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(11) **EP 1 312 296 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.05.2003 Bulletin 2003/21

(51) Int Cl.7: **A47L 15/00, A47L 15/23,
A47L 15/22, A47L 15/42**

(21) Application number: **02025758.0**

(22) Date of filing: **15.11.2002**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Zardini, Fabio**
31033 Castelfranco Veneto (TV) (IT)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Piazzale Cavedalis 6/2
33100 Udine (IT)

(30) Priority: **19.11.2001 IT UD20010185**

(71) Applicant: **International Steel Co. SpA**
31039 Riese Pio X (TV) (IT)

(54) **Low volume equipment washing machine**

(57) Washing machine (10) such as an industrial or hospital dishwasher, equipped with a washing chamber (11) for equipment to be washed, at least two rotating elements (12) arranged in the washing chamber (11) which have delivery nozzles (15) able to deliver cleaning liquid, hydraulic feed means (20) able to make the cleaning liquid circulate between the washing chamber (11) and the rotating elements (12), and pipes (13) which connect the feed means (20) to the rotating elements (12) and to the washing chamber (11). The pipes (13) and the rotating elements (12) have a size such that the volume of liquid present inside the pipes (13) and the rotating elements (12) is equal to 5%-15% of the overall volume of liquid circulating inside the entire washing machine (10). The overall volume is around 5 l.

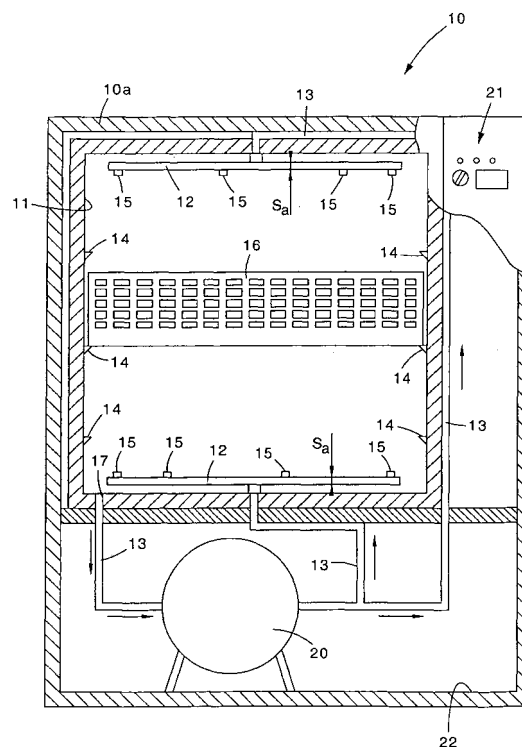


fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a washing machine, such as for example an industrial or hospital dishwasher, of the type able to wash and disinfect re-usable equipment in the medical and surgical field, for example plates, pans, urine bottles, surgical or dental instruments, containers or similar.

[0002] To be more exact, the invention concerns a washing machine of reduced bulk and consumption in which in any case the washing and disinfecting efficiency will remain unchanged with respect to washing machines of greater size and consumption.

BACKGROUND OF THE INVENTION

[0003] There are known washing machines, such as for example industrial dishwashers, employed to wash re-usable equipment. Such washing machines, for example those of the hospital or dental type, are usually housed on counters or shelves in narrow, limited spaces; for this reason, their size has to be particularly limited, yet at the same time they have to guarantee high washing and disinfecting efficiency.

[0004] In such machines, the pump and the pipes which feed the cleaning liquid often constitute, because of their bulk, the components which prevent the overall volume of the washing machine from being reduced beyond a certain limit. The pump is normally able to take in the water or the cleaning liquid circulating in the washing chamber of the machine and to send it to delivery nozzles which direct flows of water under pressure towards the equipment to be washed in the washing chamber. In this way a closed circuit is created in which the pump removes and re-introduces a certain fixed quantity of water into circulation.

[0005] In order to fulfill this function, the pump must have sufficient power, since it must take to the nozzles a sufficient quantity of water to perform the washing function and not create cavitation effects which, apart from compromising the functioning thereof, do not guarantee the correct washing and disinfection of the equipment contained in the washing chamber.

[0006] Consequently, the size of these pumps is often very great compared with the operational requirements of such washing machines and it cannot, as we have said, be reduced beyond a certain limit. Moreover, the more water is contained in the pipes, the more water is needed to guarantee a correct feed to the pump during the washing cycle.

[0007] The Applicant therefore set himself the purpose of optimizing the sizing of the hydraulic circuit of the machine in order to reduce the overall volume of water in circulation and consequently reduce the overall bulk and consumption of the pump. To obtain this purpose, and other advantages as will be shown hereafter,

the Applicant has devised and embodied the present invention.

