

[54] APPARATUS FOR CLEANING UTENSILS
OR THE LIKE

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134/131

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134/103, 131

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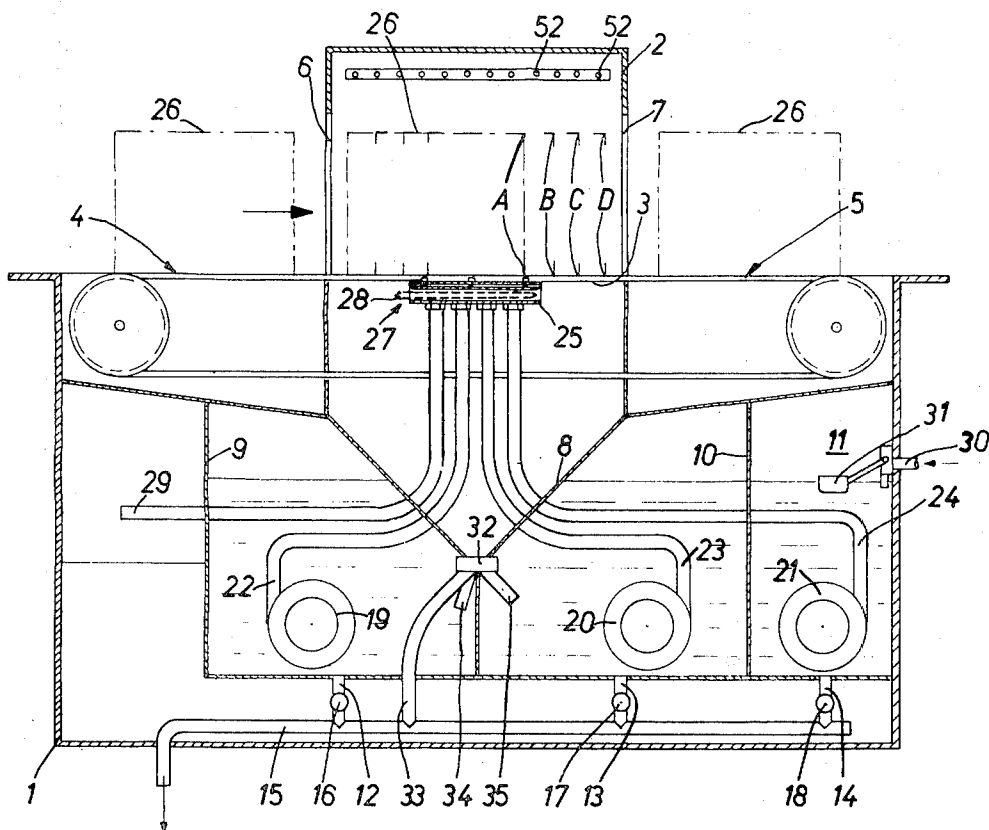
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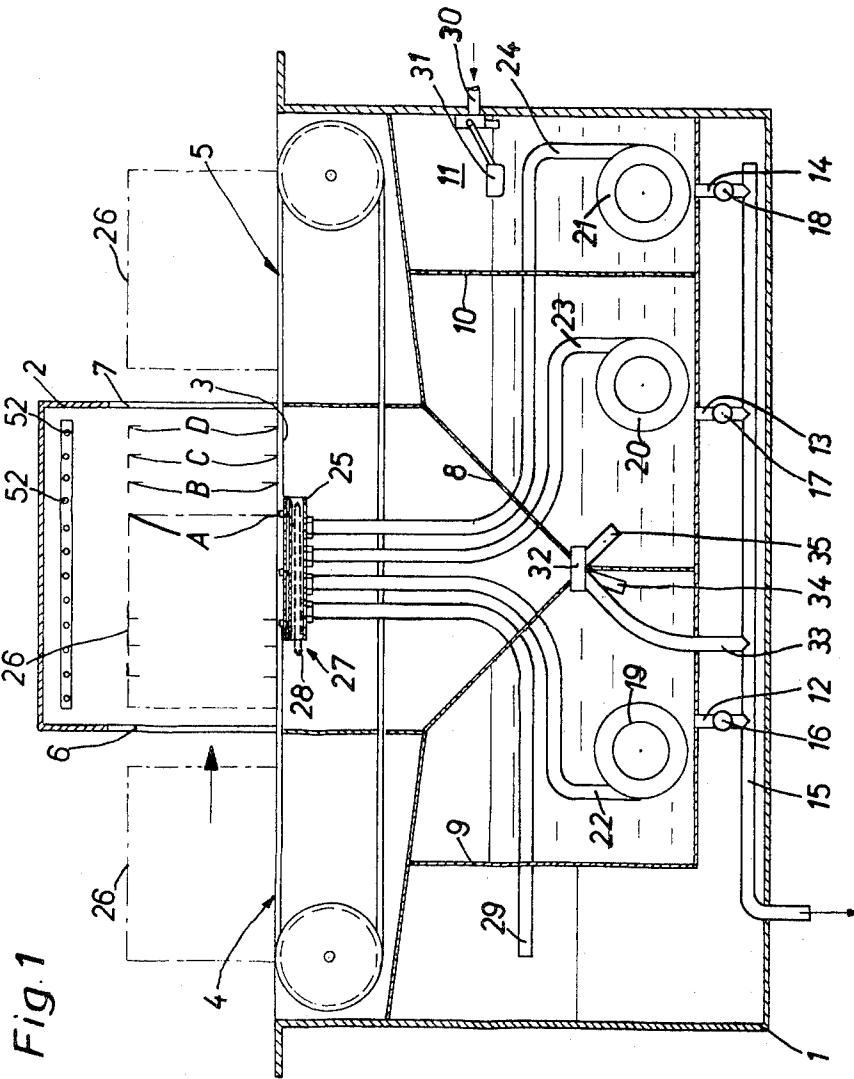
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ABSTRACT

An apparatus for cleaning utensils or the like, especially for cleaning laboratory utensils, wherein at least one carrier frame or rack for receiving the articles to be cleaned is provided and wherein the articles can be treated by different treatment liquids which are infed via a nozzle system. The nozzle system is successively connected in flow communication with separate conduits for the infeed of the different treatment liquids.

