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FRUIT AND VEGETABLE WASHING DEVICE WITH VERTICAL CIRCULATIVE FLOW AND BASE SUPPORT FOR SUBMERGED FAUCET CONNECTION

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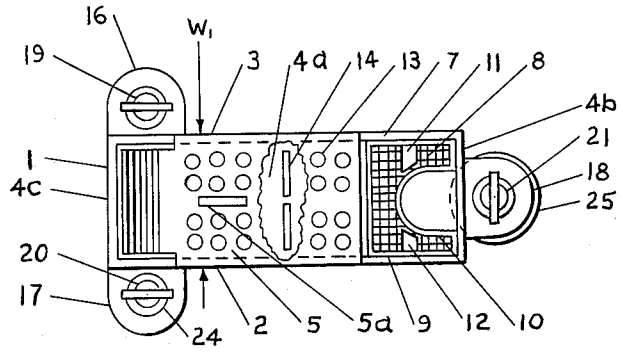

FIG 2

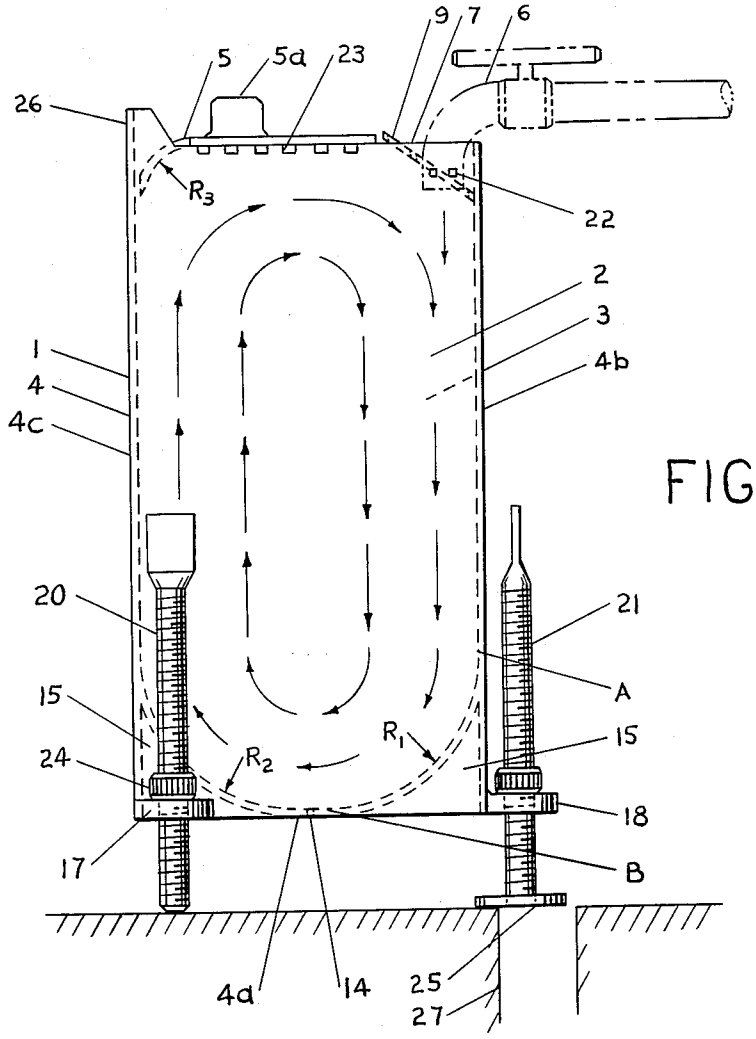

FIG 1

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3,260,510

FRUIT AND VEGETABLE WASHING DEVICE WITH VERTICAL CIRCULATIVE FLOW AND BASE SUPPORT FOR SUBMERGED FAUCET CONNECTION

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This is a continuation-in-part of application Serial No. 253,106 filed January 22, 1963, now abandoned.

