in the dissolving tank may vary widely. However, in practise it has been realized that a particularly preferable method step is that the calculation of the quantity of
15 detergent in the detergent solution is done based on a table look-up procedure, preferably of a three-dimensional data table system for conductivity, concentration and temperature.

A typical flow chart for this kind of calculation is following hereafter with the
20 following terms used:

χ_{ref} = conductivity @ reference - temperature
25 χ_T = conductivity @ actual temperature
 $\alpha(i)$ = Temperaturecoefficient(s) of detergent solution
 T = actual temperature
 T_{ref} = reference - temperature
 y = calculated detergent concentration value
30 $value$ = calculated χ_{ref}
 $x(i), y(i)$ = table look up values

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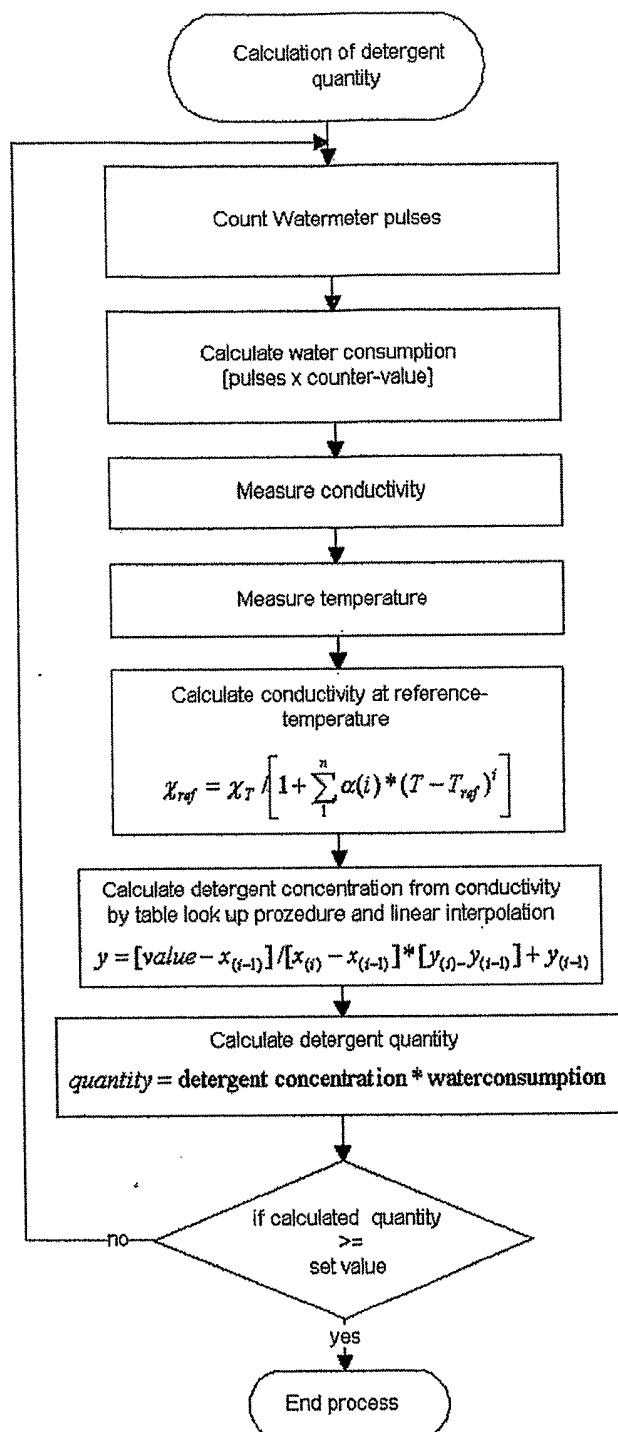
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As a safety measure it can be provided that an upper level for the detergent concentration in the dissolving tank is not exceeded, preferably by additionally supplying rinsing liquid to the dissolving tank.

5 Concentration measurement can be an indicator for consumption of solid detergent in the solid detergent reservoir. The remaining product level in the solid detergent reservoir can be indirectly monitored by continuous observation of the ratio between the supplied quantity of rinsing liquid, in particular water, and the conductivity representing the concentration of detergent.

