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(54) Title: MECHANICAL DISHWASHING AGENT AND METHOD OF MECHANICAL DISHWASHING

(57) Abstract: The invention relates a 'green' /ecological mechanical dishwashing agent, suitable for an automatic dosing system or a mechanical dishwasher, characterised in that the agent comprises biologically/stable active, living cells or biologically active spores of these cells. The mechanical dishwasher agent possesses great cleaning/destaining efficiency, ecologically friendly, it may contain no phosphate/phosphonate builder and may contain no bleaching chlorine agent, is within a pH neutral range and may contain no harmful EDTA or NTA chlorine and silicate. The invention further relates to a method of washing dishes, cutlery, crockery and the like, wherein a mechanical dishwashing agent as described herein above is used.



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Mechanical dishwashing agent and method of mechanical dishwashing

The invention relates to a mechanical dishwashing agent.

More specifically, the invention relates to an improved, more
5 eco(logically) friendly mechanical dishwashing agent for mechanical industrial dishwashers.

In the art, liquid mechanical dishwashing agents for industrial dishwashers, used in professional kitchens, are widely used. These agents contain in general amongst others a selection of the following groups of components: surface
10 active agents, alkaline salts, metal ion complexing agents, enzymes, anti-corrosion agents, bleaching agents, anti-foaming agents and viscosity controlling agents.

Basically the above described groups serve some purposes: Surface active agents help to remove soil and suspend it in the solution.

Further the surface active agents can reduce the residual water
15 remaining on the surfaces by reducing surface tension. Alkaline Salts can help the breakdown of hydrocarbons and can help break down lipids/fats. Metal ion complexing agents can help prevent the formation of insoluble salts of e.g. calcium and free fatty acids, known as "bath tub ring". Enzymes are used to chemically break down proteins, fats and/or carbohydrates. Anti-corrosion agents are used to protect the internals of the
20 dishwasher and also glassware from corroding. Bleaching agents are chemically altering light absorbing molecules, such that the surfaces to be cleaned can obtain a whiter impression. Anti-foaming agents can prevent foaming inside the dishwasher. Foam is unwanted predominantly because it can hinder the proper mechanical washing action of the water jets. Crystal and glass protective agents can reduce the etching effects, which
25 the highly alkaline nature of the cleaning solution has on silicate type of surfaces. Lastly viscosity controlling agents can prevent the individual components of the mixture to suspend/stabilize e.g. by settling. Further, a stable viscosity of the liquid product can provide a well-defined, stable and reproducible dosing of the agent in automated dosing systems.

30 Thus dishwashing agents are relative complex compositions of numerous compounds, of which some are provided only to ameliorate the negative side effects of other compounds.

Further, since dishwashers are generally operated by no other mechanical action than the action of the water jets impinging on the surfaces, a quite

aggressive environment is needed to properly clean the surfaces of the dishes and cutlery to be cleaned. This renders most agents not only aggressive in attacking dirt on cutlery and dishes, but also aggressive to any biologically active microorganisms and/or the human health and thus less environmentally friendly.

5 In the art numerous improvements have been proposed. The American patent US4 608 188 for instance proposes a composition with a reduced phosphate contents, By application of a maleic acid-acrylic acid copolymer in about 7-8 weight percent. Thus the phosphate contents could be reduced below 20 percent weight. This agent contains however a substantial amount of alkaline carbonate, and is thus of strong
10 basic/alkaline nature.

 Another example is disclosed in the American patent US 5 273 675, wherein typical milk soils can be removed from cold and hot surfaces. In this document it is proposed to use an active chlorine as a bleaching agent and an acrylic acid-maleic acid copolymer, for avoiding the use of a phosphate builder. This composition similarly
15 comprises a substantial amount of an alkali metal hydroxide and is thereby of strong basic/alkaline nature as well.

 Further improvements were suggested in the art in the Us patent application US 2012/0208734, in which a two component agent is proposed. In existing dishwashing machines the use of a two-component solution is highly unpractical,
20 because the dosing system needs to be refurbished.

