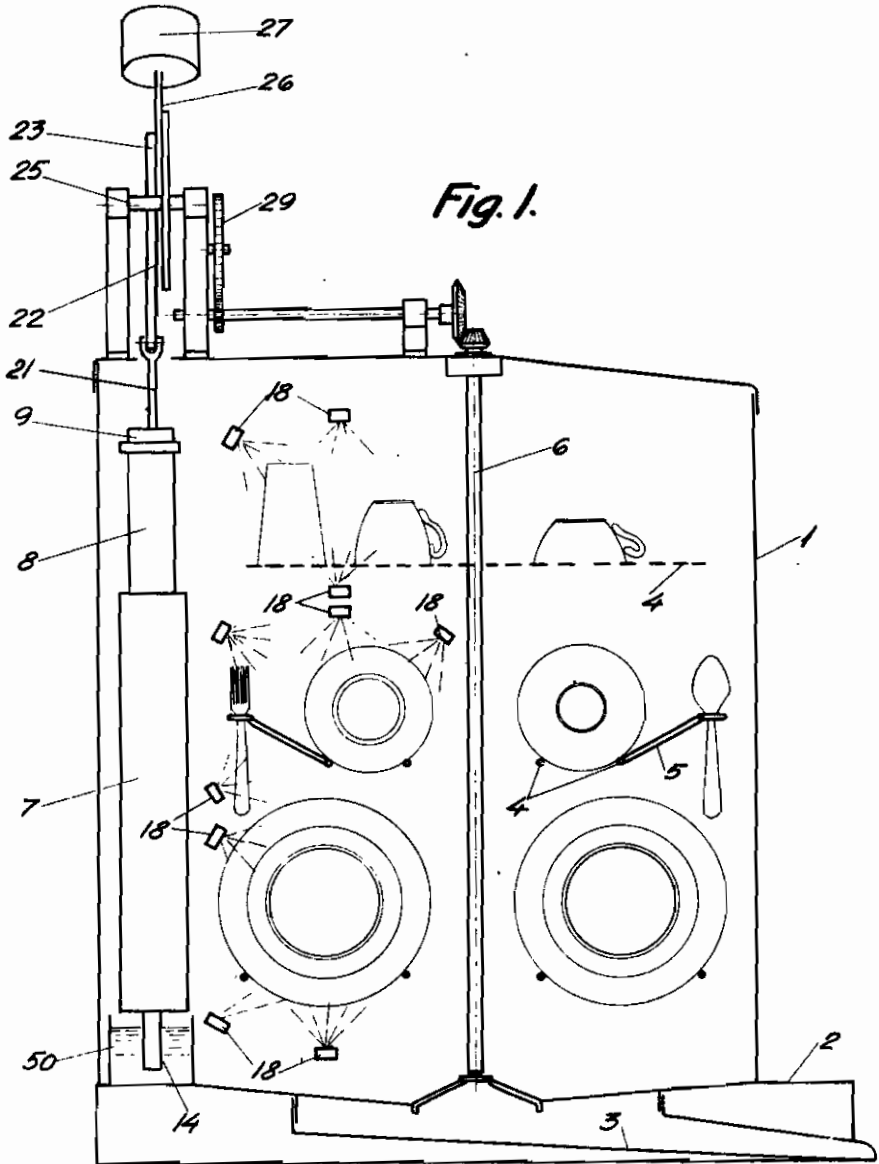


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FOR HOUSEHOLD USE
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Serial No.
241,833
3 Sheets-Sheet 1