4 Claims, 10 Drawing Figures





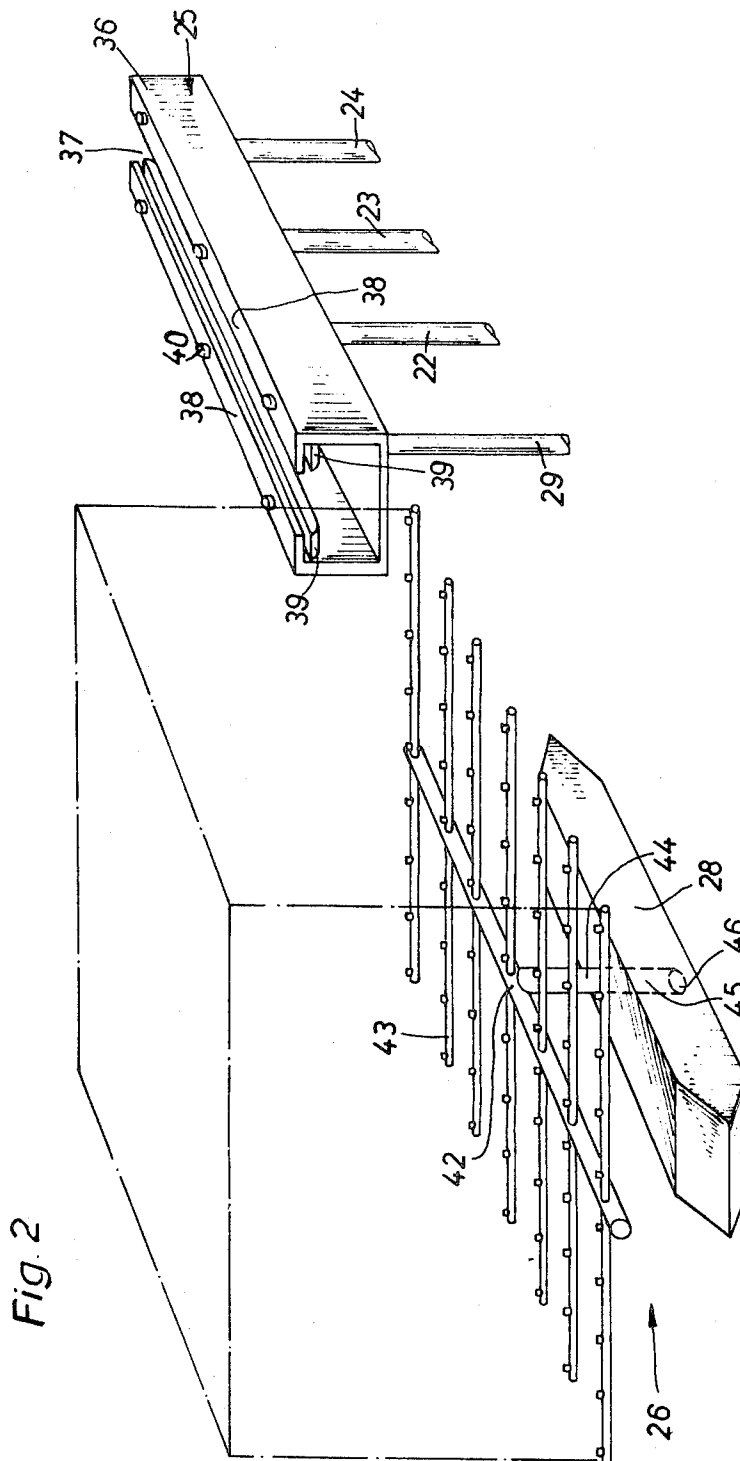


Fig. 4

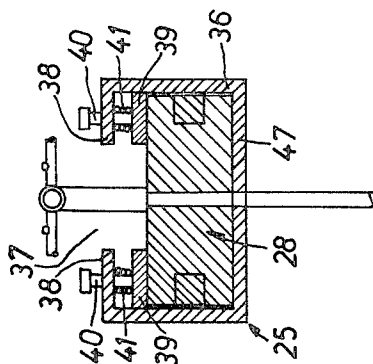
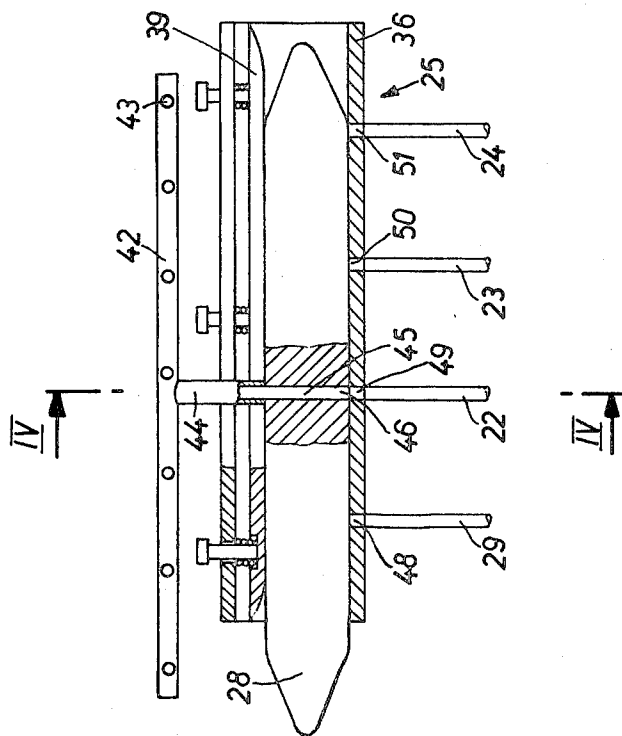