 In most mechanical dishwashing applications, the high alkaline content serves several goals. It is used to swell and/or break down of any starch, fats, oils or protein comprising dirt or other organic material containing dirt, such that this kind of dirt is more easily removed. Secondly the alkaline is used to aid in the de-esterification
25 of esters of fatty-acids and glycerine e.g. from oils and fats, the breakdown of carbohydrates and the breakdown of proteins. Thus the high pH helps both in the removal of fatty and oily dirt and the removal of carbohydrates. Thirdly, the high alkalinity can neutralize the acidic characteristics of offered soil, helping to a better removal of dirt. Fourthly, the highly basic environment avoids the propagation of most
30 living cells, fungi, yeast and/or other unwanted and/or pathogenic biologically active cells. These aggressive and highly corrosive agents however are environmentally questionable and dangerous for its users.

 In GB2484134, a recent UK patent application, the use of several microbiologically active ingredients is proposed. This cleaning agent is used for direct

hard surface cleaning, adding a layer of probiotics to the surface to be cleaned. This cleaning agent is however not suited for mechanical dishwashing applications, since it is not stable in a diluted water storage container in dishwashing machines, where the diluted agent is confronted with a high nutrition containing aqueous suspension.

5 This document further specifies for cleaning agent for dishes a surfactant contents of 18-30% w and prefer a mixture of anionic and non-ionic surfactants.

 By the action of the microorganisms and by the nature of the dirt on plates and cutlery, the pH will decrease and acidify the water-agent-dirt mixture in the
10 storage container. Thus, stopping or at least reducing the enzymatic activity of the microorganisms and their proliferation. This can give rise to the start of growth and proliferation of competing and unwanted anaerobic bacteria. These anaerobic bacterial cultures can produce bad odours and toxic compounds such as mercaptanes.

 Furthermore, in this document, the dedicated compositions for dishes,
15 specified as washing up liquids, are not suitable for mechanical dishwashers because of extensive foaming. When these agents are used, the mechanical action of the water jets is impaired by the foam, leading to unallowable poor cleaning results.

 Furthermore due to amongst others the anionic surfactants, the compositions described in this document show a poor biodegradability.

20 In another publication, the US patent application US5,863,882 a cleaner sanitizer composition is disclosed, comprising several microorganisms and having a surfactants contents of 2-7 % w. This composition, is not suited for use in mechanical dishwashers, since here again the microorganisms once in the storage of a mechanical dishwasher, the bacteria will acidify the water. Again this can lead to unwanted
25 anaerobic bacterial cultures.

 Furthermore also this composition shows extensive foaming when used in a mechanical dishwasher, preventing a thorough mechanical action of the jets, which leads to poor cleaning results.

 Besides these disadvantages, the biodegradability of the compositions
30 described in this document, are poor. The US patent US4,655,794 discloses an abrasive cleaner, that is for the same reasons not suited for use in mechanical dishwashers.

 Furthermore, none of these documents has focused on the ecological concept of their detergents. They use harmful chemical for the best efficiency, e.g. anionic surfactants or high alkalinity.

Accordingly it is an object of the invention to mitigate or solve the above described and/or other problems of dishwashing agents in the art, while maintaining and/or improving the advantages thereof.

More specifically the object of the invention can be seen in providing a
5 mechanical dishwashing agent that combines efficient cleaning with an environmentally friendly product, being not harmful for the users, a mechanical dishwashing agent that is providing environmentally friendly waste streams and that is more durable and sustainable in its production, use and discard.

These and/or other objects are reached by a mechanical dishwashing
10 agent, suitable for an automatic dosing system or a mechanical dishwasher, wherein the agent comprises biologically active, micro-organisms or biologically active spores of these organisms and a buffer, which buffer is suitable for maintaining the pH of the agent in a highly diluted state within a pH range of about 5-9.

The buffer is sufficiently powerful to maintain pH in a highly diluted
15 state, of e.g. up to 0,01-0,2% volumetric dilution at a pH range of 5-9.

By applying micro-organisms or spores thereof, a culture will develop inside the cleaning water container/storage tank of a dishwashing machine or mechanical dishwasher. In this culture, specific bacteria can be chosen, such that specific enzymes are released. These bacteria can be chosen to be environmentally
20 friendly and non-pathogen.

This mechanical dishwashing agent is thus eco(logically)-friendly, and in the development thereof, both environmental and human safety are kept in mind. Besides that this dishwashing agent is less aggressive to the users or operators, this eco-friendly agent also to a large extend does not contribute to air, water and/or land
25 pollution, in contrast to the agents according to the state of the art.

