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J. N. ALLENSWORTH
WASHING LIQUID AND DRYING AIR HEATING
MEANS FOR DISHWASHERS

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3 Sheets-Sheet 1

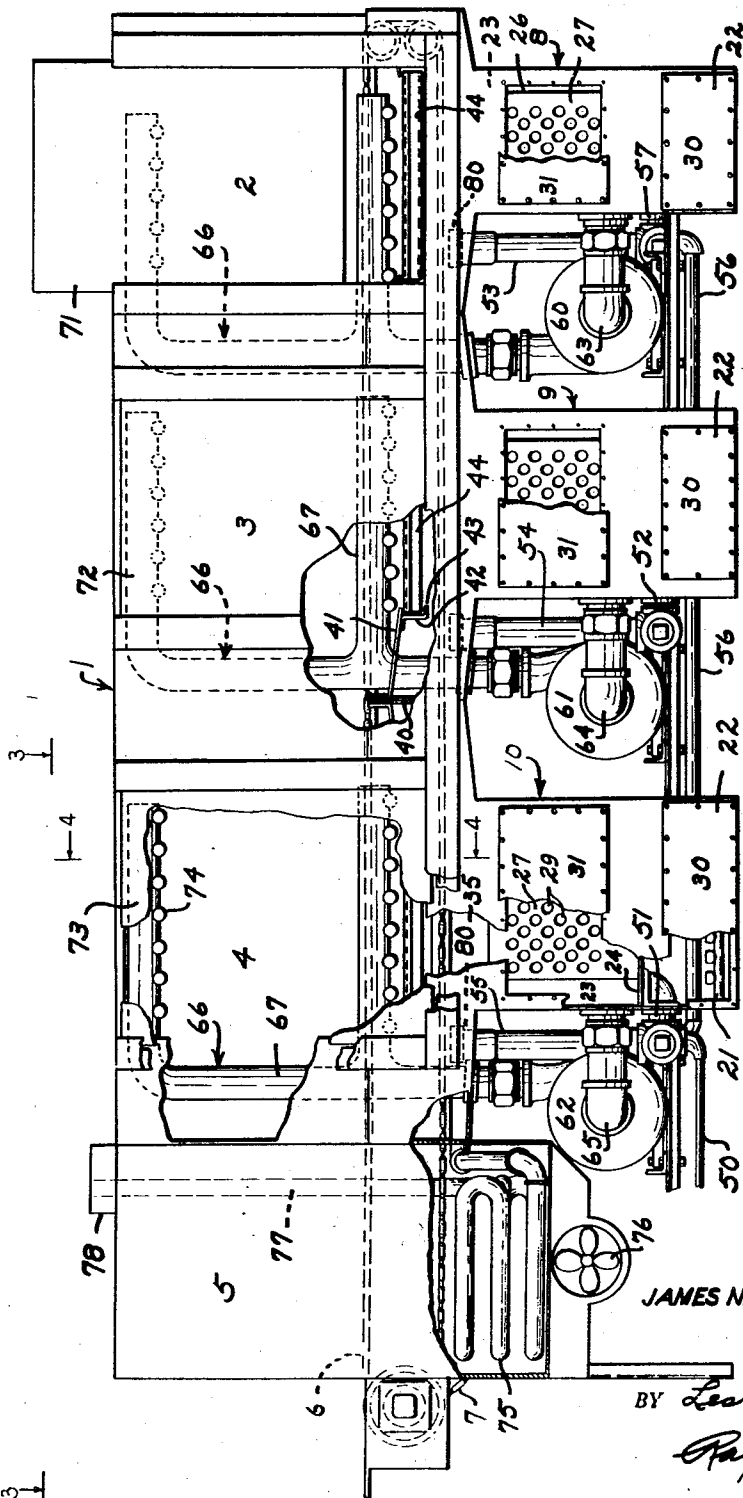


Fig 1

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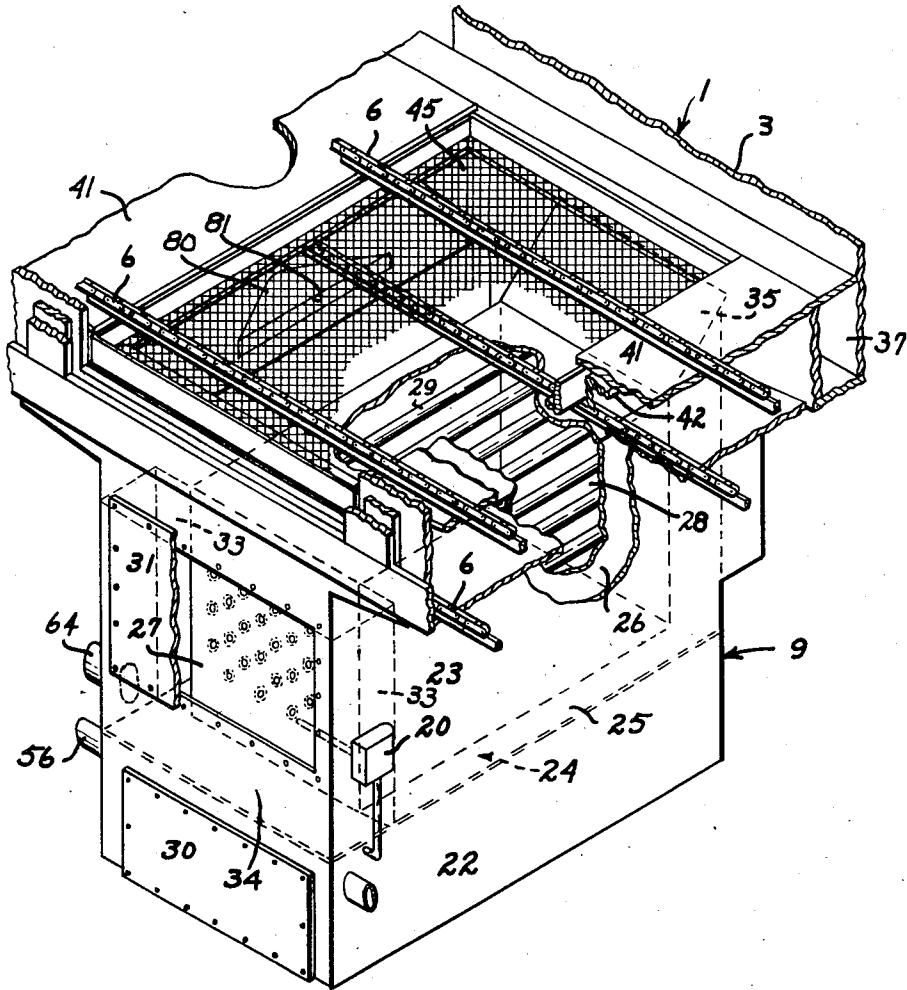