The present invention relates to a washing device for fruits, vegetables, and other solid food units. The device provides for imparting to contain liquid a two dimensional circulative flow in a vertical plane. Provision is included for the circulative liquid flow to receive sufficient kinetic energy from tangential inlet liquid flow to effect continuous vertical circulative motion of the fruits and vegetables.

Objects of the invention are to provide for the thorough cleaning of all surface areas of fruits and vegetables in minimum time and without bruises or damage.

Other objects are to provide a simple cleaning device having no moving mechanical parts, and which can be used conveniently in household kitchen sinks, and which can utilize kinetic energy available from conventional household faucet water.

Other objects are to provide reduced kinetic energy losses by introducing faucet water flow directly into circulative washing water thereby allowing earier starting of circulative flow of a static food pile, larger load washing at low faucet water pressure, and larger load washing for a given size of washing device.

Another object is to eliminate the difficulty of providing an extension conduit requiring leak resistant end adapters for the faucet and washing device.

Another object is to eliminate the inconvenience of installing and disconnecting an extension conduit at each use of the device.

Another object is to provide for preventing the intake of air at openings in faucet aerators during food unit washing and preventing a corresponding loss of inlet liquid momentum and kinetic energy.

Another object is to minimize splashing of inlet water.

Another object is to prevent the wedging of circulating food units between the submerged faucet nozzle and the side walls of the device without reducing the augmentation of the inlet liquid jet by contained circulating liquid.

Another object is to provide for adaptation of the washing device to sink floors of various angles of inclination.

Another object is to provide for adaptation of the washing device to various heights of sink floor to faucet outlet combinations.

Another object is to provide a washing device of the type described but being vertically elongated and having a height greater than the length to provide optimum material utilization in a configuration adaptable to various size sink and faucet assemblies.

A number of other objects and advantages will become apparent as the description proceeds.

One form of the present invention is illustrated in the accompanying drawings wherein similar numerals refer to similar parts throughout the views.

FIGURE 1 is a side view of the fruit and vegetable washing device properly positioned beneath an open water faucet. The arrows indicate the flow path of the circulative liquid flow. The hatched base line represents the floor of a conventional household kitchen sink having a fixed distance relationship with overhead faucet **6**.

FIGURE 2 is a plan view of FIGURE 1 showing the comparatively narrow width of the washing device. The

area broken open allows a direct plan view of a portion of the bottom of the device.

The washing of fruits and vegetables in the kitchen has heretofore been accomplished in actual practice by the use of a colander, a conventional kitchen pan, or by hand rubbing under an open faucet.

The colander is a bowl shaped sieve with a base. For food washing purposes, the colander is held under an open faucet while containing a pile of food units. The bulk of the water follows the path of least resistance and flows around rather than through the pile of food units. The velocity of the water seeping between the food units is low due to resistance so that liquid scouring and dissolving action is relatively inefficient and slow. Also the food units lie static so that areas of mutual contact and areas of contact with the container receive no washing.

The conventional kitchen pan is generally used for washing by filling the bottom of the pan with food units and most of the remainder with water. The pan is then shaken by hand to simulate the action of a tumbling barrel. The cleaning action is highly erratic and inconsistent. Rinsing is only partial as the liquid is poured out. Bruises and surface damage can be done to berries and delicate skin fruits by the shifting weight of the total load.

The prior art has also provided a narrow two dimensional flow washing device of the present type. This device is described in copending application of Serial No. 445,857, effective filing date Nov. 29, 1962. Said prior device was designed to set on the floor of the sink, and an elastic liquid conduit was provided to extend from the faucet nozzle to the tangential inlet units of the device. This mode of operation is effective and generally satisfactory. However, the present configuration provides comparable performance but without the problems, inconvenience, and cost of the extension conduit and associated end connectors. The present invention improves upon the prior devices and provides advantages as set forth in the above objectives.

Referring to the several figures, washing device **1** is comprised of side walls **2** and **3** extending longitudinally and vertically and spaced apart in relative proximity. A lateral wall **4** extends between side walls **2** and **3** to provide a bottom wall *4a* and two opposite end walls *4b* and *4c*. The bottom wall *4a* and end wall *4b* are faired together by radius R_1 to provide a curved inner surface, as shown.

