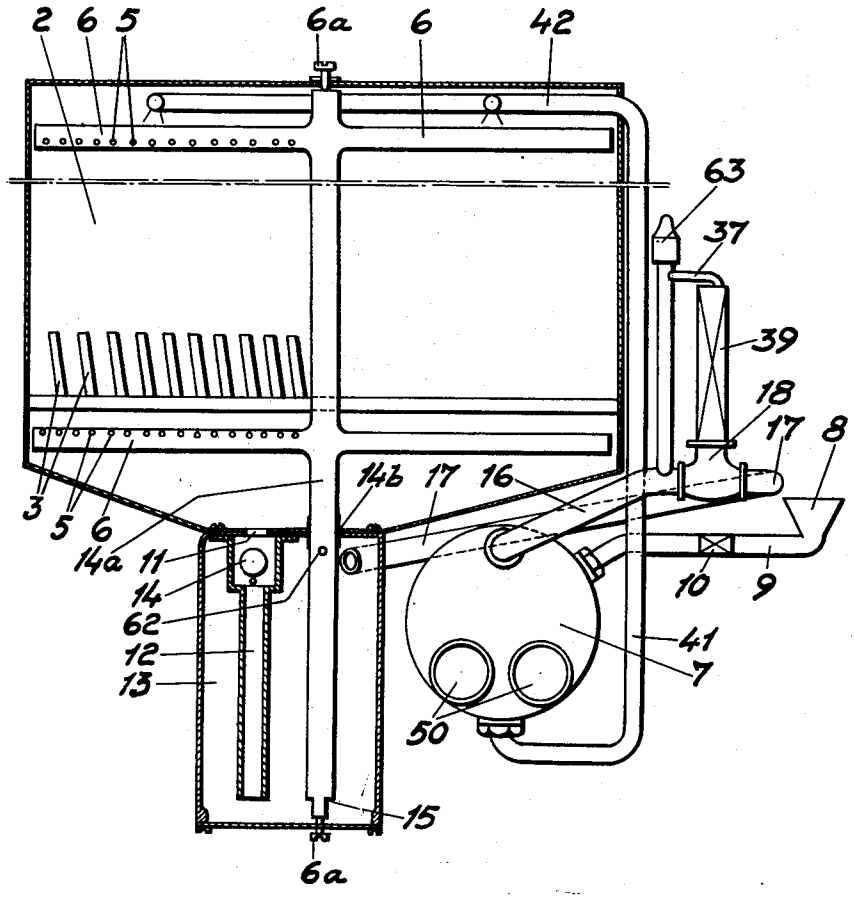
Nov. 18, 1952 H. E. S. HIORT AF ORNÄS 2,618,281

DISHWASHING DEVICE OPERABLE BY VARIABLE PRESSURE STEAM

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Fig. 1.



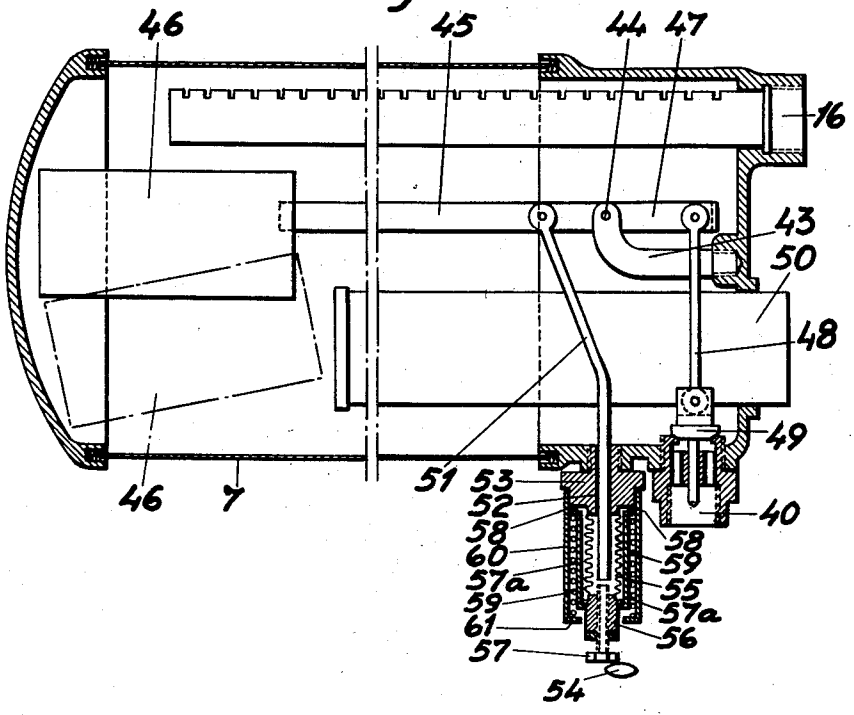
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Fig. 2.



