

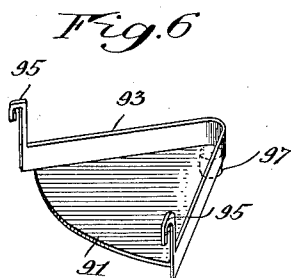
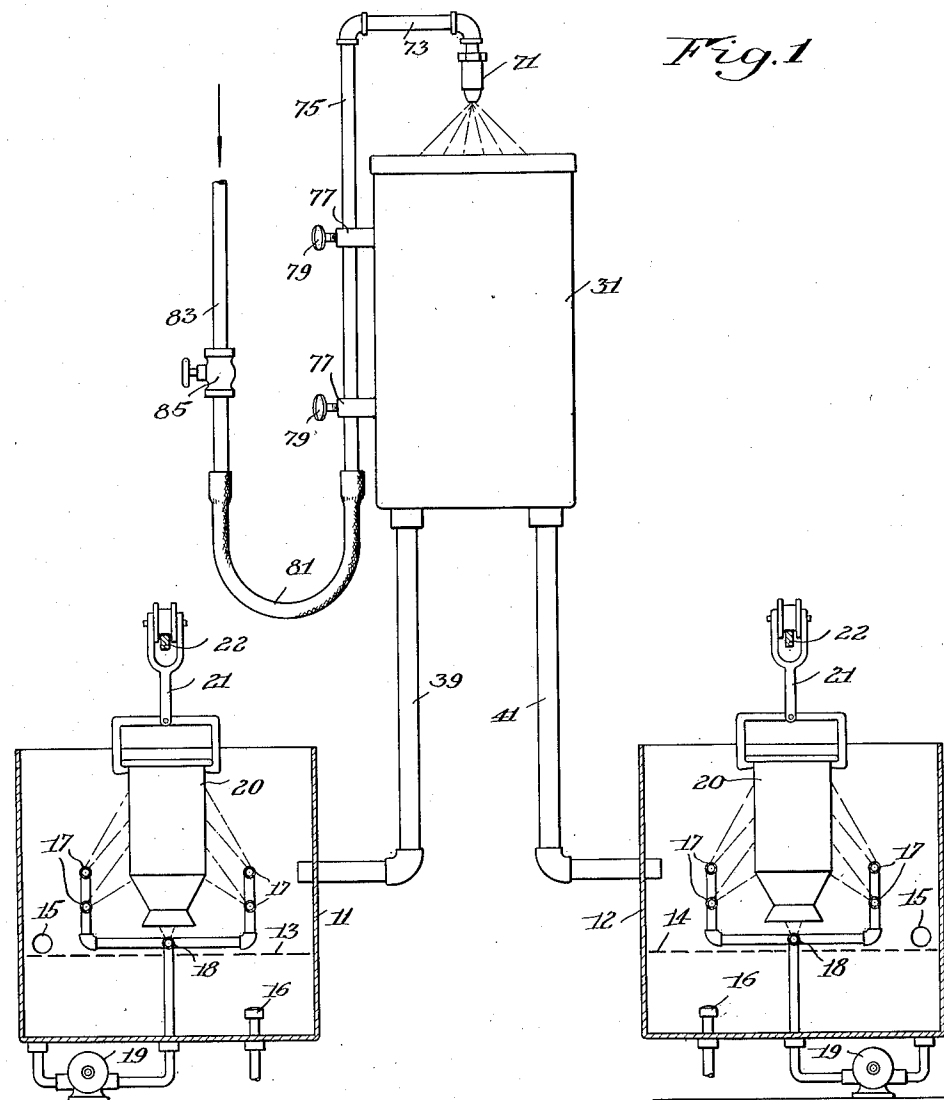
Aug. 21, 1951

