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## Description

The present invention relates to a washing apparatus and the method thereof for the tableware including forks, knives, spoons, etc. as well as dishes, cups and glasses.

The washing apparatus for tableware heretofore in use has a box type frame body on which a door is swayingly mounted on the front end opening, and within the frame body is provided a rack for permitting the tableware to stand up, and by a shower means provided on the inner wall of the frame body and a shower pipe rotatably mounted below the rack, the tableware is washed in a shower discharging over the rack.

However, the washing water from the shower is hard to spurt forth all over the tableware completely, and in a country where the tableware with a deep bottom such as a glass, etc. and the tableware formed in various shapes like the Japanese tableware are mostly used, the said washing apparatus has less washing effect, and this gives rise to the fact that the said washing apparatus has scarcely been pervasive.

In addition, some washers wash the tableware by striking a great amount of high pressure jet water against the tableware, but the jet water often tends to damage the tableware. And, even if they are used on the plastic tableware or the like, they are not suited for the washing of the high class tableware which is usually used at a hotel and restaurant.

In US—A—2642369 there is disclosed a dishwasher consisting of a tub, a basket and a device supporting the basket for rotation in the tub, a cover for the tub, a nozzle mounted eccentrically on the cover, and a device for conducting high pressure liquid to the nozzle. The nozzle has a plurality of diverging orifices for directing a number of high velocity streams of liquid into the tub, some of these streams being directed against the basket to rotate it and at least one of the streams opposing such rotation.

In US—A—3103940, there is disclosed a dishwasher consisting of a dish supporter, a water impeller, a motor having a rotor, a first shaft fixed to the rotor for rotation therewith, a second shaft coaxially mounted for rotation within the first shaft, a gear arrangement fixed to the first and second shafts and coupled to each other in a manner whereby the first shaft drives the second shaft at a rotary speed substantially less than that of the first shaft and in the opposite direction thereto, a coupling device for removably fixing the dish supporter to the second shaft, and a device for fixing the water impeller to the first shaft.

The present invention provides a washing apparatus for tableware which is capable of removing any filth on the tableware reliably and quickly.

The present invention additionally provides a washing apparatus for tableware such that the tableware can be deprived of filth in a shorter time by whirlpool flow generated alternately in reciprocating motion in the washing water immersing the tableware, and that energy saving is also effective.

According to a first aspect of the present invention there is provided a washing device which comprises: a washing tank provided with a means for introducing water into the washing tank; a rack, rotatably mounted in the washing tank, for receiving and holding one or more article to be washed; a water-agitating means rotatably mounted in the washing tank for rotating water in the washing tank; and drive means for simultaneously rotating the agitating means and the rack in mutually opposed directions;

characterised in that the water-introducing means has spray nozzles disposed at multi-stepped positions on the side wall in the washing tank to enable water to jet from lateral directions and has water-supply nozzles, and in that the drive means has a reversible motor.

Conveniently the rack is mounted above the water-agitating means, which is preferably in the form of a plate, and in preferred embodiments the rack is removably mounted in the washing tank. Preferably, the water-agitating means is mounted in the bottom of the washing tank.

According to a second aspect of the present invention there is provided a method of washing an article using a washing device according to the first aspect of the present invention, which method comprises:

placing the article in the rack;

spraying hot water, via the spray nozzles, at the article from lateral directions;

introducing water, via the water-supply nozzles, into the washing tank in order to immerse the rack together with the article;

actuating the drive means, simultaneously rotating the agitating means and the rack in mutually opposed directions and, by the rotation of the agitating means, generating a whirlpool flow in the water present in the tank for washing the article; and

rinsing with hot water introduced via the water-introducing means.

Preferably, detergent is introduced into the washing tank before the drive means is actuated. As a later step, the article may be rinsed with hot water introduced via the means for introducing water. The temperature of the hot water is preferably in the range of from 40°C to 60°C.

For a better understanding of the present invention, and to show how the same may be put into effect, reference will now be made, by way of example, to the accompanying drawings in which:—

Figure 1 shows a vertical section through an embodiment of the washing device according to the present invention.

As illustrated in the drawing, the washing tank is supported by legs 2- -. The washing tank 1 has an opening at its upper end, on the inner wall of which are provided a plural number of shower jet outlets 1a, 1a,- -, and water supply hole 1b. The piping connected to the shower jet oulet and the

water supply hole is provided with valves 3, 4. At the bottom corner of washing tank 1 is provided a drain port 1c. The drain pipe is also equipped with a valve 5.