Fig. 3



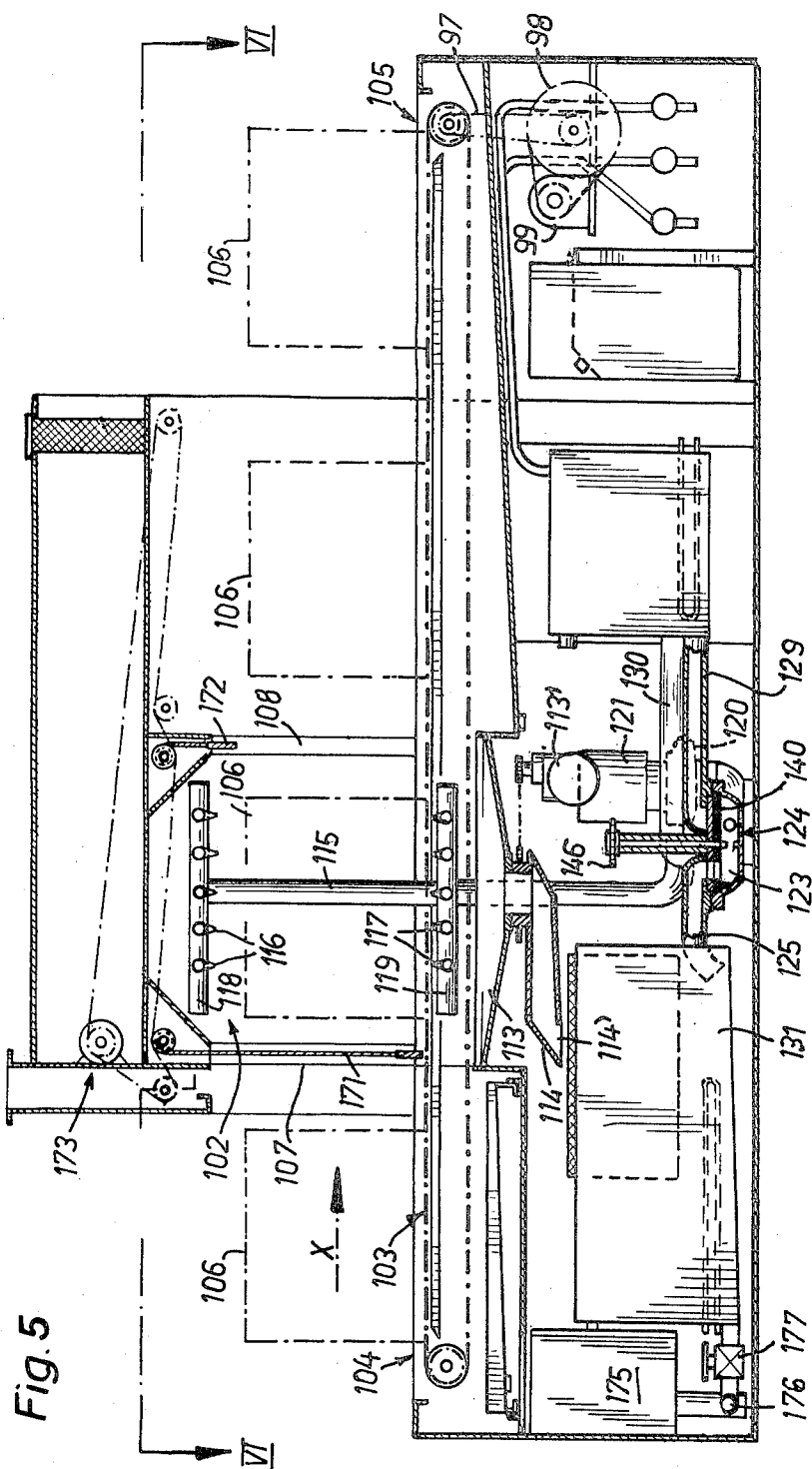


Fig. 6

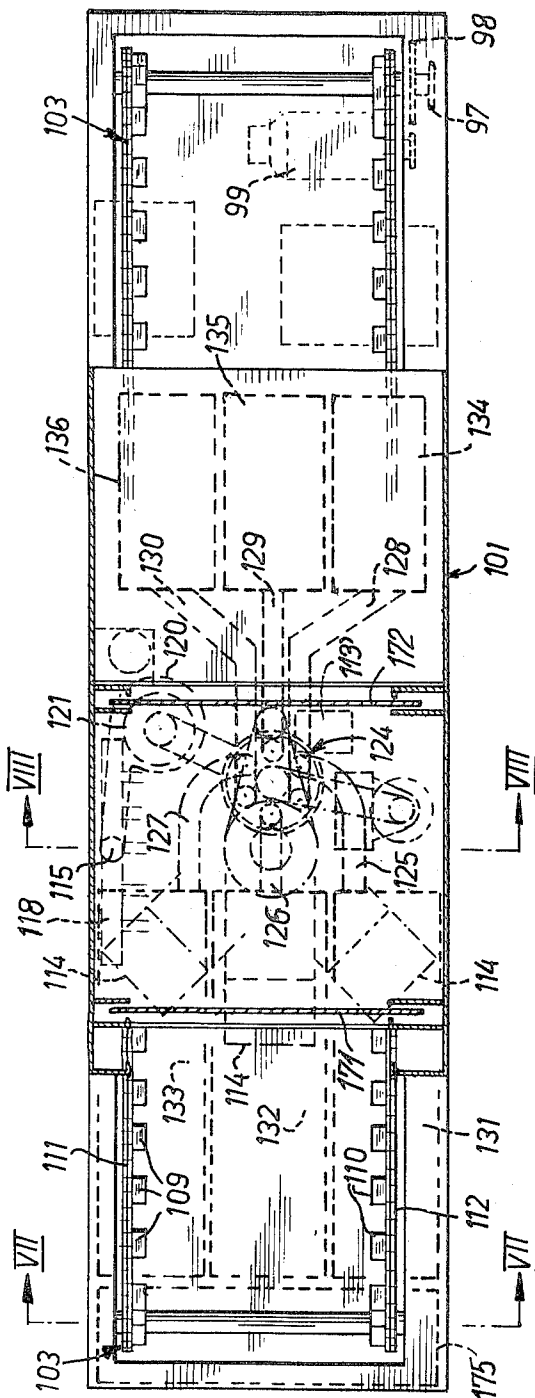


Fig. 7

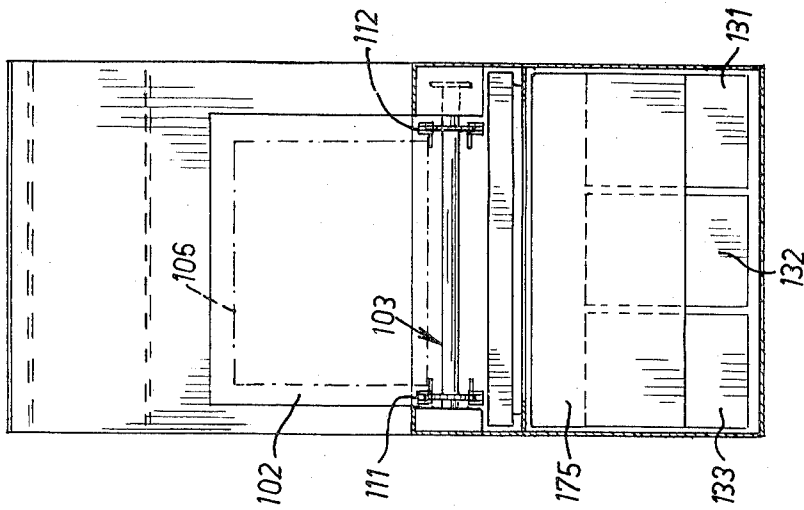


Fig. 8

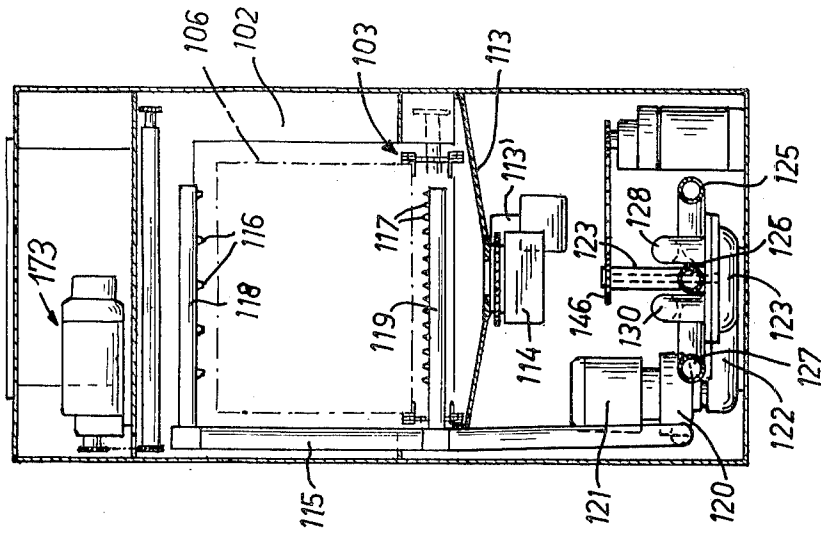


Fig. 9

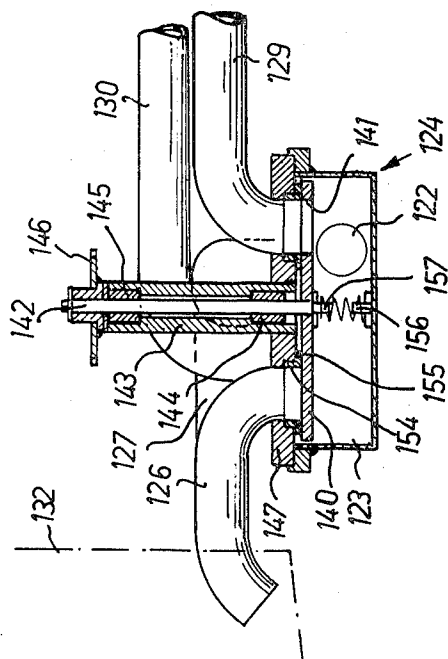
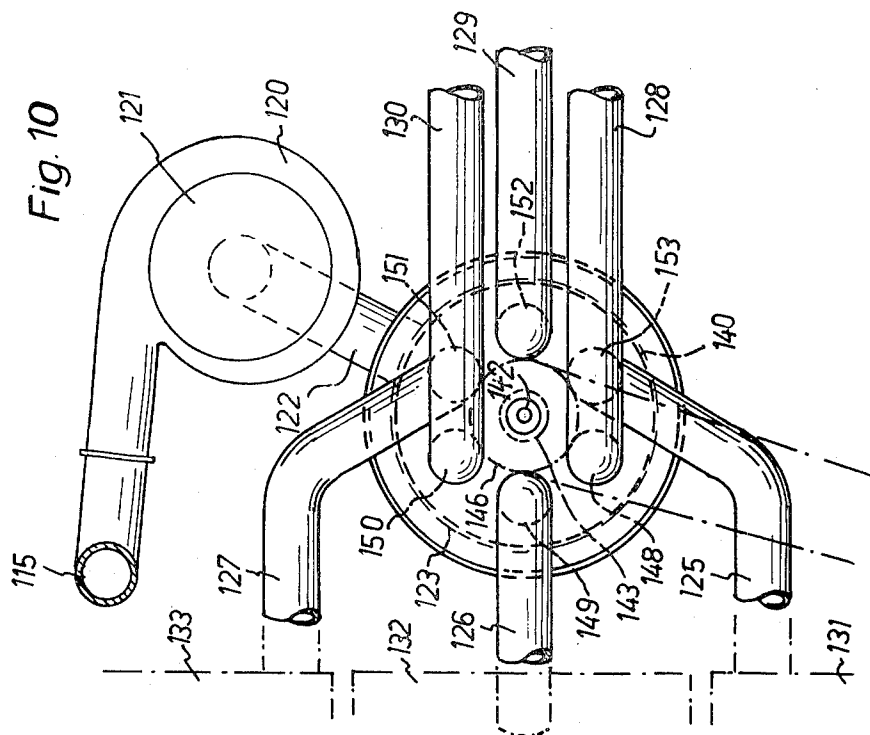


Fig. 10



APPARATUS FOR CLEANING UTENSILS OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved apparatus for cleaning articles, such as utensils or the like, especially laboratory utensils, with the aid of at least one carrier frame or rack for housing the articles which are to be cleaned, these articles are treated by different treatment liquids infed via a nozzle system. The invention also concerns a method of operating this apparatus.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide an improved construction of apparatus and method of operating the same, for the cleaning of articles, such as utensils or the like by means of which it is possible to carry out in the same treatment compartment a random number of different treatment operations.