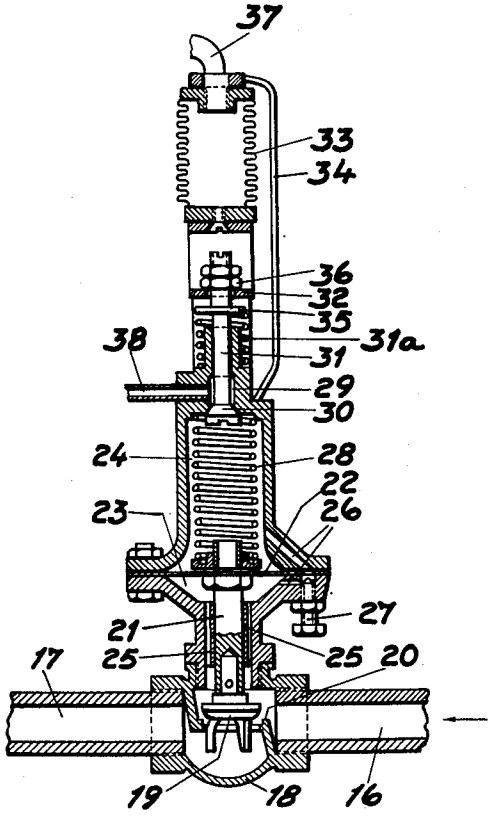
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Fig. 3.



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DISHWASHING DEVICE OPERABLE BY VARIABLE PRESSURE STEAM

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3 Claims. (Cl. 134—57)

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The present invention relates to a dish washer with a steam generator connected therewith, the said steam generator causing the washing liquid to repeatedly sprinkle dishes in a washing chamber.

The invention is substantially characterised by the fact that means have been provided to regulate the washing processes by variations in the steam pressure of the steam generator.

The washing processes are preferably regulated by means of a valve, which is adapted to be opened at a certain steam pressure and be closed at a lower steam pressure, whereby the action of the steam upon the washing liquid is regulated.

According to the invention the steam is also used to successively heat the washing liquid.

A suitable embodiment of the valve consists of a valve body, a valve head carried by a stem, the free end of the said valve stem being fixed to a diaphragm, piston, bellows or the like, which is preferably located at right angles to the stem and which divides a room into two separate chambers, which through ducts or openings are actuated by the steam pressure so that, when the pressure in the chamber which is remote from the valve head, is caused to quickly drop, the pressure in the nearest chamber presses the diaphragm with the valve head away from the seat of the valve head so that the valve is opened, but when the pressure is caused to rise in the remote chamber, the valve head is caused to successively move towards the seat, close it and rest thereon.

This valve is further provided with bellows or the like, one end of which is fixed and the other is displaceable. The said bellows communicate with the steam space of the steam generator and the movable end of the bellows is adapted to actuate a valve controlling an exhaust opening in the remote chamber so that, when the bellows have expanded a certain distance at a certain pressure, the valve opens the exhaust opening, but when the bellows have contracted a certain distance at reduced pressure, the control valve closes the exhaust opening.

According to the invention the steam space of the steam generator is, via the valve, in connection with a pressure device, preferably in the form of a pressure chamber for the washing liquid so that the steam pressure can directly or indirectly press the said liquid through pipe lines to the washing chamber.

Further, the water space of the steam generator is connected with the washing chamber by means of pipe lines, a valve being adapted,

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when the water has reached a certain low level in the generator, to lead the water of the steam generator through the said pipe lines to the washing chamber. This valve is connected with a float or the like which is provided in the water space of the generator and which opens the valve at a certain low water level in the generator.

An embodiment of the dish washer according to the invention is illustrated in the accompanying drawings.

Figure 1 is a vertical section of the washing chamber and of the pressure chamber but with the associated parts in side elevation. Figure 2 is a vertical section of the generator on a larger scale. Figure 3 is a vertical section of the valve device, also on a larger scale.