In the washing tank 1 are provided an agitating plate 6 for causing the water poured into the tank to be given a whirlpool flow and a tableware rack 7 for receiving and holding the tableware, and these are rotated each other in opposed directions by the drive mechanism which will be described hereunder. Namely, a cylindrical shaft 9 for driving the tableware 7 is axially supported pivotally through bearings in the bearing case 8 mounted under the washing tank 1. The upper end of this cylindrical shaft extends outwardly in the washing tank 1. Within and coaxial to the cylindrical shaft 9, a drive shaft 11 for agitating plate 6 is pivotally supported through bearings 12, 12, the upper end of which is made to extend outwardly in the washing tank 1. On the other hand, the rotary shaft 14 axially supported on the bearing case 8 pivotally through bearing 13 is provided with gears 15 and 16 axially attached thereto; one gear 15 is in meshing relation with the gear 17 connected to the shaft 12 and another gear 16 is in meshing relation with the gear 18 connected to the cylindrical shaft through an intermediate gear (shown by dotted line). The shaft 11 and the cylindrical shaft 9, therefore, rotate mutually in opposed directions. On the upper end of cylindrical shaft 9 located at the inner bottom of washing tank 1 is firmly fixed the center portion of a rotary plate 19, and the rotary plate is provided with a lock frame 20 on its peripheral part. While supported by this frame 20, the tableware rack 7 is rotated together with the lock frame when taken hold of with a hook pin provided upwardly on part of the said frame 20. The upper end of the shaft 11 passing through the rotary plate 19 is coupled to the agitating plate 6. On the contrary, the lower end of shaft 11 is provided with a pulley 21. And, the belt 23 is placed between this pulley and another pulley 22 fitted on the rotary shaft of a motor M installed at the lower portion of working tank 1, thereby imparting the rotary force of the said motor to the shaft 11 and cylindrical shaft 9. On the inner bottom of washing tank is provided a heater 24.

Although, in the embodiment as described above, agitating plate 6 and rotary plate 19 are to be rotated by a single motor M, they may be rotated respectively by separate motors. In this case, the gears 15, 17 are not required, and the motor for driving the tableware rack 7 for rotation will be connected to the rotary shaft 14.

Next, an explanation is made regarding the washing method for tableware in accordance with the present invention.

First, take out the tableware rack 7 from the washing tank 1, then receive and hold the tableware in the rack, for example, keeping dishes, soup dishes, etc. stood up with their surfaces facing outwardly as practicable as possible and allowing glasses, cups, etc. to turn their openings outwardly. Of course, the rack 7 should be so designed as to provide appropriately partitioned chambers that can afford to pile up the tableware in two layers, depending upon the shape and size of the tableware.

And then, set the rack 7 with the tableware received and held thereon while being locked by the lock frame 20 provided on the rotary plate 19 in the washing tank 1.

Now, opening valve 3, let water (or hot water) spurt forth from the shower jet outlet 3 toward the tableware rack. This is the preliminary washing for the tableware by which remnants of food stuck to the surfaces of the tableware can roughly be removed. The valve 5 is then kept open in advance for drainage. The shower jetting time may be approximately for 1—2 minutes. Turning the tableware rack at this time for preliminary washing enhances the washing efficiency for main washing which will be described later. The shower washing using hot water at this stage is very effective for removal of oil and fat, protein, starch and the like that have adhered to the tableware.

The temperature of this hot water should preferably be within the range of 40—60°C for the most efficient removal of those substances, because the beef fat is liquidized at nearly 50°C but hard to be liquidized at a temperature below 40°C and, at a temperature higher than 60°C, the protein tends to be coagulated.

After closing of valve 3,- - - and valve 5, the method proceeds to the immersing process by which to cause the tableware to be immersed thoroughly in the washing tank 1.

Put water or hot water into the tank through water supply hole 1b by opening valve 4, add detergent, and keep the tableware submerged completely in the water for a given time dependent upon the degree of filth. At this time, protein is decomposed into an amino acid state, and oil and fat are also decomposed. It is specially valid for paste forming when starch is stiffened. Accordingly, the immersing time varies contingent upon the stiffened condition of starch stuck to the tableware. And it will be more valid for removal of the decomposed substance from the surfaces of the tableware and for increased effects of detergent upon the adhered substance if the tableware rack is then made to turn in intermittent movements normally and reversely in every 2—15 seconds.