By using various dirt types from the dishes as nutrients, the micro-organisms will develop inside the water storage tank of a dishwasher. With the pH buffer, the proliferation and the enzyme activity inside this water can be maintained. All conventional dishwashing agents have a very high basic environment, in order to
30 prevent any proliferation of micro-organisms. Here the mechanical dishwashing agent according to the invention fundamentally differs from conventional mechanical dishwashing agents. Conventional agents do not include any buffered condition to provide a better environment for the probiotic bacteria, on the contrary they are designed to avoid any colony built up within the cleaning water storage container.

In general, the bacteria used show thermophilic properties and can proliferate quickly in the generally warm environment of the cleaning water storage tank of the mechanical dishwasher. By this rapid growth, any unwanted, pathogen or anaerobic bacteria can be outgrown due to competition and due to high levels of these
5 bacteria already present in the cleaning agent.

The mechanical dishwashing agent can be liquid. A liquid composition can be more easily dosed in an automated dishwashing system. The bacteria and/or the spores of some of the bacteria in this liquid may be encapsulated, such that the shelf life of the product can be prolonged.

10 The agent can comprise a selection of one or more of: *Bacillus Amyloliquefaciens*, *Bacillus Subtilis*, *Bacillus Lichenformis*, *Bacillus Pumilus*, *Bacillus Megaterium*. The choice of these bacteria and the specific amount is chosen such that sufficient and specific enzymes are released, and that the built up of other bacteria, fungi and yeast can be prevented, both in the agent and in its diluted form inside the
15 dishwasher cleaning liquid storage tank. The bacterial culture function to enhance the overall performance by continuously breaking down/digestion of a variety of soils (carbohydrate, protein, fats, etc). Additionally they seed the waste collection system, remove odour and compete the growth of pathogens out. The bacteria can preferably be chosen in equimolar quantities of all of the five mentioned herein above.

20 As a component of the dishwashing agent, a dispersing and/or stabilizing agent can be used. This can be one or more components selected from one or more of polyacrylic acid, polyacrylic acid methacrylate, polymethacrylic acid, polymethacrylic acid methacrylate, a copolymer of a maleic acid and one or more of the following: Polyacrylic acid, polyacrylic acid methacrylate, polymethacrylic acid, 25 polymethacrylic acid methacrylate, methylglycinediacetic acid, e.g. Trilon-M, EDTA, polyol, polyethyleneglycol, polypropyleneglycol, grafted fumaric or maleic acid or maleic acid anhydride to a natural poly carbohydrate backbone, such as e.g. a polysaccharide, a polyglucose, a poly maltose, polylactose, a polyxylose, poly galactose, poly galactane, poly fructose, the ammonium, sodium or potassium salts
30 thereof, e.g. Alcoguard H 5240 or Alcoguard H 5941 and/or other suitable complex-building or chelating agents. This component can be used to complex or to chelate specific cat-ions such as Fe^{3+} , Ca^{2+} , Mg^{2+} and/or other cat-ions. By complex-building or chelating these cat-ions, the occurrence of any solid salt disposal inside the dishwashing machine or on the items to be cleaned of these ions can predominantly be prevented.

The advantages of the use of a fumaric or maleic acid or maleic acid anhydride grafted to a natural poly carbohydrate backbone is their combination of high dispersing abilities and capture and containment of cat-ions such as Ca^{2+} and their very high biodegradability.

- 5 The complexing agent can be trisodium methylglycinediacetic acid. The advantages of the use of a methylglycinediacetic acid (MGDA) e.g. Trilon-M is the very good removal of pertinent stains. MGDA forms stable complexe with multivalent metal ions in a wide pH and temperature. It not only removes scales but also prevent the scale formation and boost the affectivity /action of dispersing agents and the detergent.
- 10 Because of the effective complexing action of MGDA to multivalent ions like calcium, the tea stain is efficiently removed from the cups/glasses. Based on this fact, the overall performance in the removing of stains is increased. Further, the biodegradability is high when compared to other complexing agents.

- As a further component, the mechanical dishwashing agent can
- 15 comprise a viscosity enhancing agent, such as a carboxymethylcellulose, poly-acrylic acid, an agarose, a xanthan gum, a modified polycarbohydrate or a derivative thereof. These agents can particularly suspend micro-organisms and/or their spores aiding to reach a homogenous solution. This promotes efficient functionality of the bacteria and efficient dosing.

- 20 As a further component, the mechanical dishwashing agent may comprise a stabilising agent. This agent may keep bacteria in an inactive state while in a concentrated form. The stabilising agent may lose its activity when diluted, such that the bacteria can become active.