H. W. LEHMKUHL
DISSOLVING APPARATUS

2,565,246

Filed April 16, 1946

2 Sheets-Sheet 1



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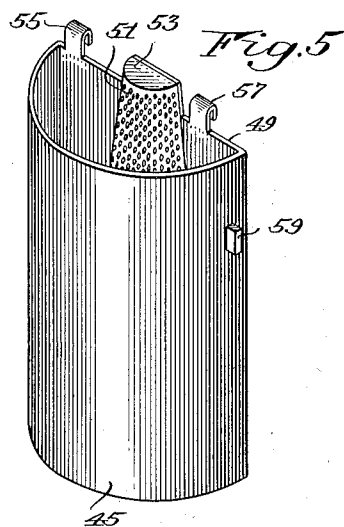
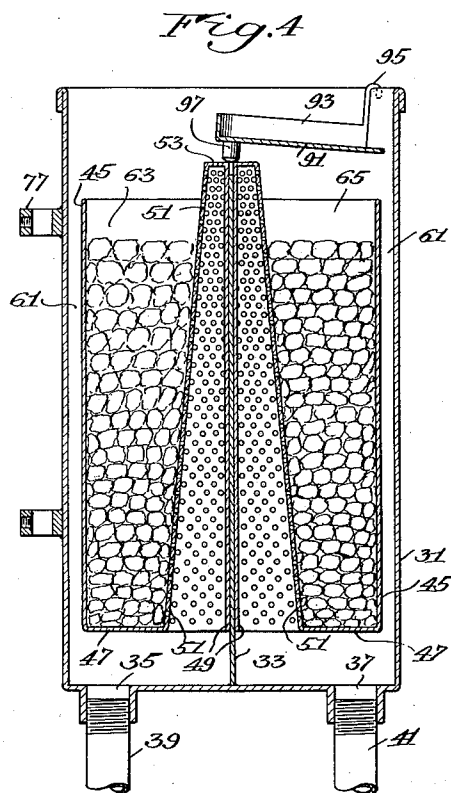
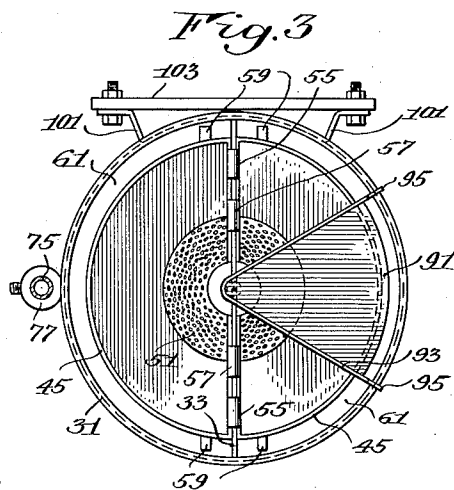
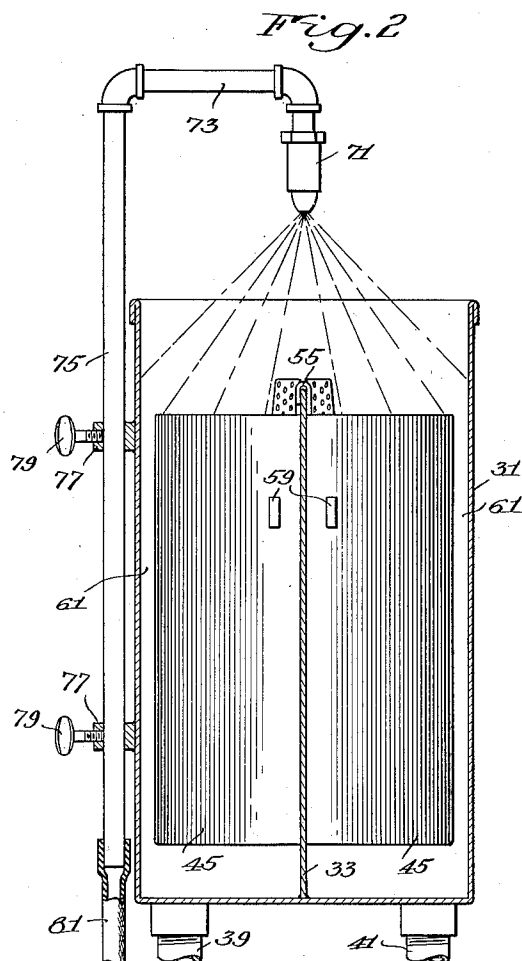
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UNITED STATES PATENT OFFICE

2,565,246

DISSOLVING APPARATUS

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9 Claims. (Cl. 23—272)

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This invention relates to a method of washing and rinsing, and to a unitary device for providing separate solutions of soap, washing powder, detergent material, or other suitable cleansing agent, both to a wash bath and to a rinse bath.