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As the reservoir empties the conductivity will drop and may trigger an alarm. The gradient of the conductivity variation depends on the quantity of rinsing liquid in the dissolving tank. This quantity will be taken into account. So altogether an excessive drop in the concentration measured in step c) is
15 interpreted as information that the solid detergent reservoir is empty.

As already explained above, preferably tap water, in particular hot tap water, is used as a rinsing liquid.

20 Further, as equally explained above, the solid detergent may be provided as a cast powder in a powder bag, as a granulate in a corresponding container or even as a semi-solid detergent, namely a gel with high viscosity, preferably in a suitable container as well.

25 In the embodiment described here, however, the solid detergent is provided as a solid block, optionally in a suitable container.

The method applied in the preferred embodiment of the invention for dissolving solid detergent from the solid detergent reservoir is well known from the prior art
30 in EP 0 229 038 A2 or in US 5,549,875 A. In this method rinsing liquid is sprayed towards the solid detergent reservoir impinging upon substantially the entire lower surface area of the reservoir. Detergent solution is dripping off the lower surface of the solid detergent in the reservoir and is collected for further feeding to the dissolving tank.

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The detergent solution may be gravity-fed from the dissolving tank to the utilization point. However, in a preferred embodiment of the method feeding from the tank to the utilization point, in particular to the system to be cleaned is done by a delivery pump.

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Normally, the detergent solution in the dissolving tank will not be very stable. So continuous movement in the detergent solution is advisable. So for a preferred embodiment of the invention it is provided that, while the preparation of the detergent solution in the dissolving tank is under way, the detergent solution in the dissolving tank is circulated within the dissolving tank or through a circulation conduit. In a very preferred embodiment circulation of the detergent solution is done by the delivery pump as well in a circulation mode thereof.

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The diagrammatic display in the drawing shows that here two solid detergent reservoirs are provided both feeding the dissolving tank. This is related to an optional method according to the invention where different solid detergents from different solid detergent reservoirs are fed to the dissolving tank in alternate or successive system-feeding cycles. As an alternative to this method or in addition thereto it may be provided that different, preferably incrementally increasing quantities of solid detergent are pre-determined and fed to the utilization point in successive feeding cycles.

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Finally, as already explained above, a preferred field of application for the inventive method is for cleaning and/or disinfecting a milking equipment, system or parlour.

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Of course, the method according to invention may be adapted to different rinsing circumstances and properties. It might be useful to end feeding of rinsing liquid to the solid detergent reservoir somewhat in advance of the final point where the pre-determined quantity of solid detergent is reached. So residual quantities can be taken into account. With a sufficiently intelligent logic in the electronic control means a self-learning system may be applied.

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Along with an explanation of the sole figure of the drawings the inventive detergent expenser will be explained hereafter.

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The figure shows a detergent dispenser for dosing of a predetermined quantity of a solid detergent. This dispenser comprises at least one solid detergent reservoir 1, in the present embodiment two of those 1a, 1b and a third one indicated in dashed lines as an option 1c. A supply line 2 for supplying a rinsing liquid 3 to the solid detergent reservoir 1 is provided with branches 2a, 2b and, optionally, 2c. A rinsing liquid dispensing means 4 in the form of a spray nozzle is positioned below the solid detergent 5 in the solid detergent reservoir 1 and is connected to the supply line 2 or the respective supply line branch 2a, 2b, 2c respectively. It is intended to dispense rinsing liquid 3 as indicated towards the solid detergent 5 to dissolve some of the solid detergent 5 in the solid detergent reservoir 1.

A solution conduit 6 is connected to the solid detergent reservoir 1 to carry detergent solution 7 away from the solid detergent reservoir 1. This will be explained later.

A concentration measuring means 8 is positioned downstream of the solution conduit 6 and is adapted to measure the concentration of the detergent solution 7 or a physical characteristics of the detergent solution 7 enabling calculation of its concentration.

Finally, an electronic control means 9 for controlling the operation of the detergent dispenser is provided wherein the measuring means 8 is connected to this control means 9.

The control means 9 has a central processing unit 9a, an input amplifier 9b for amplification of the measuring signal of the measuring means 8, and an in/out-interface 9c for all incoming and outgoing connecting lines to different parts, measuring means and control means of the dispenser.

A rinsing liquid flow meter 10 is provided at the supply line 2. This is adapted to measure the amount of rinsing liquid supplied to form the detergent solution 7. This flow meter 10 is connected to the electronic control means 9.