Fig 2

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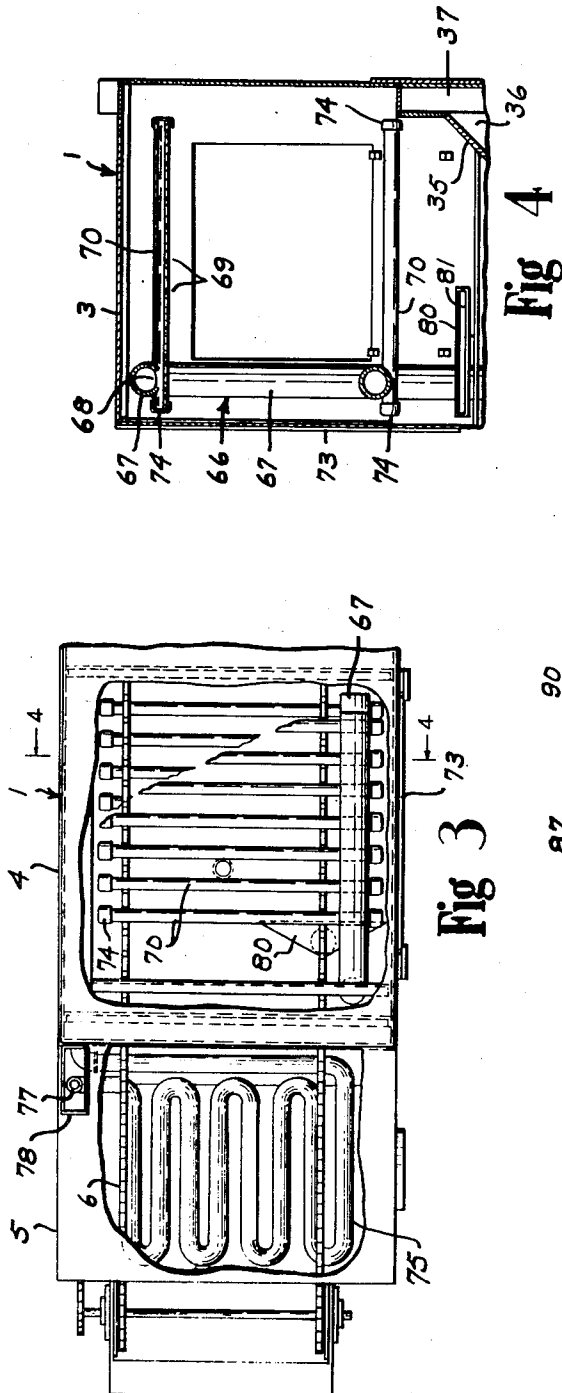
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UNITED STATES PATENT OFFICE

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WASHING LIQUID AND DRYING AIR-HEATING MEANS FOR DISHWASHERS

James N. Allensworth, Houston, Tex.

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4 Claims. (Cl. 134—60)

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This invention relates to machines for washing, drying and sterilizing dishes and like articles, and relates more particularly to a machine of the class described having a plurality of sections which are so constructed and arranged that the machine is extremely efficient in effecting desired results.

The primary object of the invention is therefore to provide a self-contained machine of the class described that is especially effective in cleaning and sterilizing the articles passing therethrough.

Another object is to provide a machine that is capable of handling a large volume of the articles to be cleaned.

Still another object is to provide a machine in which cleansing liquids are supplied successively at different temperatures to the articles, the temperatures being such as to most effectively contribute to the ultimate desired result.

A still further object is to provide a machine having successive sections in which operations such as pre-rinsing, washing, and sterilizing are carried out amid optimum conditions, and whereby effective cleansing and sterilization of the articles are brought about.

The invention also comprehends the use of individual heating units, and control means therefor, for the cleansing and sterilizing liquids to provide the desired temperature conditions.

Still another and more specific object is to provide for the conduction of the sterilizing liquid to the pre-rinse section so that residual heat of the sterilizing liquid is utilized, and the amount of additional heat required for pre-rinsing purposes is minimized.

A still further object of the invention is the utilization of waste heat from the heating units to effect drying of the cleansed articles, and at the same time to contribute to the sterilization of the articles.

Still another object is to provide for drying action, just indicated, by utilizing a heat exchanger in a manner that heated air, and not the products of combustion, will be utilized to effect the drying.

The invention also comprehends the provision of means for exhausting moisture laden air from within the device whereby none of such air is admitted to the room within which the device is used.

The foregoing objects are primary objects which, together with other objects and advantages of the invention, will be more fully apparent from the following description considered in con-

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nection with the accompanying drawings in which:

Fig. 1 is a side elevational view of one embodiment of the invention, portions thereof being cut away to show structural details of the device;

Fig. 2 is an isometric view partly in section of one of the sections or units of the machine;

Fig. 3 is a plan view partly in section taken on line 3—3 in Fig. 1;

Fig. 4 is a vertical sectional view taken on line 4—4 in Figs. 1 and 3;

Fig. 5 is a vertical sectional view showing an alternate construction providing a single combustion coil for heating the cleansing liquid in two of the sections or units of the device.