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Inventor

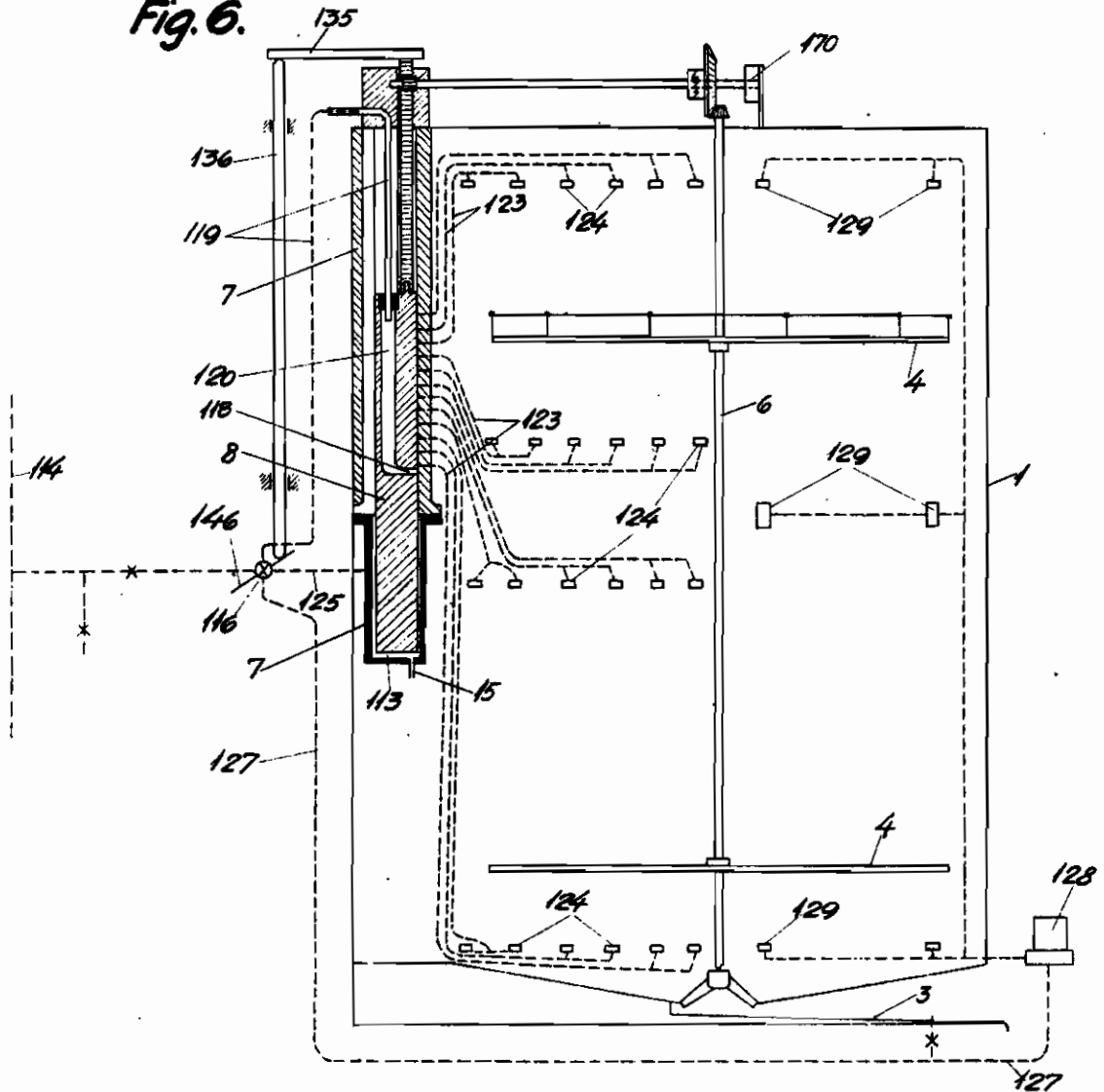
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Fig. 6.



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ALIEN PROPERTY CUSTODIAN

DISHWASHING MACHINES, PRIMARILY FOR HOUSEHOLD USE

Jørgen Hertz, Copenhagen, Denmark; vested in the Alien Property Custodian

Application filed November 22, 1938

Dishwashing machines intended primarily for household use are known in which the utensils are squirted with water or cleansing fluid, for example lye, through liquid discharge openings, for example jet nozzles. These machines contain at the bottom a receptacle which is filled with cleansing fluid which by means of a pump is pressed out through a system of cleansing fluid nozzles, causing the cleansing fluid to circulate in the machine. In order to avoid clogging of the nozzles one or more filters are fitted in the receptacle and before the pump, these retaining larger impurities. Seeing that the pump is normally driven by an electric motor, there is no complication attached to letting a comparatively large quantity of cleansing fluid, for example a couple of hundred litres per minute circulate in the machine during the treatment of the utensils with cleansing fluid, for example lye. After having treated with cleansing fluid, the utensils are squirted with pure water which may be supplied either direct from a water main or may be made to circulate by means of the pump. The squirting with water usually takes place through other nozzles than those serving for the squirting with cleansing fluid and either or both nozzle systems may be movable.