Afterwards, the main washing or whirlpool flow washing is performed.

If motor M is started, agitating plate 6 and tableware rack are then rotated mutually in opposed directions by the drive means consisting of the said motor, shaft 9 and rotary circular plate 19. The whirlpool flow to be generated among the washing liquid in washing tank 1 by the agitating plate is restrained by rotation of the tableware rack 7, thereby causing water to undergo a disturbed, complicate flow motion. As a result, water is then forced uniformly to strike filth on the surfaces of the tableware received and held in the tableware rack 7, thus filth is removed. At this

time, the number of revolutions of the agitation plate 6 is approximately 500 r.p.m. and the same of the tableware rack is approx. 40 r.p.m.

In this process of operation, physical washing is performed by generating a whirlpool flow in the washing water in the washing tank 1 thereby producing impact effects on all the surfaces of the tableware. Rotating the tableware rack in a direction contrary to the whirlpool flow during the whirlpool flow operation allows very effective washing. As for rotation of the tableware rack, it may be rotated normally and reversely in every 2—15 seconds corresponding with an inversion of the whirlpool flow.

After completion of main washing valve 5 is opened to drain off the washing water. And, by opening valve 3, let water jet over the tableware to remove detergent and adhered substance from the tableware. In this case, it is also better to turn the tableware rack. Lastly, wash by hot water shower and makes dry. The heater 24 may be energized for drying and sterilization as well.

Subsequently, take out the tableware rack 7 or the tableware only from the washing tank 1.

**Claims**

1. A washing device which comprises: a washing tank (1) provided with a means (1a, 1b) for introducing water into the washing tank (1); a rack (7), rotatably mounted in the washing tank (1), for receiving and holding one or more article to be washed; a water-agitating means (6) rotatably mounted in the washing tank (1) for rotating water in the washing tank (1); and drive means (9—18) for simultaneously rotating the agitating means (6) and the rack (7) mutually opposed directions.

characterised in that the water-introducing means (1a, 1b) has spray nozzles (1a) disposed at multi-stepped positions on the side wall in the washing tank (1) to enable water to jet from lateral directions and has water-supply nozzles (1b), and in that the drive means (9—18) has a reversible motor.

2. A washing device according to claim 1, wherein a heater means (24) is disposed on the bottom of the washing tank (1).

3. A washing device according to any preceding claim, wherein the rack (7) is mounted above the water-agitating means (6) which is preferably in the form of a plate.

4. A washing device according to any preceding claim, wherein the rack (7) is removably mounted in the washing tank (1).

5. A washing device according to any preceding claim, wherein the water-agitating means (6) is disposed inside of, and at the bottom of, the washing tank (1).

6. A method of washing an article using a washing device as claimed in any preceding claim, which method comprises:

placing the article in the rack (7);

spraying hot water, via the spray nozzles (1a), at the article from lateral directions;

introducing water, via the water-supply nozzles (1b), into the washing tank in order to immerse the rack (7) together with the article;

actuating the drive means (9—18), simultaneously rotating the agitating means (6) and the rack (7) in mutually opposed directions and, by the rotation of the agitating means (6), generating a whirlpool flow in the water present in the tank (1) for washing the article; and

rinsing with hot water introduced via the water-introducing means (1a, 1b).

7. A method according to claim 6, wherein the agitating means (6) and the rack (7) are made to turn respectively in stepped motion, intermittently to reverse the whirlpool flow.

8. A method according to claim 6 or 7, wherein the hot water has a temperature in the range of from 40 to 60°C.

**Patentansprüche**

1. Waschvorrichtung mit einem Waschbehälter (1), mit einer Vorrichtung (1a, 1b) zum Einfüllen von Wasser in den Waschbehälter (1), mit einem im Waschbehälter (1) drehbar montierten Gestell (7), zum Aufnehmen von einem oder mehreren zu waschenden Gegenständen, mit einer im Waschbehälter (1) drehbar montierten Umrührvorrichtung (6) für das Wassers im Waschbehälter (1) und mit Antriebsmitteln (9—18) zum gleichzeitigen, Drehen der Umrührvorrichtung (6) und des Gestells (7) in gegenläufigem Drehsinn, dadurch gekennzeichnet, dass die Vorrichtung (1a, 1b) zum Einfüllen von Wasser Sprühdüsen (1a) umfasst, die auf mehreren Stufen in der Seitenwand des Waschbehälters (1) angebracht sind, die Wasserstrahlen aus seitlichen Richtungen erzeugen und die Wasser-Zufuhr-Düsen (1b) aufweist, und dass die Antriebsmittel (9—18) einen Motor mit umsteuerbarer Laufrichtung aufweist.