As shown in the drawings, 2 designates the washing chamber and 3 supports for the dishes. The sprinkling device consists of turnably mounted pipes 6 which are provided with apertures 5 and made to rotate due to the liquid pressure.

7 designates a steam generator, which is filled with water through a funnel 8. The pipe line 9 extending from the funnel to the steam generator is adapted to be shut by means of a cock 10. Washing liquid is fed into the apparatus through a front opening (not shown) in the washing chamber, from where the liquid flows down to a pressure chamber 13 through an opening 11 and a pipe 12. The opening 11 is controlled by a ball valve 14, which may be lighter than the washing liquid and which is pressed against the edges of the opening by the washing liquid and by the steam pressure. The pipe 12 opens into the lower part of the pressure chamber. The pipes 6, which are arranged as arms extending from a turnably mounted pipe or shaft 14a located centrally in the washing chamber, are placed in the upper and lower part of the washing chamber. At the lower end of the pipe 14a there are inlets 15 for the washing liquid and in the roof of the pressure chamber there is a packing box 14b.

The steam space of the steam generator 7 can be put in connection with the pressure chamber 13 by means of a pipe line 16 and a pipe line 17 which extend from the pressure chamber. These pipe lines are connected with a valve casing 18, containing a valve head 19 and a seat 20. The valve head is guided by a stem 21 which is slidable in the valve casing. The free end of the stem 21 is fixed to a diaphragm 22, which preferably is arranged at right angles to the stem and divides a casing into two separate chambers 23

and 24. Of these chambers the one 23 located next to the valve casing 18 communicates with the valve casing and with the steam space of the generator by means of ducts 25. Also the other chamber 24 communicates with the steam space of the generator but via the chamber 23 through a duct 26 in the wall of the casing. The duct 26 is provided with a throttling device 27. The displacement of the stem 21 takes place against the action of a spring 28 in the chamber 24. In the wall of the chamber 24 there is an exhaust opening 29 which is controlled by a valve 30. This valve is guided by a stem 31 which is slidable in a U-shaped holder 32 fixed to bellows 33, the other end of which is fixed to a support 34 secured to the chamber 24 so that a rigid system is obtained. The stem 31 is provided with two stops 35 and 36 which are adjustable on the stem 31. The reference numeral 31*a* designates a spring which is provided on the stem 31 between the stop 35 and the chamber 24 and which tends to close the valve 30. The bellows communicate by means of a pipe 37 with the steam space of the generator, the said pipe being connected to the pipe 16.

The exhaust opening 29 can communicate with the washing chamber through a pipe 38 or with the atmosphere. This whole valve device is designated by 39 in Figure 1.

The generator 7 shown in Figure 2 is provided with an outlet 16 from the steam space to the valve casing 18 and with an outlet 40 from the water space of the generator, the said water space thus communicating through a pipe line 41 with a pipe 42 which is located in the upper part of the washing chamber and has downwardly directed perforations. A double armed lever is turnably mounted by a pivot 44 on a bracket 43 in the generator. One arm 45 of the lever carries a float 46. A link 48, which controls the outlet 40 by means of a valve 49, is fixed to the other arm 47 of the lever. Electric heating elements located in tubes are diagrammatically designated by 50. A link 51 is movably fixed to the lever arm 45. The said link can through an opening 52 in a piece 53, provided in the wall of the generator, actuate a mercury switch 54 of known construction. Bellows 55 are fluid-tightly fixed around the mouth of the opening 52 in the piece 53. The other end of the said bellows is fluid-tightly fixed to a piece 56 which by means of a member 57 can actuate the mercury switch 54. In order to prevent the expansion of the bellows beyond a certain limit, a tubular holder 57*a* is fixed to the piece 56, the free ends of the said holder being provided with a stop 58 for a spring 59. A casing 60 which surrounds the bellows 55 and has an inwardly directed stop 61 for the spring 59 extends from the piece 53. The stop 57 can be screwed into the piece 56 so that its end facing the link 51 will be located at a larger or smaller distance from the link 51 whereby the switch is caused to break the current to the heating elements at a higher or lower water level in the generator 63 is a safety valve.

