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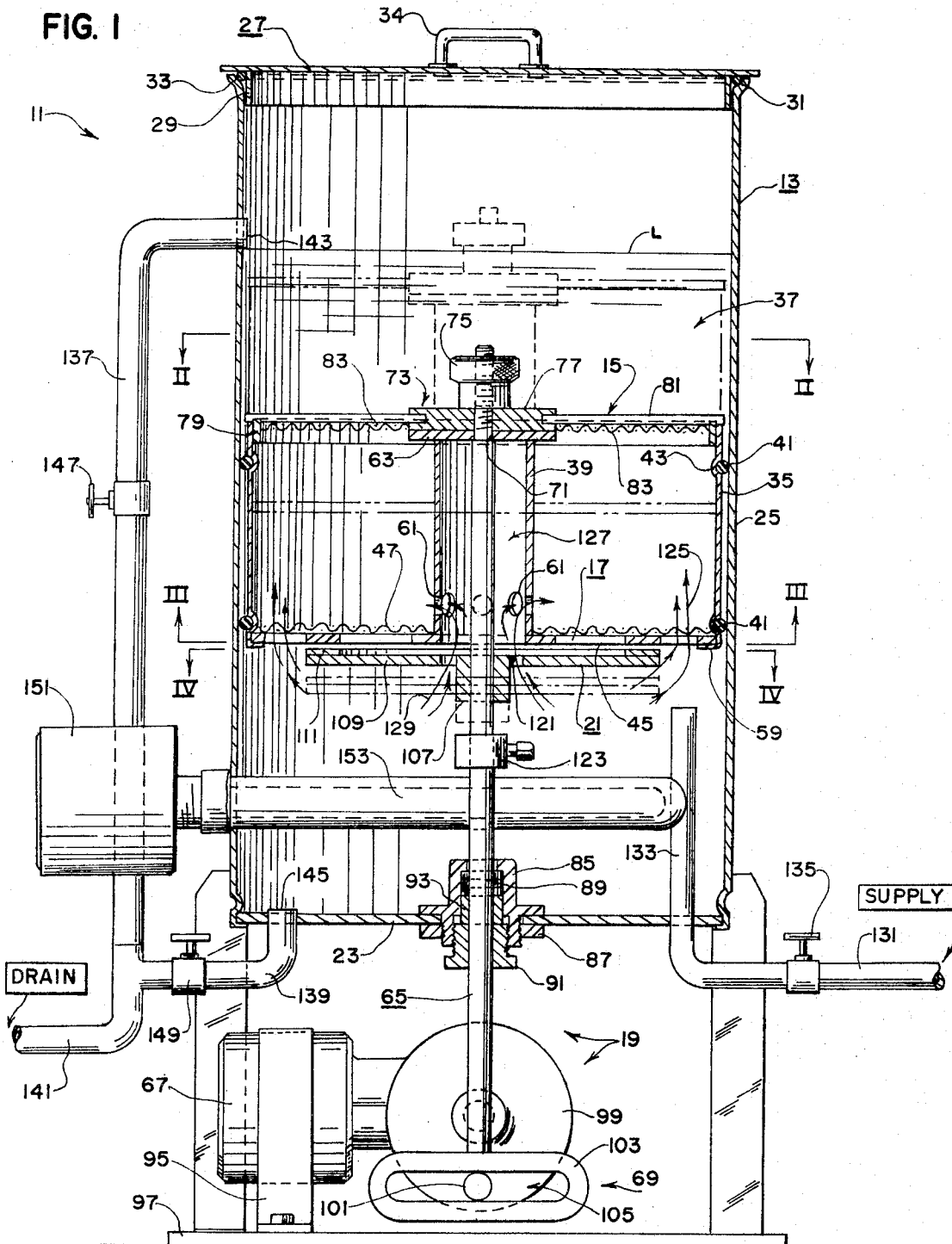
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WASHER HAVING RECIPROCATING WORK BASKET