2. Waschvorrichtung nach Anspruch 1, bei der auf dem Boden des Waschbehälters (1) eine Heizung (24) angebracht ist.

3. Waschvorrichtung nach einem der vorhergehenden Ansprüche, bei der das Gestell (7) oberhalb der Umrührvorrichtung (6), die vorzugsweise eine Plattenform hat, angebracht ist.

4. Waschvorrichtung nach einem der vorhergehenden Ansprüche, bei der das Gestell (7) im Waschbehälter (1) entfernbar angebracht ist.

5. Waschvorrichtung nach einem der vorhergehenden Ansprüche, bei der die Umrührvorrichtung (6) für das Wasser innerhalb und am Boden des Waschbehälters (1) angebracht ist.

6. Verfahren zum Waschen eines Gegenstandes mit einer Vorrichtung nach einem der vorhergehenden Ansprüche, gekennzeichnet durch das Anordnen des Gegenstandes im Gestell (7); das Sprühen von warmem Wasser aus seitlichen Richtungen mit den Sprühdüsen (1a); das Zuführen von Wasser in den Waschbehälter durch die Wasserzufuhr-Düsen (1b), um das Gestell (7), zusammen mit dem Gegenstand ins Wasser zu tauchen; das Anlassen der Antreibsmittel (9—18),

welche gleichzeitig die Umrührvorrichtung (6) und das Gestell (7) in entgegengesetzter Richtung drehen und

das Erzeugen einer Wirbelströmung des Wassers im Waschbehälter mit der Umrührvorrichtung (6), um den Gegenstand zu waschen und

das Spülen mit warmem Wasser, das mit der Vorrichtung (1a, 1b) zum Zuführen von Wasser zugeführt wird.

7. Verfahren nach Anspruch 6, bei welchem die Umrührvorrichtung (6) und das Gestell (7) schrittweise gedreht werden und dabei die Wirbelströmung abwechselnd umgekehrt wird.

8. Verfahren nach Anspruch 6 oder 7, bei der das warme Wasser eine Temperatur im Bereich von 40 bis 60°C hat.

**Revendications**

1. Dispositif de lavage comprenant une cuve de lavage (1) présentant des moyens (1a, 1b) d'introduction d'eau dans la cuve de lavage (1), un support (7) monté en rotation dans la cuve de lavage (1), destiné à loger et à maintenir un ou plusieurs articles à laver, des moyens d'agitation de l'eau (6) montés en rotation dans la cuve de lavage (1), assurant la rotation de l'eau dans cette cuve de lavage (1), ainsi que des moyens de commande (9—18) entraînant en rotation simultanément les moyens d'agitation (6) et le support (7) en des sens mutuellement opposés, caractérisé en ce que les moyens d'introduction d'eau (1a, 1b) présentent des buses de pulvérisation (1a) disposées en des emplacements multi-étagés sur la paroi latérale de la cuve de lavage (1) pour permettre à l'eau d'être envoyée sous forme de jets en provenance de directions latérales, et présentent des buses d'alimentation d'eau (1b), et en ce que les moyens de commande (9—18) comprennent un moteur réversible.

2. Dispositif de lavage selon la revendication 1, caractérisé en ce que des moyens de chauffage (24) sont disposés au fond de la cuve de lavage (1).

3. Dispositif de lavage selon l'une des revendications précédentes, caractérisé en ce que le support (7) est monté au-dessus des moyens d'agitation d'eau (6, lesquels se présentent de préférence sous la forme d'un plateau.

4. Dispositif de lavage selon l'une des revendications précédentes, caractérisé en ce que le support (7) est monté amovible dans la cuve de lavage (1).

5. Dispositif de lavage selon l'une des revendications précédentes, caractérisé en ce que les moyens d'agitation d'eau (6) sont disposés à l'intérieur et au fond de la cuve de lavage (1).