The inner surface of end wall *4b* extends vertically above point A, which is the point of tangency with radius R_1. Point B indicates the lower point of tangency with radius R_1. The opposite portion of lateral wall **4** is curved and faired as indicated by radius R_2. The internal surface of lateral wall **4** provides a smooth, curved perimeter flow path for contained liquid.

Lid **5** provides closure for the contained volume and is deflected downwardly at an end as indicated by radius R_3. The deflected surface contributes to establishing and maintaining a circulative flow pattern. Lid **5** includes lifting tab *5a*.

The liquid flow is introduced by faucet **6** which is positioned adjacent to end wall *4b*. This provides inlet flow which is tangential to radius R_1. This establishes circulative liquid flow. The discharge end of faucet **6** is submerged below upper perimeter **7** at the top of device **1**. The submerged inlet liquid is introduced with a relatively efficient mixing of the inlet flow and the contained circulative flow as has been demonstrated by controlled laboratory tests. The more efficient mixing pattern results in easier starting of circulative motion for a static food unit pile, and in larger load capacities as compared to performance where faucet **6** is not submerged. A con-

tributing factor to the efficiency is the augmentation of the inlet liquid jet by contained circulating liquid. A gross jet results having larger effective mass and lower velocity with reduced eddy losses and conservation of kinetic energy.

Screen **8**, FIGURE 2 is held by frame **9** and functions to prevent food units from becoming wedged between the submerged portion of faucet **6** and side walls **2** and **3** during operation. Frame **9** is bonded to the side walls and is provided with a port **10** to admit faucet **6**. Thus, contained liquid is free to flow around the submerged nozzle of faucet **6** and to be swept along for augmentation purposes in relatively continuous fluid streamlines with minimum eddy losses. Frame **9** also supports cantilevered guide vanes **11** and **12** which are normally submerged to assist in deflecting liquid flow around the turn.

Exhaust liquid flows out through numerous small ports **13** in lid **5**. A small amount of exhaust liquid and sand and grit are exhausted through auxiliary exhaust ports **14** in bottom wall *4a*. In FIGURE 2, lid **5** is shown partially broken open for a plan view of lower exhaust ports **14**.

Washing device **1** includes an extendable support portion comprising lower skirt portion **15** having support lugs **16**, **17** and **18** and threaded legs **19**, **20**, and **21**. The lugs have center holes internally threaded. The upper ends of legs **19**, **20**, and **21** are flattened for finger turning to allow height adjustment of device **1**. For operation, the washing device assembly is placed on sink floor and legs **19**, **20**, and **21** are extended until upper perimeter **7** is level and the faucet nozzle end and aerator openings **22** become lower than upper perimeter **7** and auxiliary overflow serrations **23**. The threaded legs are locked in place by finger turning grooved nuts **24** against the support lugs. Leg **21** is provided with base plate **25** to engage the edge of drain hole **27** of the sink.

Washing device **1** contains liquid vertically within a width W_1 of relatively narrow proportions as shown in FIGURE 2. This lateral confinement provides for two dimensional liquid flow in a vertical plane. The circulative flow pattern is induced by the tangential inlet jet and the curved inner surfaces of the lateral side wall, FIGURE 1. Two dimensional confinement contributes greatly to liquid flow control and reduces dissipation of kinetic energy from lateral flow and turbulence.

As stated above, the side walls **2** and **3** are in the state of being mutually near. This side wall proximity endows the washing device with a width less than the length or height of each. The device has been found to be operable using conventional household faucets and a reasonable container volume when width W_1 is about one half or less of the length or height of the device. As the width of the device is decreased with respect to the length or height, the efficiency and load capacity increase. When the width of the device is relatively large with respect to the length or height the circulative two dimensional flow pattern is not obtained, but localized random liquid agitation occurs at the region of faucet water entry. This results in erratic and negligible washing action. The specific side wall proximity required for satisfactory performance of any given installation depends upon a number of variables including the liquid mass flow rate, the height and length of the device, the internal contours of the device, the densities and dimensions of the food units to be cleaned, and the size of the wash load.