Dishwashing machines of the aforesaid kind suffer from several drawbacks, especially, due to their using the same circulating cleansing fluid. It is not of advantage in the same batch of utensils to cleanse plates and glasses, the glasses becoming unnecessarily soiled by the fatty substances and similar deriving from the plates; furthermore, it is unhygienic to use the same circulating cleansing fluid. To this should be added that even the employment of filters in front of the pump is not always sufficient to prevent clogging of the nozzles. It is, further, difficult constantly to maintain the circulating cleansing fluid heated to approximately the same temperature unless a special heating device is built into the receptacle. The said drawbacks in connection with the circumstance that the running of the machine necessitates for example an electric motor for driving the pump, do in a large number of cases make the said washing machines unsuitable for household use.

Dishwashing machines are further known to be constructed without any pump and in such a manner that water from the house water main and through the pressure in the main is squirted out through the machine's nozzles. By such machines it is known to add a cleansing agent to the water during a certain period so that the

nozzles in the beginning squirt cleansing fluid under the water main pressure and then, in a subsequent period, squirt rinsing water, that is water to which no cleansing agent has been added on its way from the water main to the squirting nozzle or nozzles. Such machines are intended for dealing with small quantities of utensils and in order to utilize the low water pressure fully it is usual that either the squirt nozzle or the utensils are made to rotate so that the latter may be squirted from different sides. The low pressure makes it necessary further to employ a single or a very small number of squirt openings in order that a powerful mechanical rinsing with water or cleansing fluid, or both, may be obtained and the water quantity drawn per minute from the water main can only be very limited, 10-15 litres per minute at the most.

Such machines built with a single rotating nozzle do not function satisfactorily. It has been attempted to obtain an improved effect by constructing the machine with a rotatable frame for the utensils and with two nozzle pipes arranged inclined towards one another, only one of these functioning at a time. The nozzle in action squirts liquid obliquely against plates arranged radially on a carrying frame rotatable on a vertical axle, making the frame and the plates rotate whilst the latter are being squirted on the one side. When the carrying frame and the plates have rotated a certain number of revolutions, an adjustment organ on the carrying frame effects a turning of a cock inserted between the water supply pipe and the two said nozzle pipes. The liquid supply is thereby switched on to the other nozzle pipe which squirts the plates on the other side, bringing the carrying frame in rotation in a direction opposite to the first direction until—following a certain number of revolutions—the first nozzle pipe again receives water supply. Besides the said periodically active nozzle pipes or squirt openings, the described machine is provided with a water supply pipe which is constantly in action and which at the bottom of the machine debouches in a number of squirt openings or nozzles which may be covered by up-turned glasses which will thus constantly be squirted inside, the outside being dealt with by the liquid squirted through one of the two periodically active nozzle pipes and thrown back, either by the plates on the carrying frame or by the plates in conjunction with the inner wall of the machine chamber.

The above described machine suffers especially from the drawback that it will only function

when there are many plates in the carrying frame, to which must be added that the cleansing effect is reduced in that the nozzle pipes must be generally inclined in order that the liquid jets may produce the rotation. Still, the principal falling 5 attached to the machine lies in the fact that it comprises only two periodically active nozzle pipes or squirt openings, this entailing that only small areas of the plates on the carrying frame are powerfully squirted with a powerful mechanical rinsing effect, whereas the other portions will, 10 practically speaking, not be subject to any direct mechanical squirting action by liquid jets, their treatment being limited to the effect of downwardly flowing liquid or liquid particles thrown 15 back, these combining to form a vapour of water drops without any proper mechanical rinsing effect. The described machine, therefore, does not yield any satisfactory cleansing of the utensils.