- The mechanical dishwashing agent can comprise one or more from non-
- 25 ionic surfactants, anionic surfactants, cationic surfactants. These compounds can be added to reduce surface tension and promote a better wetting, can help catching oily and fatty compounds in micelle like structures. Thus the cleaning performance can be further enhanced by these compounds.

- Preferably, the dishwashing agent comprises a non-ionic surfactant. The
- 30 mechanical dishwashing agent can comprise a non-ionic surfactant of up to 2% wt, preferably up to 1% wt. In the literature, there is virtually no limitation of surfactant use, while it is very sensitive in the mechanical use. Anionic surfactants are not used because they show high foaming activity. In the compositions according to the invention, a maximum of 2 % wt, preferably maximum of 1% wt is used, in order to avoid foaming,

which disturbs the washing operation. Thus the mechanical dishwashing agent is performing better in mechanical action, while the advantageous cleaning aspects of the surface active agent are kept at an acceptable level.

The non-ionic surfactant can be a dodecyl-, decyl- and/or octyl-glucoside, e.g. a D-glucopyranose-glycoside e.g. Twentapon HK-100. These specific non-ionic surfactants have the advantage that they originate from natural source and have a high biodegradability, as compared to the surfactants used in the art as cited herein above.

The pH of the agent can range between 5 and 9 or more specifically between 6 and 8 though the pH range can be as specific as between pH 7,5 to 8. This can be performed by adding a buffer agent. Suitable buffer agents are mostly organic acid compounds with moderate dissociation constants, such as citric acid/sodium-citrate, acetic acid/sodium acetate or citric acid/thriethanolamine and more complex multivalent acids such as maleic acid/sodium maleate, fumaric acid/sodium fumarate, malonic acid/sodium malonate, various aminoacids and their salts, adapted amino acids such as methylglycinedicarboxylic acid and salts thereof.

Thus the bacteria can be in a dormant state and/or a spore state within the agent. The pH is buffered in order to further stabilise the pH in the mixture and the pH of the agent in a highly diluted state of about 0,2-0,5% vol. inside a cleaning liquid storage tank of a mechanical dishwasher.

A specific buffer can be obtained by a combination of triethanolamine and citric acid, which is environmentally acceptable and does not harm the micro-organisms. A quantity of at least 0,1 mol/liter of the triethanolamine and triethanolamine-citrate is required to remain buffering capacity in a highly diluted state, e.g. a dilution of 0,05%-0,2% vol. This is essential for the micro-organisms to survive in the diluted state, as they are in the cleaning liquid storage tank of a dishwasher.

As described herein above, a further optimal pH of the agent can be chosen to be between pH 7.5 and 8. This range may be advantageous for the micro-organisms or their spores to remain encapsulated, and, after dilution in the cleaning liquid storage tank to be allowed to become active, aided by the dilution of stabilizers included in the spore suspension.

In general all raw materials used in this mechanical dishwasher are readily biodegradable and not harmful for human health. This is a unique feature of this detergent which makes it more powerful.

The invention also relates to a method of washing dishes, cutlery, crockery and the like, wherein the method comprises the following steps, to be executed in any suitable order: a) providing a mechanical dishwasher, a dishwashing automat; b) using a mechanical dishwashing agent as described herein above.

This method further can comprise the steps of c) c) adding the mechanical dishwashing agent to the cleaning water; d) jetting the mixture of water and the mechanical dishwashing agent against the dishes/cutlery/pots to be cleaned; e) collecting the mixture, including eventually dirt, removed from the dishes in a storage tank of the mechanical dishwasher for re-use; f) having the biologically active ingredients of the mechanical dishwashing agent build up a permanent culture within the storage tank of the mechanical dishwasher. .

In the above described method, the pH of the mechanical dishwashing agent ranges between 6 and 8 in original as in highly diluted state.

Thus, during the use and/or during off-time of the dishwashing machine, a living culture of bacteria is available inside the cleaning water storage container of the dishwasher. These bacteria can provide a mixture of enzymes such as amylases, lipases, proteases and/or other suitable enzymes.

The pH of the cleaning composition can range between 6 and 8. Thus the bacteria are provided with an optimal environment to grow and to produce the enzymatic mixture used for cleaning the items to be cleaned. This is against all current believe of how to operate dishwashing equipment. In the art, the opposite goal is envisioned, it is the goal to prevent any living (micro-)organisms from metabolising and/or from starting to proliferate within any part of the dishwashing machine. Contrary to that, current invention provides an optimum environment for the pre-dosed bacteria to grow, proliferate and produce the specific metabolic enzymes, for breaking down most dirt, resident on the items to be cleaned and/or in the cleaning water used.