Another object of the present invention relates to a new and improved construction of apparatus for cleaning articles, such as utensils or the like, especially laboratory utensils, in an extremely efficient, reliable and economical manner, wherein the apparatus itself is relatively simple in design, extremely reliable in operation, not readily subject to breakdown and requires a minimum of maintenance and servicing.

Now in order to implement these and still further objects of the invention which will become more readily apparent as the description proceeds, the aforementioned nozzle system can be successively connected in flow communication with a number of separate conduits for the infeed of the different treatment liquids.

It is a further object of this invention to prevent mixing of the different treatment liquids, such as the washing and flushing liquids.

To this end the apparatus of this development preferably incorporates at least one container for a treatment liquid, such as the washing or flushing liquid, and furthermore a collecting basin or vessel for receiving the treatment liquid present in the treatment compartment, and the outlet or drain of which can be selectively connected in flow communication with one of the containers for the treatment liquid, such as the washing liquid or the flushing liquid.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 illustrates in longitudinal sectional view a first embodiment of apparatus designed according to the teachings of this invention;

FIG. 2 is a perspective view of the coupling mechanism for the apparatus of FIG. 1, also depicting a carrier frame or rack for the articles to be cleaned;

FIG. 3 illustrates in side view and partially in longitudinal sectional view the coupling mechanism depicted in FIG. 2;

FIG. 4 is a cross-sectional view of the coupling mechanism, taken substantially along the line IV—IV of FIG. 3;

FIG. 5 depicts in longitudinal sectional view a modified form of apparatus for cleaning utensils or the like;

FIG. 6 is a cross-sectional view of the apparatus construction of FIG. 5, taken substantially along the line VI—VI thereof;

FIG. 7 is a cross-sectional view of the apparatus depicted in FIG. 6, taken substantially along the line VII—VII thereof;

FIG. 8 is a cross-sectional view of the apparatus depicted in FIG. 6, taken substantially along the line VIII—VIII thereof;

FIG. 9 is an enlarged fragmentary sectional view, similar to FIG. 5, through a multipath valve as same is employed with the apparatus constructions of this development; and

FIG. 10 is a plan view of the fragmentary sectional view depicted in FIG. 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, the exemplary embodiment of cleaning apparatus depicted in FIG. 1 will be understood to comprise a housing 1, at the upper region of which there is located a cleaning compartment or chamber 2. An endless conveyor band 3 or other suitable transport mechanism extends through the cleaning compartment 2. This conveyor band 3 can be appropriately driven by any suitable and therefore not particularly illustrated drive mechanism, such as a drive motor driving one of the conveyor wheels 3a. The conveyor band 3 extends forwardly and rearwardly past the cleaning compartment 2, and therefore forms a deposit or loading station 4 and a removal or withdrawal station 5. The treated articles of materials, for instance laboratory utensils, are housed at carrier frames or racks. In FIG. 1 these carrier frames or racks 26 have been indicated in phantom lines.

The cleaning compartment 2 possesses at the region of the path of travel of the conveyor band 3 an inlet or infeed opening 6 and an outlet or departure opening 7 for the treated articles and is closed at its bottom by a collecting basin or receptacle 8. At both sides of the collecting basin 8 there bounds a respective container 9 and 10 for a respective treatment liquid. An additional container 11 is located adjacent the container 10. This additional container 11 serves to handle a further treatment liquid. The container 9 which bounds at one side of the collecting basin 8 serves to receive a washing liquid and the container 10 bounding at the other side of the collecting basin 8 serves to receive a flushing liquid. The further container 11 serves for receiving demineralized water.

An infeed conduit or line 30 opens into the container 11 for the infeed of such demineralized water. The water infeed is controlled by a float 31 or equivalent structure.

At the lower region of the collecting basin 8 there is arranged a multipath slide valve arrangement 32 with which there are coupled three conductors or lines 33, 34 and 35. This multipath valve arrangement or mechanism 32 can selectively assume a closed position or can flow communicate the collecting basin 8 with any one of the three lines or conduits 33, 34 and 35. As a result,

the collecting basin 8 can be connected in flow communication via the conduit 33 with the outflow or drain collecting line or conduit 15, or via the conduit 34 opening into the container 9 with the interior of such container 9, or via the conduit 35 opening into the container 10 with the interior of such container 10.

Each container 9, 10 and 11 is connected via its own outflow or drain line 12, 13 and 14 respectively, with the drain collecting conduit 15 which removes the treatment liquids out of the cleaning apparatus. For controlling the flow through the outflow or drain lines each drain line or conduit 12, 13 and 14 is equipped with a control valve 16, 17 and 18 respectively. At the region of the floor of each container 9, 10 and 11 there is located a pump 19, 20 and 21 respectively. At the pressure side of each pump 19, 20 and 21 there is connected a pressure line or conduit 22, 23 and 24 respectively, through which there can be delivered into the cleaning compartment 2 the treatment liquid which is momentarily located in each respective container 9, 10 and 11. The pressure conduits or lines 22, 23 and 24 terminate at a component or portion 25 of a coupling mechanism 27, this component 25 being fixed to the housing, and thus will be referred to as the stationary housing fixed component or portion 25. The coupling mechanism 27 is composed of the stationary housing fixed portion 25 and a movable coupling portion or component 28 which is fixedly connected with a carrier frame or rack 26 for the articles to be handled.