As already explained above the rinsing liquid 3 may be any liquid adapted to a specific solid detergent 5. However, usually water will be the rinsing liquid so

that hereafter the term water will be used instead of rinsing liquid from time to time.

5 A dissolving tank 11 is provided to hold a substantial amount of detergent solution 7, and the solution conduit 6 is opening into this dissolving tank 11. In fact, the solution conduits 6a, 6b and, optionally, 6c equally lead into the dissolving tank 11.

10 The concentration measuring means 8 is operatively connected to the dissolving tank 11 and adapted to measure the concentration of the detergent solution 7 held in the dissolving tank 11.

15 The electronic control means 9 is adapted to calculate the quantity of detergent in the detergent solution 7 in the dissolving tank 11 by multiplication of the results of the measurement of the amount of rinsing liquid 3 supplied as well as the detergent concentration measured by the concentration measuring means 8.

20 The dissolving tank 11 is provided with a delivery outlet 12 which may be shut off for holding the detergent solution 7 in the dissolving tank 11 and opened for delivery of detergent solution 7 from the dissolving tank 11 to a utilization point 13, preferably to a system or equipment that has to be cleaned and/or disinfected. As already explained above such utilization point may equally be a dishwashing machine, a laundry washing machine or other cleaning equipment.

25 From the delivery outlet 12 a delivery conduit 14 leads to the utilization point 13 which sometimes may be positioned quite distant from the detergent dispenser itself.

30 In the preferred embodiment of the invention the supply line 2 is provided with a preferably motorized shut off valve 15 assigned to the rinsing liquid dispensing means 4. Further the supply line 2 is provided with a backflow preventer 16, preferably positioned downstream of the shut off valve 15. In all cases we have indications a, b, c for the three different solid detergent reservoirs 1 present in the embodiment of the drawings.

According to a further preferred embodiment of the invention it is provided that the concentration measuring means 8 is designed as a conductivity measuring means. As the conductivity is usually temperature-dependent it is advisable that a temperature measuring means is operatively connected to the dissolving tank 11 and is - here - connected to the electronic control means 9 as well. In the present embodiment the temperature measuring means is integrated into the concentration measuring means 8.

As already explained above, in the detergent dispenser according to the invention it is preferred that the calculation of the quantity of detergent in the detergent solution 7 by means of the electronic control means 9 is done based on a table look-up procedure, preferably of a three-dimensional data table system for conductivity, concentration and temperature. This allows to take care of the typical behaviour of conductivity following temperature and concentration of a solid detergent in a rinsing liquid like water. This takes care of the nonlinear relationship between the three parameters.

Further it is provided that an upper level for the detergent concentration in the dissolving tank 11 is not exceeded, preferably by additionally supplying rinsing liquid to the dissolving tank 11. In a further preferred embodiment it is provided that the electronic control means 9 is adapted to emit an "empty" signal if an excessive drop in the concentration measured by the concentration measuring means 8 indicates that the solid detergent reservoir 1 is empty. As already explained the rinsing liquid 3 is usually water from a water tap, preferably hot water.

In the embodiment shown it is provided that the rinsing liquid supply line 2 (or a separate supply line is directly connected to the dissolving tank 11, preferably by means of a motorized shut off valve 17 connected to the electronic control means 9. This separate supply of rinsing liquid 3, namely water into the dissolving tank 11 guarantees that a maximum detergent concentration in the dissolving tank 11 is not exceeded. Fresh water may be directly introduced into the tank 11 to avoid saturation effects which impair measurement accuracy. Further, this direct introduction of water into the tank 11 allows for cleaning and rinsing of the tank 11 as such.

The figure shows that in this specific embodiment the solid detergent reservoir 1 comprises a housing with a solid detergent compartment, at the top containing the solid detergent 5 and the rinsing liquid dispensing means 4 and a solution collector below this solid detergent compartment so that for dissolving of solid
5 detergent 5 from the solid detergent reservoir 1 rinsing liquid 3 may be sprayed towards the solid detergent 5 in the solid detergent reservoir 1 impinging upon substantially the entire lower surface area of solid detergent 5 in the reservoir 1.