This invention relates to a dishwashing machine constructed primarily for household use and of that kind which has one or several liquid discharge openings, nozzles or groups of such through which cleansing fluid or rinsing water is discharged periodically under the pressure from a house water main and through the intervention 25 of control means, in such a manner that the machine comprises in any case certain nozzles or nozzle groups which are periodically brought into action mutually, and what in the first place characterises the invention is the feature that the control means which bring about the periodical liquid supply to the said nozzles or nozzle groups are actuated by such means that the durations 30 of the periods of squirting, which periods need not be of equal duration, is regulated independently of whether utensils are inserted in the machine or not. The control means employed according to the invention are, in other words, independently movable and may be driven, for example by means of a weight lifted in advance, by a driving spring or other separate driving means similar to a clock or watch, or by other driving means, for example a small electro- 35 magnetic motor device or, possibly, a driving device operating with compressed air or water pressure and constructed, for example in the form of a small turbine. The simplest way is to employ a driving spring or a small water turbine driven by water from the house water main, which will not materially reduce the pressure in the latter. The nature proper of the control means, or the power by which they are actuated have no bearing upon the main principle of the invention, the same being based exclusively on 40 the feature that the movement of the control means takes place wholly independently of the utensils being dealt with in the machine.

The invention makes it possible to determine the directions in which the jets are to be ejected from the nozzles, considering solely the attainment of the greatest possible mechanical rinsing effect (detaching effect by jet action).

Seeing that in any case certain of the machine's nozzles are periodically in action mutually, the said nozzles are, according to the invention, disposed and adjusted in such a manner that each of them oversquirt will full mechanical rinsing effect only a portion of the machine's chamber holding the utensils, but still in such a manner that the periodically active nozzles do collectively and with full mechanical rinsing effect command either the whole of the said chamber or larger portions of the same, for example, a vertical middle section through the 75

chamber, extending only to the chamber's middle axis.

It is primarily only the rinsing water which is ejected through nozzles of which in any case certain are periodically in action mutually, and if the rinsing water nozzles command the whole of the machine's chamber for utensils, then the machine may be constructed with a fixed carrying frame for the utensils. If the rinsing water nozzles collectively command only a cross section through the machine, or only the one half of such a section, the machine is constructed with a rotating carrying frame for the utensils, this passing during the rotation through that zone in the machine which is commanded by the nozzles with full mechanical rinsing effect. The 15 said zone need not constitute an integral surface.

Generally, the said mutually periodically active nozzles will be employed, possibly such nozzles in conjunction with one or more constantly active nozzles intended solely for the squirting of the utensils with rinsing water, whereas for the squirting of the utensils with cleansing fluid constantly active nozzles are primarily employed. There is, however, nothing to prevent the employment of nozzles, all of which or some of which are periodically active mutually, for the ejection of cleansing fluid also.

The squirting with cleansing fluid is usually effected prior to the squirting with water, and for the squirting of the utensils with cleansing fluid a special system of nozzles is used, this discharging finer jets seeing that the squirting of the utensils with cleansing fluid shall serve, in a major degree, as a kind of maceration of the impurities on the utensils.

As explained, the machine is of the kind, whose nozzles for rinsing water or cleansing fluid eject through the pressure from a house water main. The cleansing agent must therefore be introduced at a place in the pipe or pipes which connect the house water main with the nozzle or nozzles which are intended for the ejection of cleansing fluid. This is effected in that a supply device for a cleansing agent, for example soap in solid or fluid form is in a per se known manner inserted in the said pipe or pipes.

Normally, the machine according to the invention is constructed so as to comprise both cleansing fluid nozzles and rinsing water nozzles.

The drawings show what is needful for the comprehension of the invention.

Fig. 1 shows schematically a partially vertical middle section on the line C—D in Fig. 2 through a constructional form for a dishwashing machine according to the invention.

Fig. 2 schematically, a horizontal cross section through the same,

Fig. 3 schematically, a partially vertical middle section through a constructional form for the control means for the liquid,

Fig. 4 is a horizontal section on the line A—B in Fig. 3, and

Fig. 5 a detail.

Fig. 6 shows schematically a vertical middle section through a modified constructional form of the dishwashing machine according to the invention.

In Figs. 1 and 2 the machine's washing space or chamber is marked 1, the same resting at the lowermost end on a bottom 2 which contains a drain 3 for the liquid flowing away from the chamber 1. The chamber 1 contains a carrying frame 4 or other suitable support device for the utensils, and it is, particularly in Fig. 1, indicated

by what manner plates, cups, glasses and similar may be arranged on the carrying frame 4, whereas spoons, forks and similar may be suspended in holders 5 forming portions of the carrying frame 4.