The stationary housing fixed coupling portion 25 of the coupling mechanism 27 is located in the cleaning compartment 2, therefore is arranged at the central region of the path which is traversed by the conveyor band 3 within such compartment and somewhat beneath the transport or conveying run 3b of such conveyor band 3. In addition to the already mentioned three pressure conduits or lines 22, 23 and 24 there also merges with the stationary housing fixed portion or component 25 of the coupling mechanism 27 a pressure line or conduit 29 for fresh water in order to be able to carry out a pre-flushing operation. All of the four pressure conduits or lines 22, 23, 24 and 29, viewed in the throughpassage direction of the transport or conveyor band 3, open in a row, at a spacing behind one another, into the stationary housing fixed portion 25.

On the basis of the showing of FIGS. 2 to 4 inclusive there now will be described in greater detail the coupling mechanism 27. The stationary housing fixed coupling portion 25 possesses a horizontally extending rail 36 which, in cross-section, has the configuration of a sharp cornered C, as shown, wherein the longitudinal or elongate slot or opening 37 of the rail 36 is located at the top. Internally of the rail 36 there are located contact or pressure ledges 39 beneath legs 38 bounding the longitudinally extending slot 37. These contact or pressure ledges 39 are mounted to be vertically displaceable at the legs 38 by means of attachment or fixing pins 40 and can be urged away from the legs 38 by the action of springs 41.

Each carrier frame or rack 26 for the articles to be treated possesses a movable coupling portion 28 which cooperates with the stationary housing fixed coupling portion 25. The movable coupling portion 28 is located at the lower region of the associated carrier frame or rack 26. As best seen by referring to FIG. 2 the rack or frame fixed movable coupling portion 28 is in the form

of an elongate body member having a substantially rectangular cross-sectional configuration.

The carrier frame or rack 26 furthermore possesses a conduit system essentially consisting of a collecting pipe or conduit 42 at which merge nozzle conduits or nozzles 43 and from which conduit 42 there vertically downwardly extends an infeed conduit or pipe 44. The infeed conduit 44 is fixedly inserted or seated at the coupling portion 28 and communicates with an aligned throughpassage or opening 45 which extends vertically through coupling portion 28 and forms at the under or lower side of the coupling portion 28 an inlet opening 46 for the treatment liquids.

In the showing of FIGS. 3 and 4 the rack or frame fixed movable coupling portion 28 has been depicted introduced into the housing fixed coupling portion 25 and both coupling portions are in operable engagement with one another. The coupling portion 28 possesses such a cross-sectional configuration that it can be introduced into the interior of the rail 36 of the stationary housing fixed coupling portion or component 25 and displaceably guided therein. The spring loaded ledges or rails 39 thereby push the frame fixed coupling portion 28 against the floor 47 of the rail 36.

As best seen by referring to FIG. 3, the ends of the pressure lines or pipes 29, 22, 23 and 24 are inserted into the floor of the stationary housing fixed coupling portion 25 and open into outlet or outflow openings 48, 49, 50 and 51 respectively, formed at the aforementioned floor, and with each of which outlets there can be brought into alignment the inlet 46 to the conduit system of the relevant carrier frame or rack. Viewed in the direction of movement of the carrier frame or rack 26 the sequence of the outlets connected with the pressure lines 29, 22, 23 and 24 is such that following the outlet 48 for the fresh water for the pre-flushing operation, there is located the outlet 49 for the washing liquid, and following such the outlet 50 for the flushing liquid, and following the latter the outlet 51 for the demineralized water for the post-flushing operation.

At the upper region of the cleaning compartment 2 there are located housing fixed nozzle tubes 52 with downwardly directed nozzles 52a. In each case a number of tubes 52 are connected in flow communication with one of the pressure conduits or lines 29, 22, 23 and 24.

The mode of operation of the described cleaning apparatus is as follows:

The articles to be cleaned, for instance laboratory utensils, such as glasses and Petri dishes, are appropriately inserted into or onto a carrier frame or rack 26, preferably in such a manner that the nozzles of the nozzle tubes 52 spray into the interior of the utensils and the rack 26 is placed upon the conveyor band 3 at the loading or deposit station 4. The conveyor band 3 stepwise transfers the rack or carrier frame 26 into the cleaning compartment 2 to assume the position A indicated with phantom lines in FIG. 7. In so doing, the rack fixed coupling portion 28 is introduced into the stationary housing fixed coupling portion 25 and is located in a first locking or engaged position in which the inlet 46 of the conduit system 42, 43, 44 of the rack 26 is in alignment with the outlet 48 of the fresh water pressure conduit 29. There is then opened the fresh water source and fresh water flows through the conduit 29 and the coupling mechanism 27 into the nozzle conduits or nozzles 43 of the rack and into the nozzle tubes

52 operatively associated with the conduit 29 and out of each of such nozzles in the direction of the articles to be cleaned. The water which flows-off into the collecting basin 8 is conducted to the drain collecting line or conduit 15 through the agency of the multipath valve mechanism 32 and the withdrawal or drain conduit 33. After a predetermined period of time has elapsed the infeed of fresh water is interrupted, and the conveyor band 3 further indexes or advances by one step the rack 26 into the position indicated by reference character B where the frame fixed coupling portion 28 assumes the position depicted in FIG. 3.

The pump 19 is placed into operation and the multipath valve mechanism 32 is reversed in order to free the flow path from the collecting basin 8 via the conduit 34 into the container 9 in which there is located the washing liquid. Now the washing liquid is conveyed in a circulatory fashion through the conduit 22 into the nozzle tubes or nozzles 43 of the conduit system of the rack and into a number of the nozzle tubes 52 and emanates from the nozzles thereof in the direction of the articles to be cleaned and is sprayed thereagainst.