The product and the method according to the invention, can give more flexibility with respect to the use of any kind of water quality. In some places the water is not softened and is directly connected to their dishwasher. Due to the good complexing properties, the additional calcium ions can be “caught” and bound well. The product and method according to the invention prove extra powerful when

comparing to the conventional mechanical dishwashing detergents in removal of persistent stains such as tea and/or coffee stains, without the use of any environmentally harmful bleaching agents.

The product and method according to the invention fit in an ecological
5 concept of high biodegradable compounds. A high proportion of the compounds find their origin in natural products or derivatives of natural products. The waste streams generated by the method according to the invention are less polluting, containing less carbohydrates, fats and proteins, have a close to neutral pH and require less processing than waste streams generated by methods according to the state of the art. Since the
10 product is substantially phosphate free, when using the method according to the invention, the eutrophication of the environment can be reduced. Furthermore, the storage tanks in institutional dishwashers are open, thus a possibility of aerosol-forming is present. When high enzymatic active compounds are used, these aerosols can invoke respiratory allergic problems for the users and/or operators of the dishwashers in
15 question. In the product according to the invention, enzymatic content is relative low and substantially available on demand, when a specific dirt as a substrate is offered to the micro-organisms.

The expression “biologically active” used herein is to be understood as, though not to be considered limited to comprising at least one living species, protozoa,
20 eukaryote, proto spore, spore, prokaryote, yeast, fungi or the like, which is under the proper conditions able to metabolise, grow and eventually multiply. When the conditions are not proper, the nutrients may run out, under which conditions the bacteria could form spores or eventually die.

The expression “mechanical dishwashing” used herein is to be
25 understood as, though not to be considered limited to any type of dishwashing using an automated dishwashing system or dishwashing machine, where the dishes/plates/cutlery/pots to be cleaned are automatically cleaned by spraying water jets containing the cleaning agent. In general the water used for the water jets is collected and stored in a storage container or tank for reuse. In most mechanical dishwashing
30 systems, after cleaning, a rinsing liquid is applied, with or without rinsing agents. After the rinsing step, some mechanical dishwashers apply a drying step, leading heated air in the machine. Herein, the rinsing solution does not contain any living bacterial culture and does decrease the surface tension of any residual dirt/water to reach maximum cleaning/drying.

Mechanical dishwashing can refer to institutional dishwashers, used in restaurants, hotels, hospitals, airports, canteens etc. or to household dishwashers dishwashing machines.

The expression “strongly diluted” used herein is to be understood as, though not to be considered limited to refer to degrees of dilution in the range of 0,01 - 0,2 % vol. It may more specifically refer to dilution ranges of about 0,1%-0,2% vol.

In general, professional dishwashing machines comprise three sections. The cutlery, crockery, pots, pans and/or dishes are in general installed in open basket like trays. In general the items are basically arranged in such a way that their containing space is facing downwards. This may prevent these items from catching and containing liquid during the cleaning process, and since the water jets are substantially directed upward, the insides are directly confronted with the impinging action of the jets.

In the dishwasher in a first stage a rinsing hose can be manually used to remove the coarse dirt and food left overs. In this section a sink can be arranged on which a sliding track is available suitable to accommodate and guide the open trays loaded with the items to be cleaned. The rinsing hose can in general be provided with a valve and a spray head, such that an operator or user can optimally use the water to pre clean the items.

Once the operator or user has removed the coarse dirt and/or food leftovers from the items, the tray can be slid into a second stage of the dishwashing machine. In this second stage, which in general is a tunnel like portion the items to be cleaned are subjected to mechanically applied water jets. These water jets are spraying a mixture of water and dishwashing agent onto the items to be cleaned at in general elevated temperature. Below at least a portion of this tunnel, a cleaning water collector can be arranged, being a tank or a container in which the water is collected and reused in the water jets.

Sprayers that provide the water jets can be attached to rotating arms, such that as much as possible of the surfaces of the items to be cleaned is reached by the water spray. The temperature of the water used in the second stage is in general about 60 degrees Celsius.