Filed July 8, 1968

2 Sheets-Sheet 1

FIG. 1



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FIG. 2

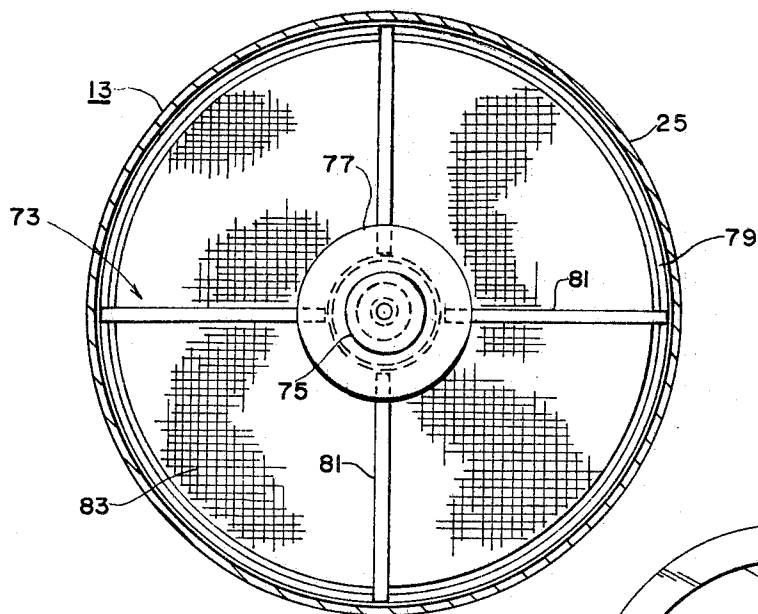


FIG. 4

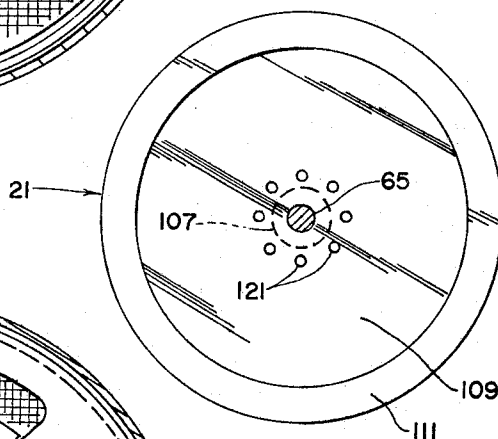
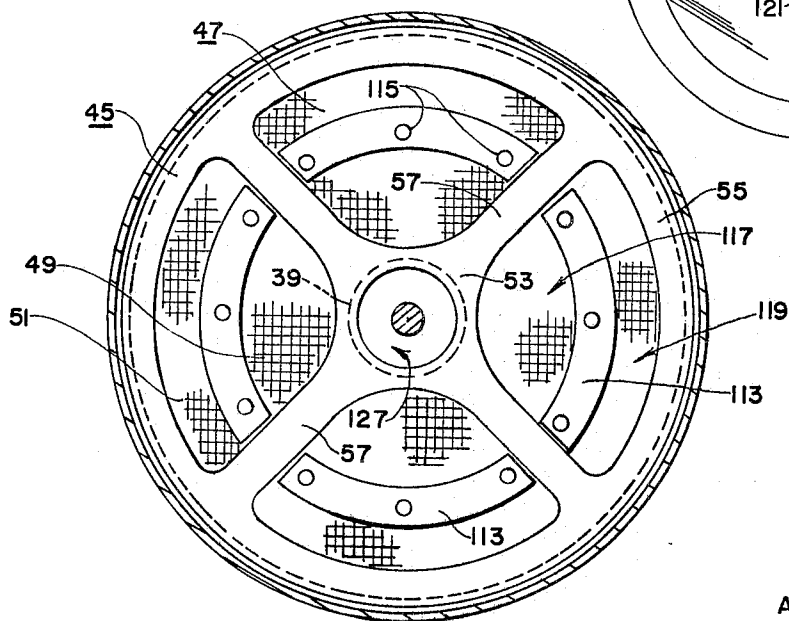