SUMMARY OF THE INVENTION

[0008] The present invention is set forth and characterized essentially in the main claim, while the dependent claims describe other innovative characteristics of the invention.

[0009] One purpose of the invention is to achieve a washing machine of the industrial or hospital type, of a reduced size and consumption with respect to conventional machines of the same type, which will in any case guarantee, with a relatively limited quantity of water, efficient performance in washing and disinfecting re-usable equipment.

[0010] Another purpose is to guarantee that the hydraulic feed means, although limited in size, have sufficient power to guarantee feed to the delivery nozzles of a quantity of liquid such as to ensure washing efficiency and also to prevent cavitation effects from occurring.

[0011] The washing machine according to the present invention comprises:

- a washing chamber in which the equipment to be washed is positioned;
- at least two rotating elements arranged in the washing chamber at different heights, and able to deliver, by means of relative nozzles, a cleaning liquid at a certain pressure;
- hydraulic feed means, for example a pump, able to make the liquid circulate in a closed circuit from the washing chamber to the rotating elements, and
- pipes able to connect said feed means with the rotating elements and the washing chamber.

[0012] As already said, since cavitation effects must be avoided, the pipes which deliver water to the rotating elements and the rotating elements themselves are always full of water.

[0013] According to a first characteristic feature of the present invention, the size and shape of the pipes and rotating elements are such that the volume of liquid inside is globally, in percentage terms, equal to about 5%±15% of the overall volume of liquid circulating inside the washing machine.

[0014] In the washing machine according to the invention, the overall volume of water in circulation, in a preferential embodiment, is equal to about 5 l, so that the overall volume of water present in each of the rotating elements is comprised between 0.05 and 0.1 l, while the volume of water contained in the pipes is comprised between 0.2 and 0.65 l.

[0015] According to another characteristic feature of the invention, the washing machine has a maximum height in bulk of about 55 cm and a minimum usable height of passage in the washing chamber of about 25 cm.

[0016] According to another characteristic of the invention, each rotating element has between 3 and 6 delivery nozzles.

[0017] According to a variant, apart from the delivery nozzles used for washing, there is at least an auxiliary nozzle for every rotating element, able to determine the rotation thereof due to hydraulic thrust. According to another variant, it is the washing nozzles themselves, or some of them, suitably directed, which determine the hydraulic thrust in order to make the rotating elements rotate.

[0018] According to another characteristic feature, the rotating element has a flattened section of a reduced value where there are no nozzles, as in the parallel patent application in the name of the present Applicant.

[0019] By optimizing the size and shape of the pipes and the rotating elements, and by using at least two rotating elements and at least three washing nozzles for each rotating element, the invention allows to use a reduced overall quantity of liquid, around 5 l, yet still guarantees high washing efficiency.

[0020] It is thus possible to use feed means, for example a pump, of smaller size, and hence to reduce the size of the whole washing machine, and consequently the consumption and the functioning costs.

[0021] According to a variant, the washing machine has another pipe, which can be selectively activated by inserting a specific basket in the working position. This pipe allows to deliver a jet of water directly through said basket, excluding at least one of the rotating elements, in order to wash zones which are particularly subject to dirt or equipment located at points of the washing chamber which can only be reached with difficulty by the jet of the nozzles.

BRIEF DESCRIPTION OF THE DRAWING

[0022] These and other characteristics of the present invention will be apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawing which schematically shows a front section of a washing machine according to the present invention.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT OF THE INVENTION

[0023] With reference to fig. 1, a washing machine 10, in this case a dishwasher of the hospital type, according to the present invention comprises a washing chamber 11 in which are rotatably mounted two rotating elements 12, an upper and a lower, hydraulic feed means, in this case a pump 20, housed in a technical compartment 22, and a plurality of hydraulic pipes 13.

[0024] The washing machine 10 is connected to a water supply from which a certain quantity of cleaning liquid is taken which defines the volume used during the washing cycle. Said machine 10 also has an outer frame 10a

able to determine a heat and acoustic insulation with respect to the outside environment.

[0025] The washing chamber 11 has a usable height of about 25÷30 cm, a width of about 35÷45 cm, and a depth which varies from about 40 to about 48 cm. Said washing chamber 11 comprises inside a plurality of supporting elements 14 arranged on the lateral walls, and on which supporting and positioning elements 16 are able to rest, such as for example baskets, trays or such-like, in which the equipment to be washed is positioned.

[0026] Inside said washing chamber 11 the two rotating elements 12 are also mounted, as already explained, respectively one associated with the lower wall and one associated with the upper wall, so as to create a crossed jet of liquid.