However, the drawing in dashed lines shows a modification or option where the
10 solid detergent reservoir 1 comprises a bottom plate 18 with perforations or the like with the solid detergent 5 stored above the bottom plate 18. This system may be in particular used with a semi-solid detergent like a gel of high viscosity. This system is similar to a system disclosed in WO 92/20876 A. It depends on viscosity and other characteristics of the semi-solid detergent 5 how the solution
15 with spraying water towards the bottom plate 18 will work.

Further details of the construction are related to the fact that the delivery outlet 12 of the dissolving tank 11 is provided with a delivery pump 19, that the dissolving tank 11 is provided with a mixing means for mixing and circulating
20 the detergent solution 7, and that the dissolving tank 11 is provided with an external circulation conduit 20 extending from the delivery outlet 12 back to the top of the dissolving tank 11. For this specific construction a three-way valve 21 is provided downstream of the delivery outlet 12 and - here - downstream of the delivery pump 19, connecting the delivery outlet 12 to either the delivery conduit
25 14 or the circulation conduit 20. During circulation and preparation of the final detergent solution 7 with the pre-determined overall amount of detergent available circulation is done through the circulation conduit 20. At the end of this phase the three way valve 21 is operated by the electronic control means 9 to close the conduit 20 and to open the delivery conduit 14 towards the utilization
30 point 13.

Of course the liquid level in the tank 11 must be controlled. To this end the dispenser is provided with a level gauge 22 which here is adapted to measure
35 different levels of liquid in the tank 11.

As explained above in the present embodiment it is provided that the dispenser is provided with more than one solid detergent reservoir 1 for dosing different detergents or a larger amount of detergent. This may be used to provide that one solid detergent reservoir 1 is provided with an alkaline solid detergent and a
5 second solid detergent reservoir 1 is provided with an acidic detergent. In the electronic control means 9 the flushing ratio or succession may be pre-set. The electronic control means 9 may be designed to predetermine different, preferably incrementally increasing quantities of solid detergent 5 to be fed to the utilization point in successive feeding cycles.

10 As equally explained above this dispenser may be used for a milking equipment, system or parlour with particular advantages.

In general the metering process may be started either manually or automatically.
15 However, it is advisable that the dissolving tank 11 is briefly flushed before with hot water to increase rinsing water temperature and to remove residues from previous cleaning processes.

Claims:

1. Method for dosing of a pre-determined quantity of a solid detergent from a solid detergent reservoir by dissolving some of the solid detergent in the reservoir in a rinsing liquid to form a detergent solution,
5 comprising the following steps:

- a) continuously or discontinuously feeding detergent solution generated at the detergent reservoir into a dissolving tank,
- b) measuring the amount of rinsing liquid supplied to form the detergent
10 solution that is fed to the dissolving tank, as well as any amount of rinsing liquid directly supplied to the dissolving tank,
- c) measuring the detergent concentration of the detergent solution in the dissolving tank,
- d) calculating the quantity of detergent in the detergent solution in the
15 dissolving tank by multiplication of the results of the measurements in steps b) and c),
- e) feeding the amount of detergent solution representing the required quantity of detergent from the dissolving tank to an a utilization point, preferably to equipment or system to be cleaned and/or disinfected.

2. Method according to claim 1, characterized by the further step:

- f) terminating the feeding of detergent solution into the dissolving tank, when the calculation in step d) has reached the pre-determined quantity of detergent.

3. Method according to any one of the preceding claims, characterized in that measuring the detergent concentration in the dissolving tank is done by measuring the conductivity of the detergent solution within the tank.

4. Method according to claim 3, characterized in that
30 in addition to measuring the concentration, the temperature of the detergent solution in the tank or a related temperature is measured.

5. Method according to any one of the preceding claims, characterized in that in step d), the calculation of the quantity of detergent in the detergent solution is
35 done based on a table look-up procedure, preferably of a three-dimensional data table system for conductivity, concentration and temperature.

6. Method according to any one of the preceding claims, characterized in that an upper level for the detergent concentration in the dissolving tank is not exceeded, preferably by additionally supplying rinsing liquid to the dissolving tank.

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7. Method according to any one of the preceding claims, characterized in that an excessive drop in the concentration measured in step c) is interpreted as information that the solid detergent reservoir is empty.