In my United States Patent No. 2,006,085, granted June 25, 1935, and my United States Patent No. 2,308,612, granted January 19, 1943, there are shown apparatuses for providing a continuous supply of solution to a washing tank. However, if the apparatus of either of these prior patents were to be used for furnishing different solutions to a wash bath and a rinse bath, it would be necessary to use two separate devices, one for each bath, with consequent duplication of cost of the equipment and duplication of expense of installation. To overcome this difficulty, it is one of the primary objects of the present invention to provide an improved solution apparatus whereby, with only one unitary apparatus, separate solutions of different compositions or different strengths may be furnished to a wash bath and a rinse bath, or to any other two baths required. This reduces the initial cost of the apparatus as well as the expense of installation, as compared with the use of two completely separate devices for furnishing the solutions to the two baths.

Another object is the provision of apparatus for furnishing two separate solutions to two separate baths which is of simple and compact form, easy and inexpensive to manufacture, and easy to install.

Still another object is the provision of apparatus which, without sacrifice of simplicity, compactness, and cheapness, is so designed and constructed as to enable the relative strengths or proportions of solution going to the two baths to be altered or varied, and also to enable solutions of entirely different composition to be furnished to the two baths.

A further object is the provision of wash and rinse baths of improved composition to obtain, in combination with each other, superior cleansing results, and the provision of an improved method of washing and rinsing.

These and other desirable objects are accomplished by the compositions and methods hereinafter disclosed and by construction disclosed as an illustrative embodiment of the invention in the following description and in the accompanying drawings forming a part hereof, in which:

Fig. 1 is a side elevation of a device in accordance with a preferred embodiment of the present invention, diagrammatically illustrating in verti-

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cal section the washing bath portion and rinse bath portion of an accompanying washing machine to which the solution is fed;

Fig. 2 is a vertical section taken centrally through the preferred form of apparatus of the present invention, with the deflector removed and with the detergent receptacles in side elevation;

Fig. 3 is a plan of the apparatus, with the deflector in place;

Fig. 4 is a vertical section similar to a portion of Fig. 2, but with the detergent receptacles in section and with the deflector in place;

Fig. 5 is a perspective view of one of the detergent receptacles removed from the rest of the apparatus; and

Fig. 6 is a perspective view of the deflector removed from the rest of the apparatus.

The same reference numerals throughout the several views indicate the same parts.

Simply as an illustration of the use to which the present invention may be put, there is shown diagrammatically, and not to scale, a portion of a washing machine including separate receptacles 11 and 12 for holding water baths up to levels 13 and 14 respectively. Either one of these baths may be the wash bath and the other may be the rinse bath. Both receptacles are provided with overflow openings 15 through which the water escapes to waste. In each receptacle, steam may be admitted through an inlet 16 to heat the water to any desired temperature. The water within each receptacle may be employed for washing and rinsing any desired articles in any suitable or known manner, by hand or by mechanical means. For instance, the water may be sprayed into and upon the articles to be washed, as for example by spray nozzles 17 and 18 supplied with water under pressure by any suitable means such as the pump 19. There is shown diagrammatically, merely as a convenient example of an article to be washed, a milk can 20 held in inverted position by any suitable holding means such as the trolley hanger 21 running on a track 22. The details of the washing and rinsing mechanism and of the manner of holding the articles to be washed may be varied in any desired manner, since such details constitute no part of the present invention, the invention being concerned with the composition of the baths used in washing and rinsing, and with the supply of make-up or replenishment solution to these baths, to make them and keep them of the desired composition.