FIG. 3



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WASHER HAVING RECIPROCATING WORK
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10 Claims

ABSTRACT OF THE DISCLOSURE

A washer for ultra-clean washing small medicinal articles including a cylindrical tank adapted to contain a cleansing liquid, a basket for holding the medicinal articles and with said basket being adapted for vertical reciprocation while submerged in said tank, and including flapper disk means arranged below the screened bottom of the basket and movable to cover and uncover a major portion of the screened bottom in response to vertical up and down movement of said basket. The action of the flapper disk being adapted to cause wave-like submerged currents of water in the tank for a somewhat gentle cleaning action of the articles contained in the basket.

BACKGROUND OF THE INVENTION

Field of the invention

The invention pertains to apparatus for cleaning small articles, particularly articles used for hospital or medicinal use. The inventive structure is particularly useful for cleaning rubber stopper members used as closure members for glass vials containing sterile injection solutions.

Description of the prior art

Typically, stoppers for glass vials for medicinal purposes are shipped in plastic bags to the pharmaceutical user. Although the rubber stoppers are cleaned by the stopper manufacturer prior to shipment, the usual practice of the pharmaceutical user is to wash the stoppers again prior to sterilization and use. During shipment in the bag containers, the rubber stoppers tend to rub together and abrade small particles of loose material in the bag containers. The stoppers also hold an electro-static charge which tends to cause the loosened dirt particles to stick to the stoppers.

Medical research has discovered evidence which seems to indicate that impure injection solutions may be responsible, to a considerable extent, for unwanted so-called side effect conditions in patients being injected with solutions, particularly parenteral solutions. Research carried out fairly recently seems to indicate that such maladies as embolism and various physiological manifestations may be brought about by injected solutions which contain foreign particles. The U.S. Food and Drug Administration is very keenly interested in the clarity of such injected solutions and seeks to minimize the likelihood of particles being contained in injected solutions.

Rubber vial stoppers and other such small medicinal articles have heretofore been cleaned in devices similar to a commercial type clothes washer. Through experience, it has been found that the washing action of the typical clothes washer is rather severe and tends to further abrade small particles from the stoppers or other such items. It has been found that the loosened dirt or rubber particles tend to stick to the stoppers and are not removed in the rinsing process. Also, the large size of the typical commercial type washer often is of capacity substantially greater than necessary for washing a rather small quantity of medicinal articles.

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SUMMARY OF THE INVENTION

The washer apparatus of the present invention is designed to meet the particular problems inherent in ultra-clean washing small medicinal articles. The washer of the present invention has a rather gentle washing action which reduces the abrasive action on the medicinal articles being washed. This reduces the presence of small abraded particles in the washing liquid and there is less likelihood for small particles to adhere to the medicinal articles as they are washed. The inventive structure includes a basket having a foraminous bottom and a flapper valve arranged underneath the bottom for opening and closing portions of the bottom upon vertical reciprocation of the basket. The flapper disk in conjunction with the up and down movement of the submerged basket tends to cause gentle wave-like currents in the cleaning fluid and to provide a gentle cleaning action. The action of the device is such that the current of the fluid applied, as well as the motion of the basket, causes the articles to be gently tumbled and separated so that they are individually subjected to the wave-like currents of the cleaning fluid.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical plane sectional view of the washer apparatus of the present invention.

FIG. 2 is a horizontal plane transverse sectional view of the washer apparatus taken as on the line II—II of FIG. 1.

FIG. 3 is a horizontal plane sectional view taken as on the line III—III of FIG. 1.