In the constructional form shown the carrying frame is movably lodged in that it is affixed on a vertical axle 6 which may be made to rotate in a manner and by means which will be particularly described below. Inside the chamber 1 there is found, besides the carrying frame, a tube or a cylinder 7 enclosing a plunger 8 movable therein. These parts are shown in section in Figs. 3 and 4. The plunger 8 consists of a top part 9 which is turnably connected to a bottom part 10, and a channel or flow passage 11 extends through both the top part and the bottom part, the passage being at the top connected to the water main through the pipe 12. The passage 11 terminates at the bottom, in order to avoid side pressure on the plunger, in the constructional form shown, in a cross passage 13 debouching on both sides of the plunger. In the lowermost portion of the tube or cylinder 7, for example in its bottom, is disposed a larger inlet 14 fitted with a non-return valve through which inlet liquid, for example water, may be sucked in from a container or basin 50 when the plunger is moved upwardly.

There is found, further—for instance in the cylinder bottom—a fine opening 15 through which the liquid sucked in will only be able to flow away very slowly during the plunger's downward travel so that this movement will be slow and uniform. In the side wall of the cylinder 5 are disposed, as shown by Fig. 3, a number of ports 16 arranged vertically in series which ports will correspond with the cross passage 13 during the downward travel of the piston and which ports 16 will through pipes 17 (Figs. 2 and 3) direct the liquid supplied from the water main each to its own group of nozzles which latter, as shown by Fig. 2, may comprise one or several liquid discharge openings or nozzles 18. These nozzles command, individually or in groups, only a limited portion of the dishwashing chamber 1 or rather of the space occupied by utensils carrying frame. It is indicated in Fig. 4 how side pressure on the cylinder may be neutralised through the arrangement of ports 19 oppositely to the ports 16, the former having outlet connections to the pipes 17 through a connecting pipe 20.

On the top part 9 of the plunger is disposed an upwardly extending plunger rod 21 which, as seen from Figs. 1 and 5, is turnably connected with a connecting rod 22 whose top end by means of a pin 23 is attached to a turnable tooth sector 24. The latter is arranged turnably on an axle 25 and carries at the top a lever 26 with a displaceable weight 27. The tooth sector 24 engages with a gear wheel 28 (Fig. 5) arranged on a boss common with another gear wheel 29 (Fig. 1). From the gear wheel 29 the carrying frame's axle 6 is rotated through a suitable transmission.

Fig. 3 shows that the plunger's bottom part 10 is turnably connected with the top part 9 so that the plunger's bottom portion and therewith the passage 11 with the cross passage 13 may be turned in relation to the cylinder, for example through manipulation of the handle 30. If the plunger bottom part 10 is turned, for example 90°, the passage 13 (Fig. 4) will break contact with the ports 18 and 19 and assume such a position that it will, during the travel of the plunger, correspond with a series of ports of which only

one, 31, is visible in Fig. 4. These ports 31 may through pipes 32 direct the liquid supplied through the plunger passage 11 into a nozzle system other than the nozzles 18 shown in Fig. 2. The latter system of liquid discharge openings or nozzles may be utilized for squirting the utensils with cleansing fluid, for example lye.

The individual pipes 32 must be presumed to be provided with a per se known cleansing agent supply, or a cleansing agent supply device must be inserted on the pipe 12, Fig. 3, in which case the supply device must be arranged so as to admit of being disconnected from the pipe 12 by means of a valve.

If the plunger be supposed stationary in the position of turning as shown in Fig. 3 and at the same time lifted to such an elevation that the cross passage 13 lies higher than the topmost of the ports 18, then the plunger will, as it travels downwardly, establish connection between the cross passage 11 and the ports 16 in downward sequence so that liquid will only be admitted to one of the pipes 17 at a time, thereby admitting liquid only to one single group of the nozzle groups shown in Fig. 2. There is per se nothing to prevent the plunger from feeding for example two or several nozzle groups simultaneously during its downward travel. This will be possible by furnishing the plunger with several cross channels 13, for example as indicated in Fig. 3 by broken lines, by a further cross channel 33, or by giving the cross channel 13 a correspondingly greater height.