After a proper treatment, the trays can be automatically transported to a third section, in which a hot clean water, eventually added with a shining agent and/or a surfactant and/or a rinsing agent can be used to rinse the items. The elevated temperature can help sterilize and dry the items to be cleaned. Substantially any residual

dirt and/or micro-organisms will be rinsed off and/or destroyed from the hard surfaces in the final step as the rinsing solution contains efficient surfactants and will be dosed in a filled boiler, providing a high temperature of about 80deg. Celsius. The third section can in general be positioned directly after the second section, either in a separate tunnel
5 or in the same housing as the second section.

The dishwashing tunnel or machine can be equipped with two separate dosing pumps. A first dosing pump can be connected to a feed in of the cleaning water supply or to the cleaning water container, in order to provide the cleaning water with sufficient dishwasher cleaning agent. The first pump can on its suction side be
10 connected to a removable or a fixed storage container for the dishwasher cleaning agent. A second pump can on its suction side be connected to a rinsing and polishing/shining agent container. The second pump can on its discharge side be connected to the water supply in the third section.

In general, the cleaning water in the second section is partially purged
15 and a same amount of fresh water is added to the system, e.g. by supplying the fresh water to the mechanical sprayers.

In the art, as described herein above, the cleaning agents used for these mechanical dishwashers is highly basic/alkali. The cleaning agent according to the invention is however neutral and has a pH of about 7. Thus, in the cleaning liquid tank a
20 high concentration of protozoa, bacteria can be expected. The cleaning agent according to the invention is providing such amounts of specific colonies that any other living organisms are outgrown and outnumbered at onset. The invention is further elucidated by the following examples. These examples should not be considered restricting the invention in any way or form.

25

Example 1

A formulation according to the state of the art, Innodish® is used at the same dishwasher as used in example 2. The agent innodish® is highly alkaline and in its pure liquid form is having a pH of 14.8. After washing, here again a visual inspection
30 of the dishes was performed, and here again no remaining dirt could be detected.

The pH of the cleaning water was measured and appeared to be pH 12. This cleaning water is in most applications discarded to the normal sewage systems. This can adversely affect the environment. From the examples it becomes clear that a

cleaning agent according to the invention sufficiently cleans the items to be cleaned, and can provide a more environmentally acceptable waste stream.

Within the cleaning agent according to the invention, it is believed that the acrylic acid polymer and the acrylic acid maleic acid copolymer are stabilising the composition and are able to keep the bacteria and/or their spores in suspension, such
5 that a homogeneous dosing can be obtained, irrespective of the time the agent has been left untouched. Thus a stable agent can be provided. More specifically it is believed that a kind of cross-linked acrylic acid polymer stabilizes the composition and suspend the bacteria, resulting in a homogenous mechanical dishwashing agent. The copolymer of
10 acrylic/maleic acid appears to improve soil removal and appears to prevent soil re-deposition, it also may play a role as a builder preventing the salts precipitation (like calcium and magnesium salts and it helps increasing the stability of the agent. Further, these compounds can aid in detergency, as surface-active agents and in chelating and or complex building of the potentially solid forming cat-ions.

15

Example 2

A formulation of a mechanical dishwashing agent is made in accordance with the following amounts of compounds: An amount of water, preferably at least partially deionized of about 64,8% wt. is mixed with an amount of polyacrylic acid
20 polymer of 0,2% wt., 25% wt. of an acrylic acid maleic acid copolymer and 10% wt. of a concentrated mixture of approximately equal amounts of *B. Amyloliquefaciens*, *B. Subtilis*, *B. Lichenformis*, *B. Pumilus*, *B. Megaterium*.

After mixing, the pH of the mechanical dishwashing agent is measured to be 7. The stability of this mixture was tested at room temperature, at 4-7 degrees
25 Celsius and at 37 degrees Celsius. The mixture remained as a homogeneous solution (for minimum 3 month), indicating a good stability.

This mixture is added to a mechanical dishwasher, Rhima WD-7. at a rate of 2 grams per litre water supply. During a cleaning cycle, in total about 60 litres of water has been added and a standard amount of averagely used dishes are subjected to
30 an standard program inside the second part of the dishwasher. After a visual inspection, no remaining dirt could be detected.

The pH of the cleaning water in the cleaning water storage tank with the diluted product was measured and appeared to be 7.5 after washing, while the pH of the

used water was 7.8, so the cleaning agent hardly affects the pH. After several cleaning cycles, the pH in the cleaning water storage tank dropped to 6.5.

The odour of the water was neutral, indicating that an aerobic condition is created in the system.