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8. Method according to any one of the preceding claims, characterized in that tap water, preferably hot tap water, is used as a rinsing liquid.

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9. Method according to any one of the preceding claims, characterized in that the solid detergent is provided as a cast powder or granulate or gel with high viscosity, preferably in a suitable container.

10. Method according to any one of claims 1 to 8, characterized in that the solid detergent is provided as a solid block, optionally in a suitable container.

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11. Method according to any one of the preceding claims, characterized in that for dissolving of solid detergent from the solid detergent reservoir, rinsing liquid is sprayed towards the solid detergent reservoir impinging upon substantially the entire lower surface area of the reservoir.

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12. Method according to any one of the preceding claims, characterized in that feeding from the tank to the system to be cleaned is done by a delivery pump.

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13. Method according to any one of the preceding claims, characterized in that while the preparation of the detergent solution in the dissolving tank is under way, the detergent solution in the dissolving tank is circulated within the dissolving tank or through a circulation conduit.

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14. Method according to claim 13, characterized in that circulation of the detergent solution is done by the delivery pump as well in a circulation mode thereof.

15. Method according to any one of the preceding claims, characterized in that different solid detergents from different solid detergent reservoirs are fed to the dissolving tank in alternate or successive system-feeding cycles.

5 16. Method according to any one of the preceding claims, characterized in that different, preferably incrementally increasing quantities of solid detergent are pre-determined and fed to the utilization point in successive feeding cycles.

10 17. Use of a method according to any one of the preceding claims for cleaning and/or disinfecting a milking equipment, system, or parlor.

18. Detergent dispenser for dosing of a pre-determined quantity of a solid detergent (5), comprising
at least one solid detergent reservoir (1),
15 a supply line (2) for supplying a rinsing liquid (3) to the solid detergent reservoir (1),
a rinsing liquid dispensing means (4) connected to the supply line (2) at the solid detergent reservoir (1) for dispensing rinsing liquid (3) towards the solid detergent (5) to dissolve some of the solid detergent (5) in the solid detergent
20 reservoir (1),
a solution conduit (6) connected to the solid detergent reservoir (1) to carry detergent solution (7) away from the solid detergent reservoir (1),
a concentration measuring means (8) downstream of the solution conduit (6) adapted to measure the concentration of the detergent solution (7) or a physical
25 characteristics of the detergent solution (7) that enables calculation of its concentration,
an electronic control means (9) for controlling the operation of the detergent dispenser, the measuring means (8) connected to this control means (9)
characterized in that
30 a rinsing liquid flow meter (10) is provided at the supply line (2) adapted to measure the amount of rinsing liquid supplied to form the detergent solution (7), and is connected to the electronic control means (9),
a dissolving tank (11) is provided to hold a substantial amount of detergent solution (7), and the solution conduit (6) is leading to the dissolving tank (11),

the concentration measuring means (8) is operatively connected to the dissolving tank (11) and adapted to measure the concentration of the detergent solution (7) held in the dissolving tank (11),

the electronic control means (9) is adapted to calculate the quantity of detergent in the detergent solution (7) in the dissolving tank (11) by multiplication of the results of the measurement of the amount of rinsing liquid (3) supplied and the detergent concentration of the detergent solution (7),

the dissolving tank (11) is provided with a delivery outlet (12) which may be opened for delivery of detergent solution (7) to a utilization point, preferably to an equipment or system to be cleaned and/or disinfected.

19. Dispenser according to claim 18, characterized in that the supply line (2) is provided with a preferably motorized shut off valve (15) assigned to the rinsing liquid dispensing means (4).

20. Dispenser according to anyone of the preceding product claims, characterized in that the supply line (2) is provided with a backflow preventer (16), preferably positioned downstream of the shut off valve (15).

21. Dispenser according to any one of the preceding product claims, characterized in that the concentration measuring means (8) is designed as a conductivity measuring means.

22. Dispenser according to any one of the preceding product claims, characterized in that a temperature measuring means is operatively connected to the dissolving tank (11) and is, preferably, connected to the electronic control means (9) as well.

23. Dispenser according to claim 22, characterized in that the temperature measuring means is integrated into the concentration measuring means (8).

24. Dispenser according to any one of the preceding product claims, characterized in that

the calculation of the quantity of detergent in the detergent solution (7) by means of the electronic control means (9) is done based on a table look-up procedure, preferably of a three-dimensional data table system for conductivity, concentration and temperature.