The apparatus of the present invention comprises, in its preferred form, an open top cylin-

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drical container 31 having its axis substantially vertical, the interior of which is divided approximately in half by a substantially diametrical septum or partition 33 which extends from the bottom of the container up to an elevation somewhat below the top edge of the container, as best seen in Fig. 2. The two halves or compartments of the container thus formed by the partition have separate outlets 35 and 37 in the bottom of the container, from which conduits 39 and 41 respectively lead to the separate tanks 11 and 12.

Mounted within the container 31 are two baskets or receptacles which may be identical with each other. As best seen in Figs. 4 and 5, each basket is of approximately semi-cylindrical shape, having an imperforate semi-cylindrical side wall 45, an imperforate bottom wall 47 of segmental shape, and a diametrical wall 49, to which is attached a foraminous member 51 in the approximate shape of one-half of a frustum of a cone. This member 51 may be in the form of wire netting, or a piece of sheet metal provided with a multiplicity of holes, and is open at its bottom, as indicated in Fig. 4, the bottom wall 47 being so shaped that it does not extend within the foraminous wall 51. The smaller end of the frustum of the cone is upwardly and terminates in a flat plate 53 at an elevation somewhat above the top edge of the walls 45 and 49, as shown. The diametrical wall 49 may be carried all the way across the diameter of the basket, the foraminous cone member 51 being welded to the inner face of the partition 49.

The diametrical wall 49 of each basket or receptacle is provided with supporting hooks 55 and 57 which hook over the upper edge of the diametrical wall 33 of the outer container to support the basket within the outer container. The two hooks 55 and 57 of each receptacle are at unequal distances from the center, as shown, so that they will not interfere with the hooks of the other receptacle hung on the opposite side of the partition 33. Spacing lugs 59 on the sides of each receptacle serve to hold the receptacles approximately centered on the supporting partition 33, preventing them from being placed too far to one side or the other. The receptacles are sufficiently smaller than the internal diameter of the outer container 31, so that an annular space 61 is maintained all the way around the curved walls of the receptacles.

The soap, detergent material, or other compound to be used in making the solution is placed in the receptacle between the semi-cylindrical wall 45 and the foraminous wall 51. The material in one basket is indicated diagrammatically at 63, and the material in the other basket is indicated diagrammatically at 65. It may be either in the form of powder or in the form of solid lumps, the latter being illustrated as an example. When water is applied to the material 63, the solution formed thereby will pass out through the foraminous wall 51 and downwardly in the space within this foraminous wall to the bottom of the container 31, and thence will flow through the opening 35 and conduit 39 into the tank 11. Similarly, water applied to the material 65 in the other receptacle will form a solution which will pass through the opening 37 and conduit 41 to the other tank 12.

For supplying water to make the solutions, there is provided a spray nozzle 71 mounted centrally over the top of the container 31 and

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supplied with water through a conduit 73 having a vertical portion 75 slidable vertically in guides 77 fixed to the outside of the container 31, and held in any position of vertical adjustment by clamping means such as the thumb screws 79. The conduit 75 is supplied with water through a suitable flexible connection which will not interfere with the vertical movements of the conduit, such as the hose 81, connected to a water supply conduit 83, the flow being controlled by a valve 85.

The purpose of the vertical adjustment of the nozzle 71 is to vary the strengths of the solutions provided by both halves of the solution device. As the nozzle 71 is lowered, a greater proportion of the total flow of water falls into the two baskets or receptacles and forms a solution therein, and a smaller proportion flows down the annular space 61 outside the baskets, without touching the material within the baskets, so that a weaker solution results.

It is seen, therefore, that by varying the elevation of the nozzle 71, the strengths of the solutions manufactured from the contents of the two receptacles can be varied together. For varying separately the strength of the solution manufactured in one half of the device as compared with the strength of the solution manufactured in the other half, there is provided an adjustable deflector preferably in the form of a sector plate 91 having raised side flanges 93 and a pair of hooks 95 which may be hooked over the upper edge of the outer container 31. Approximately at the apex of the sector 91 is a downwardly projecting boss or leg 97 which rests loosely on top of said of the flat plates 53 at the upper ends of the foraminous parts of the two baskets. The radial length of the sector 91 is such that it extends outwardly to a point close to but not quite touching the outer wall of the container 31, a little outwardly beyond the wall 45 of the receptacle, and the proportions of the hooks 95 and the leg 97 are such that the sector is tilted downwardly from its apex toward its arcuate edge, as seen in Fig. 4. Hence any water which falls from the spray nozzle 71 onto the sector will flow over the sector and directly into the annular space 61, being deflected so that it will not fall into the basket, the raised side flanges 93 preventing the water from flowing off the sides of the deflector into the basket.