The embodiment shown in the drawings includes a casing 1 within which are sections 2, 3, 4 and 5 for respectively pre-rinsing, washing, sterilizing and drying of articles passing through the machine. The articles to be cleaned are propelled through the device as by means of conveyor chains 6 driven by the drive chain 7 from a suitable source of power (not shown).

Sections 2, 3 and 4 include combination tank and heater units 8, 9 and 10 respectively, and such units contain quantities of the cleansing liquor or liquids used and are operable, as will be further detailed, to maintain these liquids at the desired temperatures. For example, it is intended that the pre-rinse liquid in the unit 8 shall be maintained at a temperature of approximately 125° F. to 140° F. This range of temperatures is such that, in the case of washing dishes the primary use of the invention, food particles and substantially all of the grease are removed in this section, and yet the temperature is not sufficiently high to fix the food particles upon the articles being cleansed. In order to maintain the desired temperature there is provided a thermostatic control shown at 20 (Fig. 2), for controlling the rate of supply of fuel to the burner 21 (Fig. 1) in the burner or combustion chamber 22 at the bottom of the respective units.

It is intended that the tank of the unit 9, section 3, shall contain a suitable detergent and the liquid in such tank shall be maintained within a temperature range of approximately 135° F. to 150° F. and that the sterilizing liquid in unit 10, section 4, shall be maintained within a temperature range of 180° F. to boiling so that effective sterilization of the articles is had.

As best seen in Fig. 2, an important feature of the invention resides in the tank and heating units 8, 9 and 10, and the structure for their cooperation with the remainder of the device,

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unit 9 being shown in this figure although it is to be understood that the units are identical except as indicated otherwise herein.

Referring specifically to the disclosure of the figure, the unit is divided into upper and lower chambers 23 and 22 respectively by the horizontal partition shown at 24. This partition comprises a peripheral portion 25 secured to the side walls of the unit, and a central inverted box-like structure 26 opening downwardly and forming a part of the chamber 22. The ends 27 and 28 of the structure 26 are spaced from the end walls of the unit and comprise headers for a plurality of water tubes 29 through which heat is imparted from the gases of combustion in the chamber 22 to the liquid within the water tubes 29 and the tank or chamber 23. It is to be noted that the front header 27 also extends sidewardly to the side walls at 33 and that the top of the structure 26 extends forwardly and sidewardly as shown at 34 to form a chamber at the forward end of the unit 9 so that liquid withdrawn through conduit 64, as will be more fully described, must pass through the water tubes whereby heat is imparted to the liquid.

The chambers 22 and 23 are provided with removable plates 30 and 31 at their forward ends to provide access to these chambers for such repair or cleansing as may be necessary.

As best seen in Fig. 4 the top of the structure 26 terminates at the rear of the unit in an upwardly extending portion 35 to provide a passage 36 for flue gases which enter the vent or flue 37 at the rear of the machine for conduction therefrom in a manner that will be more fully described.

Referring again to Fig. 1, it is to be noted that the upper side portion of the respective units 8, 9 and 10 form a baffle 40 to which inclined aprons 41 are attached. These aprons extend sidewardly and downwardly from the respective baffles and terminate at their ends in depending flanged members 42 which provide a supporting ledge 43 for the tray 44 having a screen bottom 45 (Fig. 2) which serves to collect particles that would otherwise fall into the cleansing liquid within the tank beneath.