The machine functions in the following manner:

When the utensils are arranged on the carrying frame 4 the doors or similar through which the frame was inserted into the chamber 1 are closed. Then the plunger 8 is turned by means of the handle 30 so that the cross passage 13 is brought on to the same plane as the ports 31 (Fig. 4) whence the plunger will be found adjusted for the admission of cleansing fluid, e. g. lye, to the nozzle or nozzles through which the utensils shall be squirted with cleansing fluid. The tooth sector 24 with the weight 27 is then lifted to the topmost position shown in Figs. 1 and 5, and seeing that a pawl and ratchet mechanism is normally introduced between the gear wheel 29 and the carrying frame's axle 6, the tooth sector and the weight and therewith the plunger 8 may be brought into the topmost position without rotation of the utensils. During the elevation of the plunger, liquid—for example water—will be sucked in through the inlet 14 from the basin 50 (Figs. 1 and 3). The water supply is then opened from the water main to the pipe 12 but there will not as yet be any flow through the passage 11 and the cross passage 13, seeing that the latter is occupying a position above that of the topmost of the ports 31 in the cylinder 7, assuming that there are several ports 31. The plunger will then commence to travel downwards under the influence of the weight 27 and simultaneously the carrying frame and the utensils will be set in rotation. As soon as the cross passage 13 reaches the position opposite to the port 31 or the topmost of these, water will be directed through the corresponding pipe 32 and seeing that this pipe or a shunt on same contains a cartridge or container with a cleansing agent soluble in water, the water will take up a portion of the same before being discharged as cleansing fluid through one or more liquid discharge openings or nozzles in the chamber 1.

If the cylinder 7 contains several ports 31 arranged vertically in series with corresponding pipes for cartridges or containers containing cleansing agents and terminating in one or several nozzles, the utensils may be treated with several cleansing fluids introduced in sequence, for example first an alkaline, then an acid and finally with a cleansing fluid which loosens any "fur" deposits, which latter process is of particular importance where the water is calcareous. When the cross channel 13 has passed the port or ports 31, the utensils will have been treated with cleansing fluid and the bottom part 10 of the plunger is then turned to the position shown in Fig. 3 whence the plunger—possibly, though not necessarily, in conjunction with the closing of the water supply—is lifted again and left to resume its downward travel so that the cross passage 13 will now in turn pass the ports 10 (Fig. 3) and thus through the pipes 17 admit water to the nozzle groups coming into action in sequence. When the plunger has passed the lowermost of the ports 10, all the groups will have functioned and the rinsing be completed.

Both during the treatment with cleansing fluid as well as during the rinsing with water, the utensils will be subject to rotation and the velocity of rotation may with advantage be adjusted so as to maintain a fixed relation to the movement of the plunger or the other control organs which may be used for the control of the liquid supply to the nozzle groups, for example in such a manner that one or two revolutions of the axle 8 corresponds to one passage of the cross passage 13 from one of the ports 10 or 31 to the following.

Both the liquid control and the rotation of the utensils may be obtained by other means than those explained, for instance electrically, hydraulically or pneumatically.

For the liquid control, the plunger 8 with the supply pipe 12, shown in Figs. 1 and 3 may be substituted by a hollow plunger as shown in Fig. 6. In the constructional form for the dishwashing machine shown in this figure the principal parts are denoted by the same reference designations as those used in Fig. 1. The plunger 8 is a hollow plunger to whose inner cavity 129 liquid is introduced through a fixed vertical pipe 119 whose lower end is passed through the top wall of the plunger. The plunger 8, Fig. 6, is employed in a manner similar to that shown in Figs. 1 and 3 to control the water supply to the periodically active rinsing water nozzles 124 whereas the machine's cleansing fluid nozzles 129 are fed from a water supply pipe 127, which through a cock 116, 146 may be connected to the water pipe 114. In the said water supply pipe 127 a cleansing agent supply 128 is inserted. In the constructional form for the machine shown in Fig. 6 the plunger 8 does not control the water supply to the cleansing agent nozzles 129, but is employed to determine the duration of the period during which the machine is to treat the utensils with cleansing fluid. The machine according to Fig. 6 is operated in the following manner: When the plunger is stationary in its lowermost position, the control cock 116 is adjusted in such a manner that water is passed through the pipe 125 to the space 113 below the plunger. Through this water pressure the plunger 8 is moved upwardly, applying at the same time tension to a depression spring 170. When the plunger 8 has been lifted, the control cock 118 is adjusted so that the water from the water main flows to the pipe 127 furnished

with a cleansing agent supply 128, this pipe terminating in the cleansing fluid nozzles 129.