After a predetermined period of time has expired the pump 19 is shut-off. The frame or rack 26 is displaced into the position indicated by reference character C, in which the frame fixed coupling portion 28 is located with its inlet 46 above the outlet 50 of the pressure conduit 23. The multipath valve mechanism 32 is again switched or reversed in order to free the flow path from the collecting basin 8 via the conduit 35 into the container 10, and now the pump 20 is switched-on. The flushing liquid located in container 10 is then conveyed in a circulatory fashion through the conduit or line 23 into the nozzle tube 43 of the rack 26 and into a number of nozzle tubes 52 and sprayed from these nozzles against the articles. After a predetermined period of time has again elapsed the pump 20 is shut-off. The carrier frame or rack 26 is now displaced into the position indicated by reference character D, in which the frame fixed coupling portion 28 is located by means of its inlet 46 over the outlet 51 of the pressure conduit 24. Now, the pump is switched-on. The multipath valve mechanism 32 remains in its set position.

The post-flushing liquid located in the container 11 and consisting of demineralized water is then sprayed in a pulse-like manner through the conduit or line 24 in the same manner as above described against the articles. The infeed of water to the container 11 occurs via the inflow conduit 30 and is controlled by the float 31. The water flowing down out of the cleaning compartment 2 flows from the collecting basin 8 into the container 10.

After the expiration of a further period of time the pump 21 is placed out of operation, the multipath valve mechanism 32 is switched into its starting position and the rack 26 is stepwise advanced towards the removal station 5, where the rack is loaded-off the conveyor band 3.

In the meantime a further rack or carrier frame 26 has been stepwise advanced into the cleaning compartment 2 and the described operations begin anew.

During operation the non-utilized outlets of the pressure conduits or lines 29, 22, 23 and 24 are always covered by the frame fixed coupling portion or component 28.

The cleaning apparatus depicted in FIGS. 5 and 10 inclusive possesses a housing 200, at the upper region

of which there is located a cleaning compartment or chamber 102. Extending through the lower end of the cleaning compartment 102 is an endless conveyor band 103 or equivalent structure which is driven through the agency of a drive mechanism having a drive motor 99 and a belt or chain drive 98 via a belt or chain 97. The conveyor band 103 extends at both ends past the cleaning compartment 102 and therefore, similar to the embodiment previously discussed, forms at one end a loading or infeed station 104 and at the other end a removal or load-off station 105 for the carrier frames or racks 106 in which there can be housed the articles or utensils to be cleaned. The rack 106 can be conveyed via an inlet opening 107 into the confines of the cleaning compartment 102 and can be again removed therefrom through the agency of an outlet or exit opening 108. In so doing, the rack 106 bears upon straps or brackets 109, 110 which extend towards one another and transversely with respect to the conveying direction of the articles. These brackets 109 and 110 are arranged at parallel bracket or strap bands 111 and 112 respectively, which form the conveyor band 103, as best seen by referring to FIG. 6.

The cleaning compartment 102 is closed at the lower end by a collecting basin or receptacle 113, at the lowermost end of which there is located an outflow or withdrawal channel 114 which can be pivoted or rocked by means of a transmission motor 113', the withdrawal channel 114 being pivotable into three positions about a vertical axis or shaft, again as best seen by referring to FIG. 6.

The cleaning compartment 102 possesses a nozzle system which is mounted to be stationary therein, this nozzle system encompassing a vertical infeed conduit 115 (FIGS. 5 and 8) extending laterally of the cleaning compartment and at the top and bottom the respective horizontally extending conduit arrangements 118 and 119 equipped with nozzles 116 and 117 respectively. A pump 120 is operatively connected with the infeed conduit or line 115. Pump 120 can be driven by a drive motor 121. The suction side of this pump flow communicates via a channel 122 (FIG. 10) with an outlet compartment or space 123 of a multipath valve arrangement constructed as a plate valve and generally designated in FIG. 5 by reference character 124. The plate valve 124 has been shown in detail in FIGS. 9 and 10 and will be described with greater particularity in conjunction with these Figures. The plate valve 124, depending upon its setting or position, flow communicates the infeed line or conduit 115 with one of six conduits 125, 126, 127, 128, 129 and 130 (FIGS. 9 and 10), which lead to the containers for the different cleaning liquids, namely to the three circulating containers 131, 132 and 133 for the pre-washing liquid, washing liquid and flushing liquid respectively, as well as to three fresh water containers 134, 135 and 136, and which can be selectively heated or not heated.

The plate valve 124 depicted in detail in FIGS. 9 and 10 will be seen to encompass a valve plate 140 having an eccentric valve opening or throughpassage 141 with a diameter essentially corresponding to the diameter of the conduits 125 to 130. This valve plate 140 is centrally seated upon a shaft 142 which is rotatably mounted via the bearings 144, 145 in a housing fixed tube 143 and can be driven by means of a spur gear 146 from a non-illustrated indexing or stepping drive.

The housing fixed conduit or tube 143 carries at its lower end a plate-shaped valve seat 147. Valve seat 147 is equipped with circular or round throughpassage openings 148 to 153 which are arranged at a uniform peripheral spacing about the housing fixed tube 143. Into these throughpassage openings 148 to 153 there open the outlet ends of the conduits 125 to 130. The valve throughpassage 141 in the valve plate 140 possesses approximately the same diameter as the openings 148 to 153 in the valve seat 147 and is also arranged like such along the same circle. Sealing rings 154 formed of tetrafluoroethylene, briefly known in the art as "TEFLON" rings, are inserted into the openings 148 to 153 from the side confronting the valve plate, and such rings engage by means of their collars 155 over the edge of the associated openings. The arrangement of the valve plate 140, shaft 142 and spur gear 146 is biased against the collars 155 of the "TEFLON" rings 154 by means of a compression or pressure spring 156 which is supported at the underside of the housing and guided upon guide bolts 157. The pre-bias of the spring 156 is calculated such and the mutually sliding surfaces of the "TEFLON" rings 154 and the valve plate 140 are machined or worked such that there is attained a sliding seal between the valve plate and the "TEFLON" rings.

As a result, there is realized that in each instance liquid can only arrive from one of the conduits 125 to 130 at the outlet compartment 123 of the valve when the relevant conduit at least is partially overlapped by the valve throughpassage or through-flow opening 141 in the valve plate 140.