5 After several days left untouched, with the bacteria composition still remaining in the cleaning water storage tank, the odour of the cleaning water container was still neutral. This indicates that any rotting or other anaerobic digestion is predominantly suppressed by the vast amount of selected bacteria. Samples taken from the cleaning water show absence of pathogenic bacteria proliferating within the cleaning
10 water storage tank. Within the cleaning water a cell count of about 100 000 colony forming units (CFU) per ml was measured.

The tests were repeated with softened water as well. It appears that the cleaning with softened water may even provide better results.

15 **Example 3**

A mixture of 0,1% wt. xanthane gum, 30% wt. of the sodium salt of a maleic acid anhydride grafted polysaccharide, "Alcoguard H5240", 20% wt. TEA citrate, 20% of the trisodium salt of methylglycinediacetic acid "Trilon-M", 1% wt. of
20 D-glucopyranose-oligomeric decyl-, octyl- glycoside, "Twentapon HK-100" and about 6% of a concentrated mixture of approximately equal amounts of B.

Amyloliuefaciens, B. Subtilis, B. Lichenformis, B. Pumilus, B. Megaterium was prepared, wherein the concentrated mixture of the Bacillus probiotics was only added after adjusting the pH to 6-8 by adjusting the amount of TEA. The mixture was
25 completed up to 100% wt. by adding the above listed components to an amount of softened water.

This mixture is added to a dishwasher, Rhima WD-7. at a rate of 2 grams per litre water supply. During a cleaning cycle, in total about 60 litres of water has been added and a standard amount of averagely used dishes are subjected to an
30 standard program inside the second part of the dish-washer. After a visual inspection, no remaining dirt could be detected.

The pH of the cleaning water was measured and appeared to be 7,7 after washing, while the pH of the used water was 7,9, so the cleaning agent hardly affects the pH.

The odour of the water was neutral, indicating that an aerobic condition is created in the system.

After several days left untouched, with the bacteria composition still remaining in the cleaning water storage tank, the odour of the cleaning water container
5 was still neutral. This indicates that any rotting or other anaerobic digestion is predominantly suppressed by the vast amount of selected bacteria. Samples taken from the cleaning water show absence of pathogenic bacteria proliferating within the cleaning water storage tank. Within the cleaning water a cell count of more than about 100 000 colony forming units (CFU) per ml was measured.

10 The above given composition was used to remove standardized tea stains on various surfaces. After visual inspection, a substantial 100% removal of the relevant tea stains could be obtained.

As an indication to low toxicity, some fish were exposed to the diluted product, as it is present in the storage containers of dishwashers. These fish survived
15 this exposure.

It is further believed that the lack of nutrients within the cleaning agent can prevent any of the bacteria and/or their spores from growing as long as they remain in the concentrated form inside the cleaning agent and becoming active and/or starting
20 to metabolise after being diluted in the cleaning water. Because of the absence of nutrient or any other carbon source to stimulate them to come to the germination phase, and eventually by application of stabilizers the bacteria remain dormant. As soon as the agent is diluted more than 10 times and/or exposed to any carbon source, the dilution of stabilizer or the nutrient exposure can trigger the spores to come to the germination.

25 It is further believed that the specific strains of bacteria provide for a mixture of enzymes that help he break down and dissolution of most of the spectrum of dirt resident on cutlery or dishes.

The invention is to be understood not to be limited to the exemplary embodiments described in the specification and/or the examples. For instance the
30 cleaning agent can comprise further compounds without departing from the scope of the invention.

In de description a mechanical dishwasher is described to have three sections, however some dishwashers combine the cleaning, rinsing and/or drying in fewer, sometimes in one section.

These and other modifications are considered to be variations that are part of the framework, the spirit and the scope of the invention outlined in the claims.