25. Dispenser according to any one of the preceding product claims, characterized in that

an upper level for the detergent concentration in the dissolving tank (11) is not exceeded, preferably by additionally supplying rinsing liquid to the dissolving tank (11).

26. Dispenser according to any one of the preceding product claims, characterized in that

the electronic control means (9) is adapted to emit an "empty" signal if an excessive drop in the concentration measured by the concentration measuring means (8) indicates that the solid detergent reservoir (1) is empty.

27. Dispenser according to any one of the preceding product claims, characterized in that

the supply line (2) is connected to a water supply or water tap, preferably for hot water.

28. Dispenser according to any one of the preceding product claims, characterized in that

the supply line (2) or a separate rinsing liquid supply line is directly connected to the dissolving tank (11), preferably by means of a motorized shut off valve (17) connected to the electronic control means (9).

29. Dispenser according to any one of the preceding product claims, characterized in that

the solid detergent reservoir (1) comprises a housing with a solid detergent compartment at the top containing the solid detergent (5) and the rinsing liquid dispensing means (4) and a solution collector below this solid detergent compartment so that for dissolving of solid detergent (5) from the solid detergent

reservoir (1) rinsing liquid (3) may be sprayed towards the solid detergent (5) in the solid detergent reservoir (1) impinging upon substantially the entire lower surface area of the reservoir (1).

- 5 30. Dispenser according to any one of the preceding product claims, characterized in that
the solid detergent reservoir (1) comprises a bottom plate (18) with perforations or the like with the solid detergent (5) stored above the bottom plate (18).
- 10 31. Dispenser according to any one of the preceding product claims, characterized in that
the delivery outlet (12) of the dissolving tank (11) is provided with a delivery pump (19).
- 15 32. Dispenser according to any one of the preceding product claims, characterized in that
the dissolving tank (11) is provided with a mixing means for mixing and circulating the detergent solution (7).
- 20 33. Dispenser according to claim 32, characterized in that
the dissolving tank (11) is provided with an external circulation conduit (20) extending from the delivery outlet (12) back to the top of the dissolving tank (11).
- 25 34. Dispenser according to any one of the preceding product claims, characterized in that
a three way valve (21) is provided downstream of the delivery outlet (12) and, preferably, downstream of the delivery pump (19), connecting the delivery outlet (12) to a delivery conduit (14) or the circulation conduit (20).
- 30 35. Dispenser according to any one of the preceding product claims, characterized in that
the delivery tank (11) is provided with a level gauge (22), preferably adapted to measure different levels of liquid in the tank (11), wherein, preferably, the level
35 gauge (22) is connected to the electronic control means (9).

36. Dispenser according to any one of the preceding product claims, characterized in that

the dispenser is provided with more than one solid detergent reservoir (1) for dosing different detergents or a larger amount of detergent.

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37. Dispenser according to claim 36, characterized in that one solid detergent reservoir (1) is provided with an alkaline solid detergent and a second solid detergent reservoir (1) is provided with an acidic detergent.

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38. Dispenser according to any one of the preceding product claims, characterized in that

in the electronic control means (9) the flushing ratio or succession may be pre-set.