FIG. 4 is a horizontal plane sectional view taken as on the line IV—IV of FIG. 1 but showing mainly the flapper disk of the inventive structure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to FIG. 1, the inventive structure includes basically a generally cylindrical tank 13; a basket 15 having an apertured bottom 17 arranged in tank 13; means 19 for vertically reciprocating basket 15; and a flapper disk 21 arranged subjacent to basket 15 for engagement and disengagement with the bottom of the basket as it is moved upwardly and downwardly in the tank. Tank 13 includes a circular bottom wall 23 and an upstanding cylindrical lateral wall 25. A lid 27 having a circumferentially extending downwardly projecting flange 29 is adapted to removably engage rim portion 31 of tank 13. A circumferential, round sectioned seal element 33 is snugly fitted around lid flange 29. A handle 34 fixed concentrically on lid 27 provides hand grip means for the manipulation of lid 27 and for covering and uncovering tank 13.

Basket 15 includes a cylindrical sleeve-like lateral wall 35 snugly but freely received in the interior of tank interior 37 and includes a vertical cylindrical core 39 arranged centrally concentrically of basket wall 35. A pair of nylon rub rings 41 are snugly fitted around the periphery of basket wall 35 and provide anti-friction means between basket 15 and tank 13. Each rub ring 41 is round sectioned and preferably formed of nylon and snugly received in a circumferential recess 43 in lateral wall 35 of basket 15.

Bottom means 17 of basket 15 preferably includes a star-shaped base 45 and an annular screen 47 arranged superjacent to base 45 (see FIG. 3). Screen 47 includes an inside annular portion 49 lying close around the lower portion of core 39, and includes an outside peripheral portion 51 engaging the lower interior of basket wall 35. Basket bottom base 45 preferably is formed of rigid sheet material, such as stainless steel, and con-

figured to include an apertured hub portion 53, a rim portion 55, and four web portions 57 interconnecting hub and rim portions 53, 55. Rim portion 55 is fixedly secured by suitable means to internal flange 59 of basket lateral wall 35. Basket core 39 is fixedly secured on and extends uprightly concentrically from basket bottom base 45 and is provided with a plurality of circumferentially spaced radially opening apertures 61 arranged in the lower portion of the core member. A basket mounting disk 63 is fixedly secured concentrically on the upper rim portion of basket core 39 and provides mounting means for the basket.

Means 19 for reciprocating basket 15 preferably includes a vertical pitman rod 65, an electric gearmotor 67 and cam means 69 interconnecting pitman rod 65 and motor 67. Pitman rod 65 projects upwardly sealingly through tank bottom 23 and the upper end thereof through aperture 71 in basket mounting disk 63. The upper terminal portion of pitman rod 65 is of a reduced diameter and extends through mounting disk aperture 71 with the disk supported on the shoulder portion of rod 65.

Basket 15 is provided with a removable basket top 73 removably secured on the basket body by a threaded nut 75. Basket top 73 includes a disk-like hub 77, a downwardly flanged rim 79 concentrically arranged around hub 77, a plurality of support rods 81 rigidly interconnecting hub and rim 77, 79 and an annular screen 83 fixedly secured by suitable means on the undersurfaces of support rods 81. Basket top 73 is adapted to be removably fitted on basket wall 35 with hub 77 removably engaging basket core mounting disk 63 in flatwise engagement. Suitable packing means sealingly interconnecting pitman rod 65 and tank bottom 23 preferably includes a downturned cuplike body 85 fixedly secured concentrically in tank bottom 23 by a nut 87, and includes annular packing elements 89 fitted in body 85 and adjustably secured by packing nut 91. A bronze bushing 93 preferably is fitted behind packing elements 89 for slidably constraining the pitman rod in the tank bottom. In some cases, it may be desirable to lengthen bushing 93 and its associated parts and omit rub rings 41 so that the bushing 93 and its associated parts alone maintain the basket 15 in correct vertical alignment as it is reciprocated upwardly and downwardly.