These latter will function whilst the plunger 8 moves downwardly, driven by the depression spring 170 which also has the effect of making the carrying frame 4, 8 for the utensils rotate. At the termination of the plunger's downwardly movement an arm 135, which is fixedly connected to the plunger 8, acts through the push rod 130 on the control cock 118, 148, causing it to be turned in such a manner that the water supply to the cleansing fluid nozzles is interrupted. The cock 116 is then adjusted so that water is introduced below the plunger, lifting the latter whilst the depression spring is being tensioned. When the plunger has been lifted, the control cock 116 is adjusted so as to pass water to the pipe 119. The plunger moves downwardly, driven by the spring 170, water being all the while passed to the cavity 120 in the plunger. During the plunger's downwardly movement, its water outlet 119 passes the inlets to the pipes 123 terminating in the rinsing water nozzles 124 so that these in turn come into action whilst the utensils rotate. When the plunger approaches the lowermost position the arm 135 causes such a turning of the cock 116, 146 that the water supply to the rinsing water nozzles is interrupted.

As explained in the foregoing, the plunger may be driven in a downwardly direction by means of a spring to which tension is applied during the upwardly travel of the plunger, hence this driving device replaces the weight 27 in Fig. 5.

The rotation of the utensils need not take place in conjunction with the means, for example the said spring 170 or the weight 27, effecting the liquid control. Thus the utensils may for example with advantage be rotated by a water jet acting on a bucket wheel on the axle 6, that is by a small turbine device fed direct from the water main without materially reducing the pressure in the same.

It is not necessary that both the nozzle systems for cleansing fluid and for rinsing water be divided into groups which are fed only at a time, thus in one of the systems nozzles may be used which are all in action simultaneously, or a single nozzle only. The constructional form for the machine as shown on the drawings operates with a movable plunger and a fixed cylinder, but the opposite is also possible; in the same way it is per se not at all necessary to control the liquid supply automatically, seeing that the control, especially in the case of machines with few nozzle groups, e. g. a single nozzle group or nozzle for the cleansing fluid, may be effected by hand.

The control of the water supply to the periodically acting nozzles may be effected in numerous different ways. Valves may be inserted in the pipes serving the individual nozzles, these valves being opened one or more at a time by means of a motor or a corresponding driving device, for example through a rotating cam shaft in a manner similar to that of the valves in an automobile engine. In place of a vertically actuated control plunger as the example shown in figs. 1, 3 and 6, a rotatable valve or rotatable ported slide valve functioning in a similar manner may be employed, driven by means of a spring, a weight or by a motor of any kind, for example a water turbine. In place of a movable plunger, a fixed plunger may be employed, the cylinder 7 being moved in relation to same, this applying whether the relative movement be vertical or rotating. The downwardly movement of the plunger may

be due to applied forces or to the plunger's own weight, the same applying to the cylinder, if the latter represents the movable part. If desired, both the plunger and the cylinder may be movable.

The constructional forms for the liquid control means shown on the drawings represent only a few examples of construction serving to elucidate the principle of the invention, namely that the control means are actuated independently of the quantity and nature of the utensils which may be found in the machine. As said, it will frequently be preferred only to use the plunger as control means for the rinsing water, in which case the water which is to be mixed with a cleansing agent

is directed so as to pass round the plunger or the corresponding slide valve or turning valve.

In the case described it is possible in the manner explained to let the plunger control the closing and, in part, also the opening of a liquid control cock for the cleansing fluid pipe and in such a manner that the control cock is opened when the plunger is lifted, and closed when the plunger reaches its lowermost position.

In connection with the outflow opening 15, fig. 3, a regulating valve may be fitted so that the outflow velocity, and consequently the speed of the plunger's downwardly travel, may be regulated as desired.

JØRGEN HERTZ.