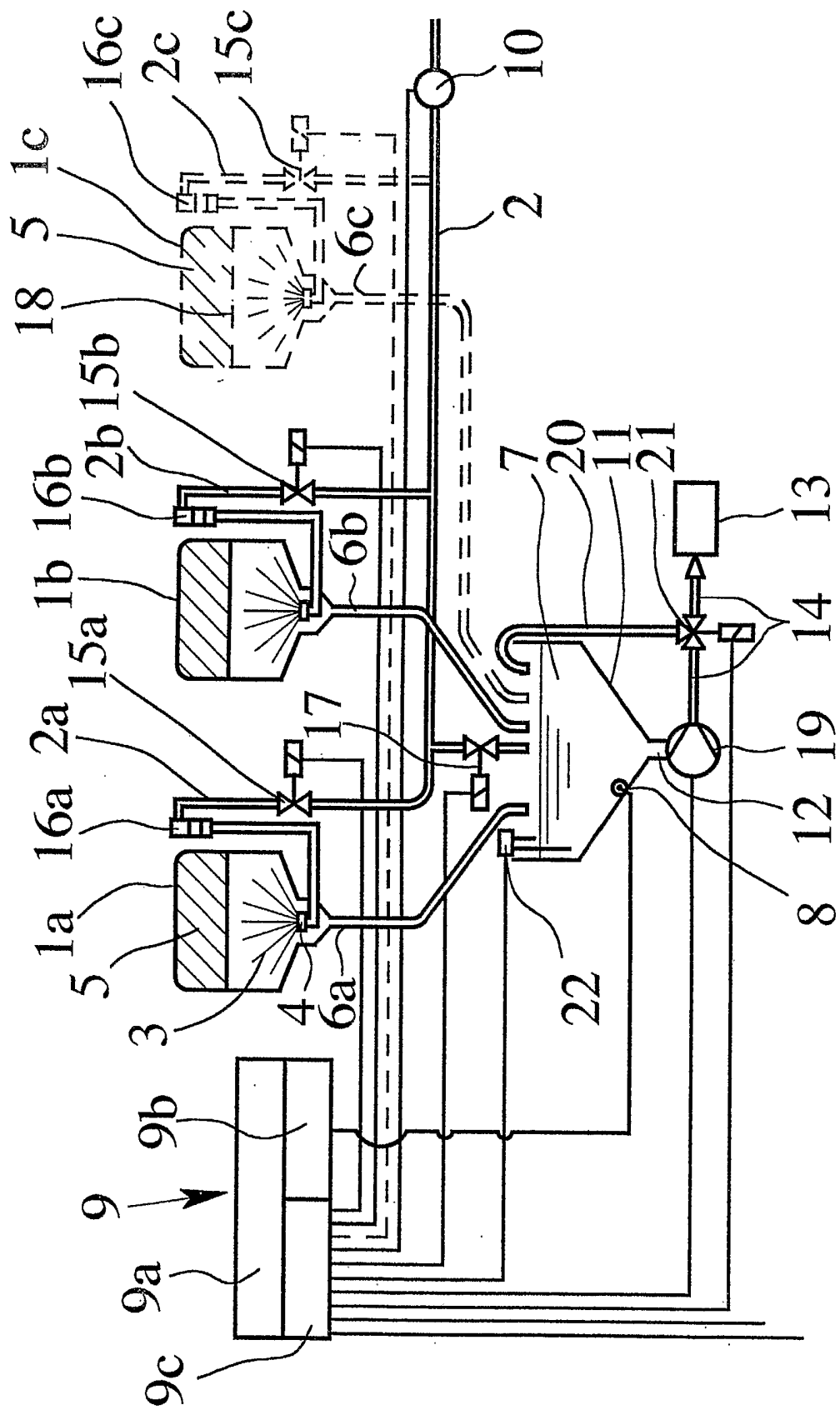
15

39. Dispenser according to any one of the preceding product claims, characterized in that

the electronic control means (9) is designed to predetermine different, preferably incrementally increasing quantities of solid detergent (5) to be fed to the utilization point in successive feeding cycles.

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40. Use of a detergent dispenser according to any one of the preceding product-claims for cleaning and/or disinfecting a milking equipment, system, or parlour.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/010955

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47L15/44 D06F39/02

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 7 A47L D06F B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 137 694 A (COPELAND ET AL) 11 August 1992 (1992-08-11) the whole document	1, 3, 6, 8-14 19, 21, 25, 27-33, 35
A	US 4 845 965 A (COPELAND ET AL) 11 July 1989 (1989-07-11) the whole document	3, 8-12, 15, 16, 18-22, 24, 25, 27-31, 34, 36, 37
A	US 4 020 865 A (MOFFAT ET AL) 3 May 1977 (1977-05-03) column 20, lines 27-41 -/--	7, 26

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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E earlier document but published on or after the international filing date

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O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

7 July 2005

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Ureta, R

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/010955

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 35 10 831 A1 (SILBER, WOLFGANG) 9 October 1986 (1986-10-09) page 6, lines 24-27 -----	7, 26

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/010955

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5137694	A	11-08-1992	NONE	
US 4845965	A	11-07-1989	NONE	
US 4020865	A	03-05-1977	IT 1203031 B	15-02-1989
DE 3510831	A1	09-10-1986	NONE	