Liquid is supplied to the machine from a single source or inlet pipe shown at 50 whence it is conducted through pipes 51 and 52 to the tanks of units 9 and 10 respectively. The tanks of the units 8, 9 and 10 have overflow pipes 53, 54 and 55 respectively. The pipe 54 of unit 9 is connected directly to a discharge drain in a well known manner. The overflow pipe 55 in the sterilizing unit 10, however, communicates with the conduit 56 which terminates at 57 in the bottom of the tank of the pre-rinse unit 8. In this manner sterilizing liquid in the unit 10, being relatively clean and having lost some of its heat, is conducted to the pre-rinse section 8 where little if any additional heat is necessary to maintain the proper pre-rinse temperature conditions. The overflow pipe 53 of the unit 9 is also connected to the discharge drain and hence all cleansing liquid to be discharged from the machine is conducted through the overflow pipes 53 and 54.

The circulation of the liquids in the sections 2, 3 and 4 is produced by pumps 60, 61 and 62 driven by suitable motors (not shown). The inlets 63, 64 and 65 to these pumps are connected with the respective tanks at their forward ends whereby the inlet fluid passes through water tubes 29 preliminary to its conduction to the

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pump outlets which respectively communicate with the spray heads 66 comprising U-shaped manifolds 67 at one side of the spray chambers.

The spray terminals in each section comprise tubes 70 that are integrally attached to and communicate with the interior of the manifolds 67 as seen at 68 in Fig. 4. These tubes extend transversely of the spray chambers in parallel relation and have suitable openings 69 therein so that the pumped cleansing liquid in each section is sprayed from both above and below into the area through which the articles pass under propulsion of the conveyor chains 6.

Attention is also directed to the fact that the doors 71, 72 and 73 for the sections 2, 3 and 4, are movable vertically to open position, and that the caps 74 closing the ends of the spray tubes 70 are then readily accessible for removal so that, when necessary, a cleansing tool may be passed through these tubes to effect cleaning thereof.

Opening of any of the doors 71, 72 and 73 likewise makes accessible the tray 44 so that any material accumulated thereon can be removed.

As already indicated, the products of combustion surrounding the water tubes 29 in the respective units 8, 9 and 10 are conducted rearwardly to the flue or vent passage 37 at the back of the machine. It is desired to use the residual heat in these gaseous products for drying and effecting a further sterilizing action upon the cleansed articles, and yet to avoid actual contact of such gases with the articles. To this end the vent 37 communicates with a heat exchanger comprising the coil 75 in the section 5. This coil is sinuous in form to provide adequate surface for heat exchange so that air admitted by the fan 76 to the interior of the drying section is first heated and then moves upwardly about the articles as they move to the left (Fig. 1) under the influence of the conveyor chains 6. It is to be understood that the heat exchanger may be of any suitable form so long as it provides for adequate transfer of heat from the heated gases to the air that is introduced to and moves upwardly within the drying chamber 5.

The exhaust end 77 of the heat exchange coil 75 extends upwardly and terminates within the flue 78 which is of sufficient size to also serve for removing moisture laden air from within the drying chamber 5. It is intended that natural or forced draft exhaust from the flue 78 shall be sufficient that there is a slight suction from within the machine, and in this manner no moisture laden air from within the machine or combustion products from the burner chambers 22 is permitted to enter the room in which the machine is being used.

The overflow pipe in each of the units 8, 9 and 10 is provided with a head 80 having a horizontally disposed entrance 81 so that any material which rises to the surface of the liquid in the tank chamber tends to enter the head and to be removed from the tank.

In the operation of the machine as above described, and by way of further description thereof, it is pointed out that water is admitted through the inlet pipe 50 and distributed through pipes 51 and 52 to the tanks of units 10 and 9 respectively. The rate of admission of water, or other cleansing fluid, is desirably controlled that proper cleansing and sterilization of articles passing through the machine are effected at all times. The liquid level in the respective tanks is maintained constant as determined by the overflow

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heads 80, the rinse water of unit 10 overflowing into the unit 8 whereby the desired quantity of liquid is maintained within the latter. The thermostatic control for the respective units controls the rate of combustion at the burners 21 whereby the cleansing and sterilizing liquids are maintained at desired temperatures. A suitable cleansing agent or agents such as soap and the like may be added from time to time to the liquid within any of the tanks. In the preferred use of the invention, however, it is contemplated that a detergent shall be added only to the liquid within the unit 9.