Gearmotor 67 is permanently secured by strap means 95 on tank base 97. Cam means 69 preferably includes a crank wheel 99 supported and driven by gearmotor 67 and an eccentric pin 101 adapted to engage a slotted camway 103 fixedly secured transversely on the lower end of rod 65. Rotative movement of crank wheel 99 and back and forth movement of pin 101 in slot 105 of camway 103 causes vertical reciprocation of rod 65 and basket 15.

Flapper disk 21 preferably includes a hub portion 107 and a flat circular body 109 integrally secured with hub 107. A flat annular sealing ring 111 is fixedly secured superjacent to the outer periphery of disk body 109. The upper surface of sealing ring 111 is adapted to abuttingly engage in face to face engagement the lower surface of basket bottom 17. The basket bottom is preferably provided with a plurality of arc-shaped seating elements 113 arranged between radially extending web portions 57. Fasteners 115 extending respectively through seating element 113 and annular screen 47 of basket bottom 17 permanently secure the elements on the basket coplanar with basket base 45 (see FIG. 3). For purposes of clarity in description, seating elements 113 will be considered as demarcating basket bottom 17 concentrically into inward and outward sections 117, 119 (see FIG. 3). In some instances, it may be desirable to omit the separate sealing ring 111 and seating elements 113 and have a metal-to-metal seal between body 109 and the bottom of basket 17, in which case a ring, not shown, is provided in place of elements 113 against which the body 109 seats and which ring is preferably integrally

formed with web portions 57 as a part of the bottom of the basket.

Flapper disk 21 is provided with a plurality of equiangularly spaced vertically extending through openings 121 arranged concentrically about and adjacent hub 107 (see FIG. 4). A stop collar 123 is fixedly secured on rod 65 subjacent to flapper disk 21, and with rod 65 provides guide means for flapper disk 21. When basket 15 is submerged in the cleaning fluid in tank 13 and is moved upwardly and downwardly in the tank the following actions take place: As basket 15 moves downwardly in tank 13, the cleaning liquid beneath the basket is substantially trapped in the lower portion of the tank and the downward movement of the basket causes the flapper disk to be held substantially stationary and the bottom of the basket is moved downwardly and into engagement with the flapper disk; the pitman rod stop collar 123 is moved downwardly away from the hub portion of flapper disk 21 and seating ring 111 sealingly engages seating elements 113 of basket bottom 17. The downward movement of the basket against the trapped cleaning liquid beneath the basket causes a portion of the cleaning liquid to move around the outer periphery of the flapper disk and through outer section 119 of basket bottom 17 (see arrows indicated 125 in FIG. 1). A portion of the cleaning liquid also is moved upwardly and into the interior of basket 15 through apertures 121 in flapper disk 21. Liquid traveling upwardly through apertures 121 pass into interior 127 of basket core 39 and outwardly through radially opening apertures 61 in the core and into the interior of basket 15 (see the flow of cleaning fluid indicated by arrows 129 in FIG. 1). The purpose of this flow indicated by arrows 129 is to cause any stoppers which might accumulate near the center of basket 15 to be moved outwardly so that they can be washed more effectively.

On the upstroke of pitman rod 65 and when basket 15 is carried upwardly, the basket moves upwardly and away from flapper disk 21 thereby uncovering inward section 117 of the basket bottom. With flapper disk 21 disengaged and separated from the screened basket bottom the cleaning fluid within the basket is free to move downwardly through both inward section 117 and outward section 119 of the basket bottom and into the lower interior of tank 13. Crank wheel 99 is driven by gearmotor 67 at a rather slow rate of speed and the up and down movement of basket 15 is such that provides gentle washing action within the basket.