6. Procédé se lavage d'un article, mettant en oeuvre le dispositif de lavage selon l'une des revendications précédentes, caractérisé en ce qu'il consiste:

à mettre en place l'article dans le support (7),

à projeter de l'eau chaude, au moyen des buses de pulvérisation (1a) sur l'article, à partir de directions latérales,

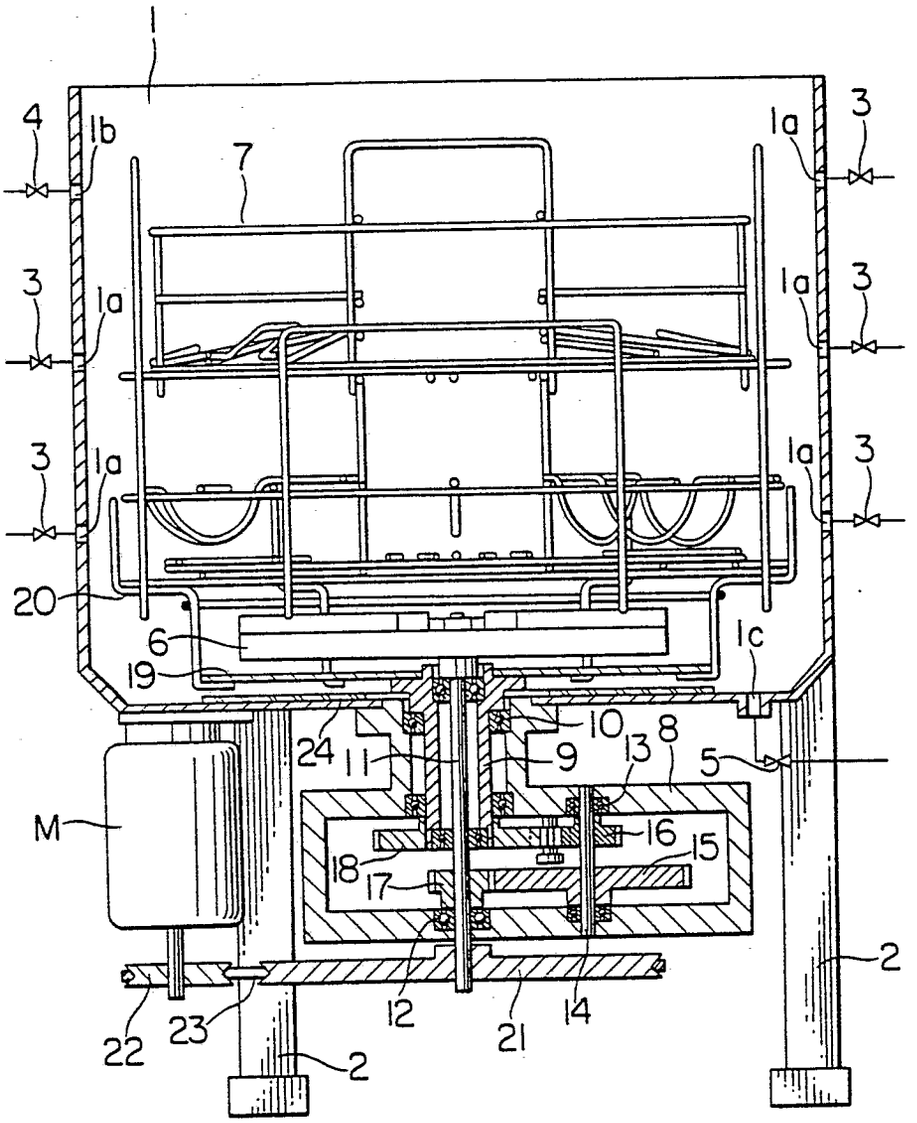
à introduire de l'eau, au moyen des buses d'alimentation d'eau (1b), dans la cuve de lavage, en vue d'immerger le support (7) en même temps que l'article,

à actionner les moyens de commande (9—18) entraînant en rotation, simultanément, les moyens d'agitation (6) et le support (7) en des sens mutuellement opposés et, par rotation des moyens d'agitation (6), à provoquer la formation d'un écoulement tourbillonnaire dans l'eau présente dans la cuve (1) pour le lavage de l'article, et,

à effectuer un rinçage à l'eau chaude introduite par les moyens d'introduction d'eau (1a, 1b).

7. Procédé selon la revendication 6, caractérisé en ce que les moyens d'agitation (6) et le support (7) sont réalisés de manière à tourner respectivement pas-à-pas, de façon intermittente, afin d'inverser l'écoulement tourbillonnaire.

8. Procédé selon la revendication 6 ou 7, caractérisé en ce que l'eau chaude présente une température comprise entre 40 et 60°C.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