As water is controllably admitted to the respective tanks, the heating thereof is effected by combustion within the chambers 22, the products of combustion first passing about the tubes 29 and thence to the vent or flue passage 37. The heat conducted through the walls of the tubes 29 is instrumental in maintaining the desired temperature of the liquid within the respective tanks. The pumps 60, 61 and 62 are placed in operation whereby cleansing fluid is sprayed in the respective sections both upwardly and downwardly from the lower and upper groups of spray terminals or tubes 70. At the same time articles to be cleansed are moved successively through the pre-rinsing, washing, sterilizing and drying sections 2 to 5 inclusive so that such articles emerge from the section 5 in a sterile and dry condition.

When cleansing articles in which temperature differentials between succeeding cleaning operations are unnecessary, the structure shown in Fig. 5 may be used. In this construction containers 85 and 86 communicate with two of the tanks of the units 8, 9 and 10. A combustion coil 87 has portions extending into each of these tanks. At the inlet end 88 to this coil there is provided a mixer 89 so that a combustible mixture is admitted to, and is burned within the coil. The outlet 90 of the coil may terminate in the vent 37 or may be directly connected to the heat exchanger 75. In such manner there is a coordination of elements so that desired and intended results are accomplished.

It is emphasized that the invention comprehends a unitary structure in which all necessary operations are performed to clean and sterilize the articles passing therethrough. While specific details and temperatures have been set forth, such details are presented by way of illustration and not as limitations as the invention broadly comprehends a machine for washing, drying and sterilizing articles in a continuous process, cleansing fluids being supplied in successive stages, that clean and sterile articles are withdrawn therefrom.

The invention claimed is:

1. In a machine for cleaning dishes and like articles, the combination of successive cleaning sections in which the articles to be washed are treated with cleansing liquids, each of said sections including a liquid container and heating means therefor, whereby required temperatures for the respective cleansing liquids are maintained, a heat exchanger, means for conducting heated gases of combustion from at least some of the heating means to said heat exchanger, additional means for conducting air over said heat exchanger and supplying such air to the articles

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leaving said cleansing divisions, and flue means for conducting the products of combustion from the heat exchanger, said last mentioned means being constructed and arranged to also withdraw air from within said sections.

2. In a machine for cleaning dishes and like articles, the combination of pre-rinsing, washing and sterilizing sections having aligned chambers through which the articles pass, each of said sections including a liquid container below the chamber thereof, a fluid inlet and an overflow for each of said containers, means for admitting fresh liquid to the container of each of the washing and sterilizing sections, means to project the liquid onto the articles in each respective section and a conduit interconnecting the overflow of the sterilizing section to the inlet of the pre-rinse section.

3. In a machine for cleaning dishes and like articles, the combination of pre-rinsing, washing and sterilizing sections having aligned chambers through which the articles pass, each of said sections including a liquid container below the chamber thereof, a fluid inlet and an overflow for each of said containers, means for admitting fresh liquid to the container of each of the washing and sterilizing sections, a conduit interconnecting the overflow of the sterilizing section to the inlet of the pre-rinsing section, and additional means for maintaining the cleansing liquid in each container within a predetermined limit of temperatures.

4. In a device of the class described, a plurality of aligned cleaning sections in which articles to be cleaned are treated with cleansing liquids, each of said sections including a liquid container, a heating chamber communicating with each of said containers and combustion means extending into at least two of said heating chambers to impart heat to the liquid in the containers communicating therewith, said combustion means comprising a conduit for heated gases of combustion and passing sealably through the walls of the heating chambers.

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