[0027] On each rotating element 12 there are in this case 4 delivery nozzles 15, each of which is able to deliver a desired quantity of liquid at a certain pressure. Auxiliary nozzles of hydraulic thrust, not shown here, may also be present, able to cause the rotation of the relative rotating element 12 by means of the jet of water delivered. Alternatively the nozzles 15 can be suitably directed so as to achieve this effect of hydraulic thrust which makes the rotating element 12 rotate.

[0028] The machine 10 also comprises a pushbutton panel 21 with a luminous display by means of which the functioning of the machine is started and/or managed, and possibly different washing programs are set.

[0029] The rotating elements 12 have a flattened transverse section "S_a" where there are no nozzles 15, and a transverse section greater than a minimum value where there are nozzles 15, as expressly described and claimed in a patent application made by the Applicant parallel to this one. This conformation allows to keep inside said rotating elements 12 a smaller quantity of liquid than in traditional machines, yet still guarantees a volume of delivery by the nozzles 15 sufficient to ensure efficient washing conditions.

[0030] The washing machine 10 is suitable to operate with an overall volume of water of about 5 l. In this case, inside each rotating element 12 there is a limited quantity of water, equal to about 0.075 l.

[0031] The pipes 13 are arranged substantially around the perimeter of the washing chamber 11 and have a reduced section of passage in order to diminish the quantity of water present therein during the washing cycle.

[0032] The water delivered by the nozzles 15, which collects on the bottom of the washing chamber 11, is discharged through the hole 17 and sent to the pump 20 which puts it back into circulation through the pipes 13.

[0033] According to a preferential embodiment of the invention, the overall quantity of cleaning liquid present, during the cycle, in the pipes 13 and in the rotating elements 12 is about 0.5 l, that is, about 10% of the overall quantity of liquid circulating inside the machine 10, equal to about 5 l.

[0034] Thanks to the reduction in the quantity of liquid present in the pipes 13 and in the rotating elements 12, the machine 10 according to the invention allows to use a smaller pump 20. This allows to reduce the overall size of the machine 10, and in particular it allows to contain

the maximum height in bulk to a value equal to about 55 cm while still respecting the limit of having a usable height of the washing chamber 11 of not less than 25 cm.

[0035] According to a variant which is not shown here, there is an auxiliary pipe 13, which can be selectively activated by valve means which can be driven by inserting a specifically prepared basket. By means of this pipe it is possible to send a jet of water directly through said basket to wash zones and/or equipment which can only be reached with difficulty by means of the nozzles 15 on the rotating elements 12.

[0036] It is clear however that modifications and/or additions of parts may be made to the machine 10 as described heretofore, but these shall remain within the field and scope of the present invention.

[0037] For example, according to a variant which is not shown here, other directional and/or special nozzles may be provided able to deliver the cleaning liquid to hidden or particularly dirty points, such as holes, shelves, blades or suchlike, of particular equipment put to wash in the machine 10.

[0038] According to another variant, a container is provided integrated into the machine 10 to deliver cleaning liquid to be mixed with the liquid present therein.

[0039] It is also clear that, although the present invention has been described with reference to specific examples, a person of skill shall certainly be able to achieve many other equivalent forms of washing machine, all of which shall come within the field of protection of the present invention.

Claims

1. Washing machine such as an industrial or hospital dishwasher, comprising a washing chamber (11) for equipment to be washed, at least two rotating elements (12) arranged in said washing chamber (11) and having delivery nozzles (15) able to deliver cleaning liquid, hydraulic feed means (20) able to make said cleaning liquid circulate between said washing chamber (11) and said rotating elements (12), and pipes (13) which connect said feed means (20) to said rotating elements (12) and to said washing chamber (11), **characterized in that** said pipes (13) and/or said rotating elements (12) have a size such that the volume of liquid present inside said pipes (13) and said rotating elements (12) is equal to about 5%÷15% of the overall volume of liquid circulating inside the entire washing machine (10), said overall volume being around 5 l.

2. Machine as in claim 1, **characterized in that** in said

pipes (13) and in said rotating elements (12) there is a volume of liquid equal to about 10% of the overall volume of the liquid circulating inside the washing machine (10).

3. Machine as in claim 1, **characterized in that** said pipes (13) are sized so that the volume of liquid present inside them during a cycle is between 0.2 l and 0.65 l.

4. Machine as in claim 1, **characterized in that** every rotating element (12) is sized so that the volume of liquid circulating inside it during a washing cycle is comprised between 0.05 l and 0.1 l.

5. Machine as in any claim hereinbefore, **characterized in that** it has an overall height in bulk of less than 55 cm and a usable height of said washing chamber (11) at least equal to 25 cm.

6. Machine as in any claim hereinbefore, **characterized in that** every rotating element (12) has from 3 to 6 delivery nozzles (15).