When a weaker solution is to be made in the righthand half of the device (when viewed as in Figs. 3 and 4) from that made in the lefthand half, the deflector is placed over the righthand half in some such position as indicated in Figs. 3 and 4. It is apparent that with the deflector in this position, the righthand receptacle will receive less water from the nozzle 71 than the lefthand receptacle, because part of the water which would otherwise fall into the righthand receptacle will be deflected by the sector 91 and will flow down the annular space 61 instead of flowing into the receptacle. Hence the solution made by this half of the device will be weaker than the solution manufactured in the other half. In order to vary the proportions of the solution the deflector may be swung circumferentially around the device, to any desired position. If it is swung so that approximately half of the sector overlies one receptacle and approximately half overlies the other receptacle, then the effect of the sector on the solution in the two halves of the apparatus will be equal and both solutions will still be of the same strength, notwithstanding

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ing the presence of the deflector. It can be adjusted to some other position in which a little more than half of the deflector overlies one receptacle and little less than half overlies the other receptacle, in which event a slightly weaker solution will be made in that half of the apparatus on which the greater part of the sector is placed. Thus the relative strengths of the solutions may be varied by infinitesimal degrees, by shifting the deflector one way or the other, the maximum difference in solution strengths being attained when the sector is entirely over one receptacle and not at all over the other, as indicated in Figs. 3 and 4. If a still greater difference in strengths is desired, a sector of larger size may be employed. It is contemplated that the apparatus will be provided with two or three sectors of different sizes in order to obtain a greater variety of proportions of solution strength. For example, a sector having an apex angle of 60° may be sufficient in most cases, but the apparatus may be provided with a second sector having an apex angle of 90°, and possibly a third sector with an apex angle of 120°, for use in case a very weak solution is to be made in one half of the apparatus, as compared with the solution to be manufactured in the other half.

For mounting the apparatus conveniently, it may be provided with brackets 101 (Fig. 3) which can be bolted to any convenient support 103.

The discharge openings 35 and 37 in the bottom of the outer container 31 are sufficiently large to provide an outflow capacity greater than the maximum inflow from the nozzle 71 into either half of the device, so that liquid does never at any time accumulate in the container 31, but always runs out as fast as it is supplied to the container. A much better and more uniform solution results when the material in the baskets does not stand under water, and when the water merely flows quickly over the material and thence out through the discharge openings. The inclination of the foraminous partition 51 is quite advantageous in minimizing formations of crystals or other deposits in the apparatus, for a large proportion of the water going through the holes in the foraminous partition will drip straight down out of contact with the partition, instead of trickling down the wall of the partition with a consequent tendency to make undesirable deposits thereon.

The foregoing apparatus is particularly satisfactory and useful in connection with the preparation of the novel washing solutions hereinafter disclosed, and in carrying out the hereinafter disclosed washing process.

It is well understood that when washing food containers (for example, milk cans) by conventional washing machines, it is highly desirable to wash them with a hot detergent solution, and thereafter to give the cans a rinsing operation with hot water. However, in many parts of the country hard water is encountered, possessing both temporary and permanent hardness, the former usually being due to the acid bicarbonates of calcium or magnesium or both, the latter usually being due to chlorides and sulfates of calcium or magnesium or both. When water of temporary hardness is heated to form a hot wash bath or rinse bath, the heating is likely to convert the soluble acid carbonate or bicarbonate to an insoluble normal carbonate which is then likely to be precipitated upon and adhere as a scale upon the surfaces of the milk cans or other articles being washed, as well as to adhere to