The washer apparatus of the invention preferably includes means for flushing the interior of tank 13 or for simultaneously filling and draining tank 13: Cleaning fluid or water supply means includes a supply line 131 having an upturned portion 133 sealingly entering bottom 23 of tank 13. Although not shown, the cleaning liquid supply means also includes means for supplying either hot, cold or mixed water to tank 13. A hand valve 135 is interposedly fitted in supply line 131 for regulating the passage of liquid into tank 13. The drain means of tank 13 preferably includes upper and lower drain conduits 137, 139 which merge with a main drain conduit 141. Upper and lower drain conduits 137, 139 include inlet ends 143, 145 communicating respectively with the upper and lower levels of tank interior 37. Hand valves 147, 149 are fitted respectively in upper and lower conduits 137, 139. By turnably manipulating selectively control valves 147, 149 the cleaning liquid within tank 13 may be drained from the upper or lower levels of the liquid. This feature is particularly useful when foreign matter or particles of varying density or weight is in suspension in the cleaning fluid. In washing various medicinal articles it may be desirable to open one or the other or perhaps both valves 147, 149 simultaneously in draining the cleaning liquid from the tank. If desired, hand valve 147 may be omitted without departing from the spirit and scope of the present invention.

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The cleaning apparatus preferably includes thermostatically controlled heating means for heating and maintaining the cleaning liquid in tank 13 at a desired temperature: An electrically energized heater 151 having a bayonet type heating element 153 sealingly projecting into the lower interior of tank 13 preferably provides the heating means of the washer apparatus. Such heating means is well known to those working in the art and is preferably the type heating means of the preferred embodiment of the invention. It will be understood, however, that in certain applications of the invention it may be desirable to use a heating means other than that shown in this disclosure.

In operation of the apparatus of the present invention the following procedure may be carried out: (1) With tank lid 27 and basket top 73 removed, the rubber stoppers or other medicinal articles are placed within the basket and the tank and basket closures 27, 73 are fitted and secured in place; (2) Supply line valve 135 is opened and tank 13 is filled with fluid to the level indicated L in FIG. 1. The cleaning fluid in tank 13 preferably is at 180° F. Detergent, in liquid or powder form may be introduced optionally in the supply line water or directly into the tank after the tank has been filled; (3) With heater 151 operative, and the cleaning fluid within the tank maintained at a substantially constant temperature, the gearmotor is actuated and basket 15 reciprocatingly moved upwardly and downwardly; (4) the agitation and the reciprocating movement of the basket is preferably permitted for approximately 15-20 minutes; (5) Lower drain conduit hand valve 149 is opened and the wash water is drained from the tank through conduit 141; (6) Supply line conduit valve 135 is again opened and tank 13 refilled with clean fresh and preferably filtered water to the level indicated L; (7) gearmotor 67 is again energized and the basket reciprocated for five to ten minutes; (8) the basket movement is continued and the tank interior is flushed by diluting the water for approximately 30 minutes. The diluting or flushing of tank 13 may be carried out by simultaneously opening supply valve 135 and one or both drain valves 147, 149; (9) After flushing for approximately 30 minutes, the water is drained from the tank and the medicinal articles removed from the basket.

Although the present invention has been described with reference to a preferred embodiment, it will be understood that various changes and modifications in structure may be made without departing from the scope of the invention as defined in the appended claims.

I claim:

1. Washer apparatus for ultra-clean washing small medicinal articles such as rubber vial stoppers comprising a tank adapted to contain liquid; a basket having an imperforate sleeve-like lateral wall spaced inwardly from said tank and a foraminous bottom disposed in the interior of said tank; means preventing flow of liquid through the space between said wall and said tank, means for moving said basket upwardly and downwardly in said tank while said basket is submerged in the liquid; and horizontal flapper disk means supported from said basket subjacent to said basket bottom and freely movable to and from engagement and disengagement with said basket bottom, said flapper disk being of a diameter substantially less than the diameter of said foraminous basket bottom for permitting passage of the liquid upwardly around the outer periphery of said flapper disk upon downward movement of said basket, said flapper disk including structure defining a plurality of apertures passing substantially vertically through said flapper disk adjacent the central portion thereof for permitting passage of liquid upwardly therethrough, and means in said basket for directing the liquid from said apertures radially outwardly.