7. Machine as in claim 6, **characterized in that** said rotating element (12) has a flattened section where there are no nozzles (15).

8. Machine as in claim 1, **characterized in that** it comprises an outer frame (10a) able to determine a heat and acoustic insulation of said washing chamber (11).

9. Machine as in claim 1, **characterized in that** a panel (21) equipped with a luminous display allows to activate the functioning of the machine (10) and to control the washing parameters of said machine (10).

10. Machine as in claim 1, **characterized in that** it comprises an auxiliary pipe which can be selectively activated, able to feed cleaning liquid to a basket to clean zones and/or equipment arranged at points which can only be reached with difficulty by means of the nozzles (15) on said rotating elements (12).

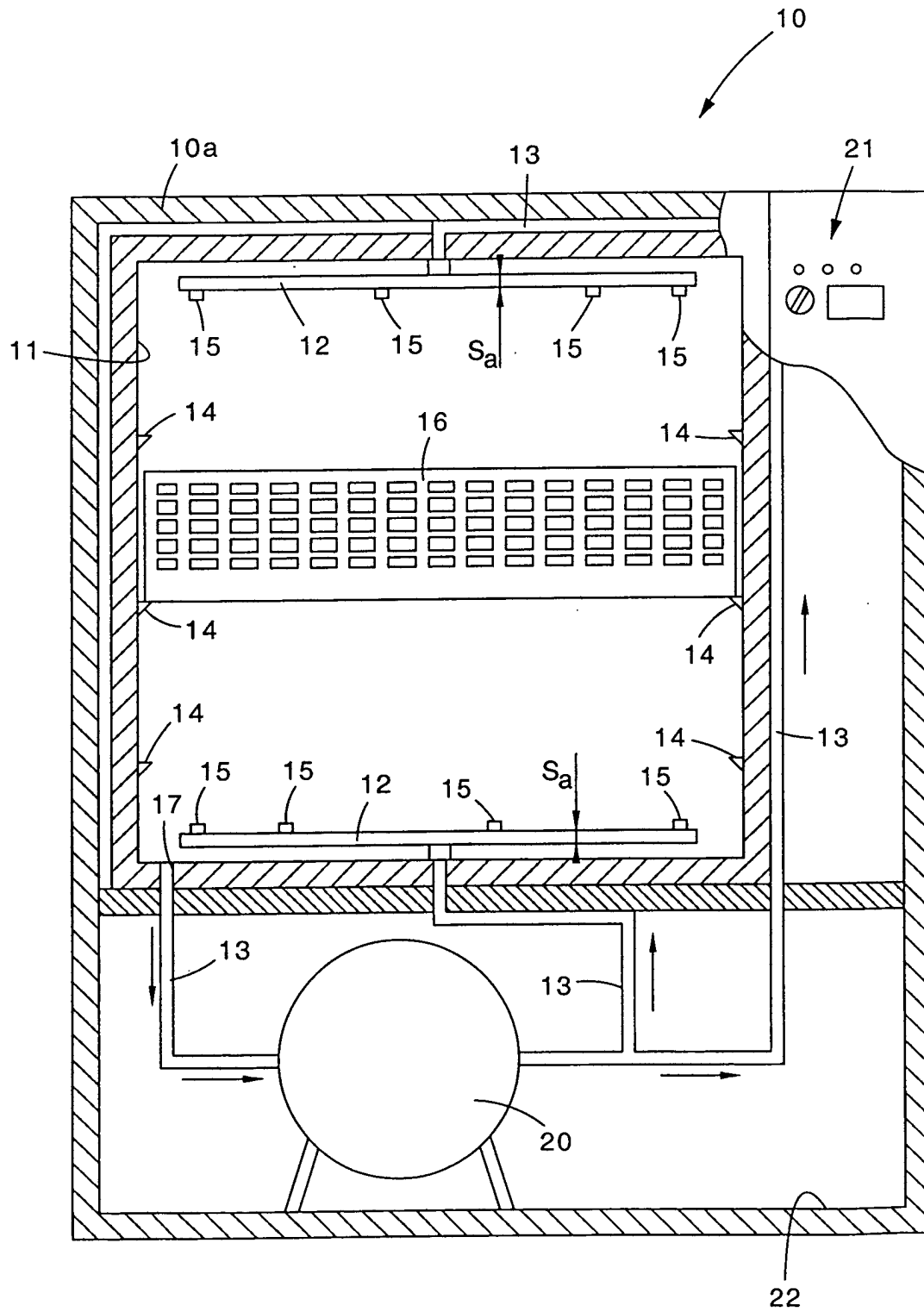


fig. 1



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Application Number
EP 02 02 5758

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 9 January 2003	Examiner Papadimitriou, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

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