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and clog up the openings of the spray nozzles and other parts of the washing apparatus. It is well known that water of only permanent hardness does not precipitate on heating; however, the addition of the common alkaline cleansing materials, e. g. carbonates, phosphates and silicates of sodium, will precipitate scale from waters of both temporary and permanent hardness, by chemical interaction, with or without heating. This is equally true of the rinse bath for such rinse water is usually heated and there is almost always a carry-over of appreciable quantities of wash water from the wash bath to the rinse bath, and so the tendency to form scale also exists in the case of rinse water, this tendency being greater in water of temporary hardness because rinse temperatures are usually higher than wash temperatures, and being less in the case of waters of permanent hardness because of the carry-over referred to introducing less of the alkaline wash salts, which react quantitatively with the calcium and magnesium present in the water. Hence, when hard water of temporary hardness is used, it has become customary in many localities to use only a tepid or even a cold rinse bath, in order to prevent precipitation of insoluble compounds, even though this necessarily foregoes the advantages of a hot rinse bath in promoting thorough drying of the milk cans without undue expense.

According to the present invention, the necessity for using a tepid or cold rinse bath is avoided and a hot rinse bath is used, even when the water has considerable hardness. Moreover, the present invention provides an improved hard-water wash bath as well as rinse bath.

For water having a total hardness of less than about twenty grains per gallon, there is used according to the present invention, for the wash bath, a treating composition consisting of a mixture of approximately one part by weight of a "wetting agent" and approximately one to five parts by weight of anhydrous tetra sodium pyrophosphate, the preferred mixture being one part wetting agent to two parts of said pyrophosphate. It is pointed out that ordinary alkaline salts, such as ordinary phosphates, silicates, and carbonates, are eliminated as detergents when the solution of the present invention is used, since they all tend to form insoluble compounds with calcium and magnesium salts present in hard water as previously described. The words "wetting agent" as herein used are intended as a generic expression including any alkyl aryl sulfonate or alkylated aryl sulfonate or other sulfonated aromatic hydrocarbons and their derivatives of the kind commonly referred to by chemists as a "wetting agent" or "surface-active agent," many examples of such wetting agents being currently available on the market.

The above-mentioned mixture of wetting agent and anhydrous tetra sodium pyrophosphate is dissolved in the water for the wash bath in an amount to provide the bath with such alkalinity that it has a pH value between about 7.0 and 8.2, and such that 100 cc. of the wash solution requires the addition of 1/2 to 1 cc. of deci-normal hydrochloric acid to discharge the blue color of the solution when 3 to 5 drops of a 0.02 percent bromthymol blue indicating solution have been added to the test sample. When the concentration of the solution is kept within these limits, the water may be safely heated to the desired degree for producing a hot wash bath (for example, heated to the range 170° to

212° F.) without producing insoluble precipitates or scale, and yet the water has satisfactory cleansing and detergent properties for satisfactory washing of milk cans and similar articles.

For harder water, such as water having a total hardness exceeding twenty grains per gallon, a somewhat different wash water treating composition or mixture is preferable. In this instance, there is used approximately one part by weight of the abovementioned wetting agent, mixed with approximately two to eight parts by weight of sodium polyphosphate glass. The preferred mixture normally is one part of wetting agent to four parts of sodium polyphosphate glass, but these proportions must sometimes be varied for purely mechanical reasons resulting from the construction of the particular can washing machine in which the solution is to be used. For example, if the washing machine uses high pressure jets of water, the preferred amount of wetting agent is likely to cause excessive formation of suds, with the undesirable result that suds get into the milk cans or overflow the machine onto the floor. Hence a smaller proportion of wetting agent should be used with such washing machines. The words "sodium polyphosphate glass" as herein used are intended to define the improved vitreous or fused sodium polyphosphate complex disclosed in the specification and referred to in the claims of United States Patent No. 2,370,473, granted February 27, 1945, for "Water Treatment," in the name of Charles S. King as inventor, the disclosure of which patent is hereby incorporated herein by reference. This mixture of wetting agent and sodium polyphosphate glass is dissolved in the wash water in an amount to give the same degree of alkalinity as that previously mentioned in connection with tetra sodium pyrophosphate.