The kinetic energy of the inlet jet is conserved by the relatively large proportions of radii R_1, R_2, and R_3 and by the substantially two dimensional liquid flow pattern. The overflow liquid is of low velocity and low kinetic energy loss. Viscosity functions to maintain the entire liquid body in a state of circulative flow.

The two dimensional circulative liquid flow in a vertical plane imparts similar circulative motion to contained food units. The submerged food units are buoyed by forces equal to the weights or the displaced liquid. Consequently, only a relatively small amount of liquid drag force is required to lift a given food unit vertically against the gravity force. The drag force of a solid body in nonlaminar liquid flow is proportional to the relative velocity squared. Hence, by constructing washing device **1** as described to conserve kinetic energy and to maintain high liquid rotative velocity, the food units are forced to rise and circulate with the liquid. Food unit circulative washing has been achieved using the water jet from conventional household faucets. It was found that the food units experience local tumbling as they move in general circulative flow. This tumbling action adds to the liquid scouring effect and to the cleaning by mutual attrition between food units.

During operation of the washing device, insecticides, fungicides, and other chemicals and soil particles are progressively removed from food units by a continuously diluting liquid flow. At the conclusion of washing, when faucet **6** is closed, drainage occurs automatically through auxiliary exhaust ports **14** permitting food units conveniently to be removed from the device without liquid at spout **26**.

As stated above, the extendable support portion includes skirt portion **15**, support lugs **16**, **17**, and **18**, and threaded legs **19**, **20**, and **21**. An equivalent configuration would be a telescoping single column with a set screw for locking in a fixed position, or pivotably mounted legs with friction clamps for any semi-upright leg positions, or any number of various mechanical arrangements. These alternates reside within the scope of the present specification. The present invention broadly provides an extendable support portion to provide any desired height within limits for a washing device of the type described and for the novel purposes, advantages, and total results described.

A further important advance of the present invention is to provide in a washing device of the type described a height greater than the length for the container portion. The prior art has provided multiple configurations of washing devices of the type described and all illustrated heights less than the lengths. That is the obvious, logical construction in order to provide optimum liquid flow conditions resulting in larger wash loads, easier starting up of a static load, and operation at lower available water pressures. These advantages resulted from the efficient flow turning at larger radii and a larger flat bed of food units having a shallow depth for easier starting from a static condition. The present deviation from prior practice by providing a larger height to length ratio of the container portion is contrary to design principles and was not obvious as either feasible or desirable. However, gains to be made in reduced amount of storage space required and in more economical use of material for a given volumetric requirement are advantages of the present configuration. The vertically elongated container portion of the device has been verified as operationally practical by laboratory testing.

While one embodiment of the present invention has been illustrated it is to be understood that what is defined by Letters Patent is specified by the appended claims.

What is claimed is:

1. A washing device including two side walls extending longitudinally and vertically and spaced apart, a lateral wall extending between said side walls to provide a bottom wall and two opposite end walls and connecting with said side walls in unitary relation to provide a container cavity, and the inner surface of said bottom wall and the inner surface of at least one of said end walls substantially faired to provide a substantially curved inner surface at the region of juncture, and overflow means disposed upwardly to determine the operating liquid level in normal operation, and a wall upper edge provided at a faucet access location, said edge to under-

lie a horizontally disposed faucet in normal operation, and said overflow means and said wall upper edge at said faucet access location of substantially the same horizontal elevation to provide for a submerged faucet discharge end generally in normal operation, and a downwardly extending support portion adapted to hold said container portion in an upright position, and said support portion operatively extendable to provide variable elevation for said container portion.

2. A washing device as in claim 1, and a deflector, and at least one opening in said deflector, and said deflector positioned above said substantially curved surface, and means for supporting said deflector with respect to said device.

3. A washing device as in claim 1, and operative means for securing said vertically extendable support portion in fixed vertical position with respect to said washing device.

4. A washing device as in claim 1, and said support portion including means for leveling said device.

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