2. The washer apparatus of claim 1 in which said means for directing the liquid from said apertures radi-

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ally outwardly includes a hollow core arranged concentrically of said basket and having structure defining an opening opening downwardly and said core having structure defining a plurality of radially opening openings communicating the interior of said core with the interior of said basket.

3. Washer apparatus for ultra-clean washing small medicinal articles such as rubber vial stoppers comprising a tank for containing washing liquid and having a bottom wall and a generally cylindrical upstanding lateral wall; a basket generally cylindrical in form concentrically arranged in close adjacency to the interior cylindrical wall surfaces of said tank upstanding lateral wall, said basket including a substantially rigid cylindrical lateral wall, a hollow vertical core having a closed upper end and an open lower end and having radially opening apertures arranged in said core, and including web means substantially rigidly supporting said basket lateral cylindrical wall and said core, and including a foraminous annular basket bottom concentrically arranged interposedly between said core and said basket lateral wall, said annular foraminous basket bottom having an inward annular section and an outward annular section concentrically arranged; means for reciprocatingly vertically moving said basket in the interior of said tank and for up and down movement of said basket while submerged in the washing liquid contained in said tank; a flat flapper disk of a diameter appreciably smaller than the diameter of said foraminous basket bottom and of a size to substantially fully underlie said inward annular section of said basket bottom, and with said flapper disk having at least one opening passing vertically therethrough adjacent the center portion thereof; and guide means for guiding said flapper disk axially upwardly and downwardly in response to the up and down movement of said basket; said guide means supporting said flapper disk substantially concentrically of an extension of the vertical center axis of said basket for engagement with the bottom of said basket upon downward movement of said basket and disengagement from said basket bottom upon upward movement of said basket.

4. Washer apparatus as defined in claim 3 which additionally includes supply and drain means selectively operable respectively for supplying cleansing liquid to the interior of said tank and for draining said tank of the cleansing liquid.

5. The washer apparatus of claim 4 wherein said drain means includes upper and lower drain conduits for draining cleansing liquid and debris respectively from the upper surface and lower levels of the cleansing liquid contained in said tank, said upper and lower drain conduits each having an inlet end communicating respectively with the interior of said tank respectively at the upper surface of the cleansing liquid and the lower level of said tank, and including a hand valve fitted in said lower drain conduit for regulating the flow of liquid from the tank.

6. The washer apparatus of claim 2 wherein said means for reciprocatingly vertically moving said basket in the interior of said tank includes a vertical pitman rod fixed on its upper end concentrically to said basket core and extending sealingly slidingly through said tank bottom wall and including an electric gearmotor and cam means interconnecting said gearmotor and said pitman rod for changing rotary motion of said gearmotor to reciprocating motion of said rod.

7. The washer apparatus of claim 6 wherein a guide means is provided for guiding said flapper disk axially upward and downwardly, said guide means including structure in the center portion of said disk defining an aperture and with said flapper disk being guidingly constrained with said pitman rod being received in said flapper disk aperture; there being relative free movement between said rod and said disk; said basket bottom being engageable and disengageable with said flapper disk upon vertical reciprocation of said basket.

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8. The washer apparatus of claim 7 which additionally includes stop collar means fixed on said pitman rod subjacently of said flapper disk and at a spaced position from said disk when said disk is in engagement with the bottom of said basket.

9. The apparatus of claim 8 which includes heating means and thermostat means for heating and maintaining the cleansing liquid in said tank at a certain temperature.

10. The washer apparatus of claim 1 which additionally includes upper and lower drain conduits for draining contaminants respectively from the upper surface and lower level of the cleansing liquid contained in said tank, said upper and lower drain conduits each having an inlet end communicating respectively with the interior of said tank respectively at the upper surface of the cleansing liquid and the lower level of said tank.

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DANIEL BLUM, Primary Examiner

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68—156; 134—140, 154, 155