The operation of the dish washer described is as follows:

Water is fed into the generator 7 to the desired height and the washing liquid is fed into the pressure chamber 13. When the float 46 is raised by the water, also the link 51 will be raised so that the mercury switch actuated by the link closes the current to the heating elements. When steam is begun to be generated in the generator the said steam is led through the pipe line 16 to the valve casing 18, and to the valve 19 which is kept closed due to the spring pressure of the spring 28. Steam is led through the ducts 25 to the chamber 23 and also through the duct 26 to the chamber 24, consequently both chambers will be under the same pressure. Steam also passes through the pipe line 37 to the bellows 33, which at rising steam pressure is extended, the U-shaped holder 32 moving in relation to the stem 31 until it meets the stop 35. The holder now moves, against the action of the spring 31*a*, the stem 31 with the head 30 downwards so that the exhaust opening 29 is set free, whereby steam in the chamber 24 rushes out through the pipe 38, preferably into the washing chamber, and the pressure drops in the chamber 24 because the steam supply to same is restricted by means of the throttling device 27. The steam pressure in the chamber 23 now presses the diaphragm 22, which has a larger area than the valve head 19, the stem 21 and the valve head 19 upwards against the action of the spring 23 so that the steam rushes through the pipe line 17 into the pressure chamber 13. The steam pressure and the washing liquid now move the ball 14 towards the edge of the opening 11 and therefore the washing liquid is forced by the steam pressure through the openings 15 into the shaft 14*a* and through the arms 6 and out of the apertures 5 for sprinkling the dishes. The steam pressure in the generator begins to drop as soon as the valve 19 opens because of the admitted heat quantity not being sufficient to raise enough steam to maintain the pressure. When the pressure has dropped so must that the bellows 33 have contracted so far that the holder 32 by means of the stop 36 closes the valve 30, the steam pressure on the upper side of the diaphragm is again built up so that the steam pressure becomes equal on both sides thereof, whereby the valve head 19 is pressed down against the valve seat partly by the force of the spring 28 partly by the steam pressure on the valve head 19. When the valve has thus been closed, the steam ceases to press upon the washing liquid, the ball valve 14 falls down and the washing liquid flows from the washing chamber back to the pressure chamber 13. The air and steam in the pressure chamber escapes through a hole 62 in the pipe 14*a* which communicates with the apertures 5. Meanwhile the pressure again rises in the steam generator, the valve opens again and so on. The process above described continues a certain number of times, the washing liquid being successively heated by the steam until so much generator water has been boiled off that the float 46 will sink so far that the valve 49 is lifted from its seat. Due to the steam pressure the hot generator water now rushes along the pipe line 41 into the washing chamber and rinses the dishes with clear water of about 100° C. The link 51 actuates the stop 57 which actuates the mercury switch 54 so that the current to the heating elements is broken.

The used washing liquid is drawn off through a suitable cock not shown in the bottom of the pressure chamber.

The invention is not limited to the above described embodiment, but its details may be varied within the scope of the appended claims. Any heating medium can be used. Any steam-driven device can be used for pumping the washing liquid with steam pressure to the washing chamber. Any valve device which opens and closes at varying steam pressure, can be used.

Having now described my invention, what I

claim as new and desire to secure by Letters Patent is:

1. A dish washer of the type wherein a pressure device is employed for forcing the wash water over the dishes to be washed, which comprises, in combination, a washing chamber including spray pipes for supplying washing liquid to the dishes to be washed, a pressure chamber in which said washing liquid collects, a pipe line extending between a point near the bottom of said pressure chamber and said washing chamber and placing said spray pipes of said washing chambers in communication with said pressure chamber, a separate steam generator comprising a water space and a steam space, and including a direct connection from said water space of said steam generator to said washing chamber through a pipe line, valve means in said line for controlling flow therethrough, said valve means being so adapted as to open and permit flow of water from said steam generator through said pipe line directly to said washing chamber under the action of the steam pressure in said steam generator when the water in said steam generator has dropped below a predetermined level therein, thereby sprinkling said dishes in said washing chamber with said water, said dishes being rinsed thereby.

2. A dish washer as defined in claim 1, in which there is included a float controlling said last named valve means and positioned in said steam generator, said float being adapted to open said valve, whereby rinse water is forced by the

pressure of steam therein to said washing chamber when said float drops to a predetermined level as the water drops in said steam generator.

3. A dish washer as defined in claim 2, including means to which said float in said steam generator is also connected to shut off the supply of said heating medium to said steam generator when the water in said steam generator has dropped below a predetermined level.

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