Claims

1. A mechanical dishwashing agent, suitable for an automatic dosing system or a mechanical dishwasher, characterised in that the agent comprises
5 biologically active, micro-organisms or biologically active spores of these organisms and a buffer, which buffer is suitable for maintaining the pH of the agent in a highly diluted state within a pH range of about 5-9.
2. A mechanical dishwashing agent according to claim 1, wherein the
10 agent is liquid.
3. A mechanical dishwashing agent according to any of the preceding claims, wherein the agent comprises a selection of one or more of: B. Amylolyticus, B. Subtilis, B. Lichenformis, B. Pumilus, B. Megaterium.
15
4. A mechanical dishwashing agent according to any preceding claim, wherein a preferably non-phosphate builder or a complexing agent is used.
- 5 A mechanical dishwashing agent according to claim 4, wherein the
20 dispersing/stabilizing agent is selected from one or more of Polyacrylic acid, polyacrylic acid methacrylate, polymethacrylicacid, polymethacrylicacidmethacrylate, a copolymer of a maleic acid and one or more of the following: Polyacrylic acid, polyacrylic acid methacrylate, polymethacrylicacid, polymethacrylicacidmethacrylate, polyol, polyethyleneglycol, polypropyleneglycol, grafted fumaric or maleic acid or
25 maleic acid anhydride to a natural poly carbohydrate backbone, such as e.g. a polysaccharide, a polyglucose, a poly maltose, polylactose, a polyxylose, polygalactose, poly galactane, poly fructose, the ammonium, sodium or potassium salts thereof, e.g. Alcoguard H 5240 or Alcoguard H 5941 and/or other suitable dispersing or stabilizing agents.
30
6. A mechanical dishwashing agent according to any preceding claim, wherein the complexing agent is selected from, trisodium methylglycinediacetic acid, Trilon-M.

7. A mechanical dishwashing agent according to any of the preceding claims, wherein the agent comprises a viscosity enhancing and/or rheology modifier agent and/or stabilising agent, such as a carboxymethyl-cellulose, poly-acrylic acid, an agarose, a xanthan gum, a modified polycarbohydrate or a derivative thereof.
- 5
8. A mechanical dishwashing agent according to any of the preceding claims, wherein the mechanical dishwashing agent comprises one or more non-ionic surfactants.
- 10
9. A mechanical dishwashing agent according to claim 8, wherein the agent comprises a non-ionic surfactant of up to 2% wt., preferably up to 1% wt.
- 15
10. A mechanical dishwashing agent according to claim 9, wherein the non-ionic surfactant is a decyl- and/or octyl- glucoside, preferably a D-glucopyranose-glycoside.
11. A mechanical dishwashing agent according to any of the preceding claims, wherein the pH of the agent in a highly diluted state ranges between 6 and 8.
- 20
12. A mechanical dishwashing agent according to claim 11 wherein the pH of the agent ranges between 7,5 and 8.
- 25
13. A mechanical dishwashing agent according to claim 11 of 12, wherein the buffer comprises a combination of triethanolamine and triethanolamine citrate.
- 30
14. A mechanical dishwashing agent according to claim 12, wherein the agent comprises a quantity of at least 0,1 mol/liter triethanolamine and/or triethanolaminecitraat.
15. A method of washing dishes, cutlery, crockery and the like, wherein the method comprises the following steps, to be executed in any suitable order:
- a) providing a mechanical dishwasher, a dishwashing automat;

b) using the mechanical dishwashing agent according to any of claims 1-14 is used.

16. The method according to claim 15, wherein the method comprises
5 the additional steps:

- c) adding the mechanical dishwashing agent to the cleaning water;
- d) jetting the mixture of water and the mechanical dishwashing agent against the dishes/cutlery/pots to be cleaned;
- e) collecting the mixture, including eventually dirt, removed from the
10 dishes in a storage tank of the mechanical dishwasher for re-use;
- f) having the biologically active ingredients of the mechanical dishwashing agent build up a permanent culture within the storage tank of the mechanical dishwasher.

17. A method according to claim 15 or 16, wherein the pH of the
15 mechanical dishwashing agent ranges between 6 and 8 as well as in original state as in highly diluted state.

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2014/050005

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D3/38 C11D7/40
ADD.

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)
C11D

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 practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 5 863 882 A (LIN JIAN-ER [US] ET AL) 26 January 1999 (1999-01-26) cited in the application	1-15,17
A	column 1, lines 7-10 column 6, lines 9-54 claims; examples	16
X	US 4 655 794 A (RICHARDSON RAY O [US] ET AL) 7 April 1987 (1987-04-07) cited in the application	1-15,17
A	column 1, lines 6-18; claims; examples	16
X	US 6 180 585 B1 (SCHALITZ WILLIAM JOHN [US] ET AL) 30 January 2001 (2001-01-30)	1-15,17
A	column 1, lines 6-24 column 4, line 41 - column 7, line 23 claims	16
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2014/050005

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X A	EP 0 569 140 A1 (SYBRON CHEMICALS [US]) 10 November 1993 (1993-11-10) page 2, lines 32-37 page 4, line 47 - page 5, line 49 claims; examples -----	1-14 15-17
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