Now a drying compartment or chamber 160 is arranged in the conveying direction of the conveyor band 103 (arrow X of FIG. 5) behind or downstream of the cleaning compartment 102.

Further components of the apparatus will be considered in conjunction with the following description of the mode of operation of the equipment.

Initially a rack or carrier frame 106 which is filled with the articles or utensils to be cleaned is introduced via the inlet or infeed opening 107 into the cleaning compartment 102. Both the inlet opening 107 as well as also the outlet or exit opening 108 are subsequently automatically closed by an automatically operating closure mechanism, for instance roller curtains 171 and 172 respectively, which are actuated via a drive mechanism 173.

The cleaning operations occur in succession in the following manner:

From one of the containers, for instance the pre-washing container 131 there is sucked-up by means of the pump 120 and via the conduit 125 pre-washing liquid and such is delivered via the infeed conduit 115 to the nozzles 116, 117 in the cleaning compartment 102, which then spray the pre-washing liquid against the articles or utensils to be cleaned. The pre-washing liquid is recirculated via the collecting basin 113 and the pivotal withdrawal or drain channel 114 arranged therebelow back into the pre-washing container 131. Owing to this circulatory flow the cleaning process can be maintained for a random long period of time without having to introduce further liquid. After a pre-programmed period of time has elapsed, the pump 120 is switched-off and therefore this phase of the cleaning is likewise terminated. After appropriately switching or reversing the plate valve 124 a fresh water container is connected

in flow communication with the valve outlet compartment 123.

The pump 120 now sucks-up fresh water which, in the manner heretofore described, is sprayed upon the utensils. The withdrawal or drain channel 114 assumes the same position as during pre-washing, so that the fresh water flows back into the prewashing container 131 and regenerates the pre-washing water. From the pre-washing container 131 the excess water flows into an overflow tank 175 (FIG. 5) from which location it can flow-off via an outlet or drain 176. The pre-washing container 131 is in flow communication with the drain 176 via a normally closed drain or outflow valve 177. After the post-flushing operation the plate valve 124 is switched such that it provides a connection of the inflow conduit 115 with the washing container 132. The outflow channel 114 is shifted or rocked over the washing container 132.

There now occurs the actual washing operation in which water is sprayed from the heated washing container 132 upon the articles to be cleaned and again caught in the washing container. Into the washing container 132 there is automatically infed or dosed a washing agent or detergent. The valve throughflow or throughpassage opening 141 of the plate valve 124 is switched so it is now in flow connection with one of the heated fresh water containers wherein, however, the outflow channel 114 remains in position over the washing container 132. There is now undertaken a hot or warm post-flushing operation and the outflowing post-flushing water is conducted back into the washing container 132.

Thereafter, the plate valve 124 is rocked or pivoted in such a manner that it provides flow communication of the flushing container 133 with the infeed conduit 115, wherein also the outflow or drain channel is rocked into position over the flushing container. Thereafter, there is again undertaken a hot or warm post-flushing operation, similar to that which follows the washing operation, by again switching the plate valve 124.

Following the described treatment operations and after automatically raising the roller curtain 172 the rack 106 is transferred from the cleaning compartment 102 into the drying compartment or chamber 160.

After completion of the drying operation the rack is conveyed out of the drying compartment 160 to the removal or unloading station 105 where the finished flushed and dried articles are removed from the rack.

In the meantime a further rack which has been filled with the articles to be cleaned has been introduced into the cleaning compartment or chamber 102 and at the same time as there occurs the drying operation there also occurs again the described pre-washing-, washing- and flushing operations.

Instead of using only one cleaning compartment it would also be possible to provide a number of tandemly arranged cleaning compartments with a nozzle system.

Furthermore, the plate valve could be replaced by a valve set or group of valves, wherein each container would have associated therewith one valve or valve arrangement which is located at the relevant infeed of a container to the pump.

With the described exemplary embodiments there are under-taken three treatment steps, namely pre-

washing-, washing- and flushing as a function of the number of containers. However, it would also be readily possible to provide a larger or small number of containers and accordingly to carry out a greater number or lesser number of treatment steps.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims. ACCORD-
INGLY,

What is claimed is:

1. An apparatus for cleaning articles, such as utensils or the like, especially laboratory utensils, said apparatus comprising:

at least one rack for receiving articles to be cleaned,

a nozzle system for delivering different treatment liquids for the treatment of the articles,

separate conduits for the infeed of the different treatment liquids, said separate conduits having respective outlets,

means for successively connecting said nozzle system with said separate conduits,

wherein said nozzle system comprises a conduit system arranged at the rack and spray nozzles supplied by said conduit system,

means defining a cleaning compartment,

a conveyor mechanism for stepwise moving the rack through the cleaning compartment, and

an inlet for said conduit system arranged at the rack such that during the conveying movement of the rack said inlet is successively connected in flow communication with respective outlets of the sepa-

rate conduits,

wherein the outlets of the separate conduits, viewed in the direction of movement of the conveyor mechanism, are arranged in a row behind one another at a first stationary coupling portion, and the inlet for the conduit system is arranged at a second coupling portion fixedly mounted at an associated movable rack such that said second coupling portion is capable of being brought into operable engagement with the first coupling portion and is displaceable relative thereto in order to successively flow communicate the inlet with one of the outlets at the first coupling portion.

2. The apparatus as defined in claim 1, wherein the first coupling portion is located in a path of movement of the second coupling portion and in the engaged position the second coupling portion is displaceably held at the first coupling portion.

3. The apparatus as defined in claim 1, wherein outlets which are momentarily not connected in flow communication with the inlet are directly covered by the second coupling portion.

4. The apparatus as defined in claim 1, further including:

means defining a treatment compartment for the articles,

a collecting basin for receiving treatment liquid from the treatment compartment, said collecting basin having a discharge, and

connecting means for selectively connecting the discharge of the collecting basin with one of a plurality of containers, each container being provided for accommodating a respective treatment liquid.

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