Further, according to the present invention, the water used for the rinse bath is treated (regardless of the degree of hardness, whether it be less than or more than twenty grains per gallon) with said sodium polyphosphate glass, used in the form of hard pieces or lumps known in the trade as phosphate glass. The amount to be used is determined according to need, no alkalinity test being necessary, the criterion being merely the absence of scale precipitation on the milk cans and on the parts of the washing machine.

In using the preferred washing and rinsing baths according to the preferred method and in the preferred apparatus above disclosed, the composition for treating the wash water is placed in one of the baskets 45 in one side of the outer container 31, being placed for example in the left hand side when viewed as in Figs. 1-4, so that the solution manufactured in this left hand side of the apparatus flows down the conduit 39 to the wash tank 11. The material may be used in powder form, but preferably is used in the form of lumps or compressed tablets made of the mixture of wetting agent and tetra sodium pyrophosphate, or wetting agent and sodium polyphosphate glass (as the case may be) already mixed in the desired proportions, so that the user need not bother with the proportions of the mixture but can confine his attention to making and keeping the proper strength of the solution. The sodium polyphosphate glass for treating the rinse water (preferably in the form of lumps as above mentioned) is placed in the other basket 45 in the other half of the outer container 31 (such as the right hand half when

viewed as in Figs. 1-4) and the solution manufactured in this half of the apparatus flows down the conduit 41 to the rinsing tank 12.

Before the machine is set into operation, the alkalinity of the wash water in the tank 11 is tested in the manner above mentioned or by some other suitable test giving equivalent results, and more of the solution or more plain water is added, as required, to bring the alkalinity within the limits above set forth. No special test is necessary for the original rinse water within the tank 12, the experience of the operator being sufficient to enable a bath of approximately the right consistency to be manufactured.

As the washing and rinsing operations continue, the water issuing from the spray nozzle 71 sprays into both sides of the container 31 and manufactures the two separate solutions which flow to the wash bath and rinse bath as above set forth. From time to time, the wash bath is tested to make sure that the alkalinity is remaining within the proper limits, and from time to time observations are made upon the rinsed milk cans to see whether any precipitate or scale is forming on the cans. If it appears that stronger solutions are necessary in both the wash tank and the rinse tank, the clamps 79 can be loosened so that a larger proportion of the water goes into the baskets 45 and a smaller proportion flows down outside the baskets. If a weaker solution in both the wash bath and the rinse is needed, the reverse procedure is followed and the nozzle 71 is raised. If a weaker solution in only one of the baths is needed, the deflecting member 91 is placed in the apparatus over the corresponding side where the weaker solution is wanted, and will deflect some of the water so as to form a weaker solution on this side. By moving the deflector 91 so as to lie partially over one basket 45 and partly over the other, different proportions of solutions can be obtained as already explained and as will be obvious from the foregoing disclosure. Thus great flexibility of operation is possible, and both the wash water and the rinse water can be kept at the proper composition, even during long continued runs of the washing machine, as may be necessary in large milk processing establishments.

It is seen from the foregoing disclosure that a construction of apparatus, a cleansing method, and bath composition are provided which admirably fulfill the above-mentioned objects of the invention. It is to be understood that the foregoing disclosure is given by way of illustrative example only, rather than by way of limitation, and that without departing from the invention, the details may be varied within the scope of the appended claims.

What is claimed is:

1. A unitary apparatus for supplying separate solutions to two separate baths, said apparatus including a substantially cylindrical container with its axis substantially vertical, a substantially diametrical partition dividing said container into two parts, separate outlets for the two parts of the containers, conduit means leading from one outlet to one of the baths and from the other outlet to the other of the baths, a pair of baskets in said container, one in each part thereof, each basket having one approximately flat vertical side lying approximately against said diametrical partition when the basket is in place in said container and having a pair of hooks near the top of said vertical side for hooking over the top

edge of said diametrical partition to support the basket from said partition, each basket being adapted to hold soluble material and having a foraminous wall so that a solution of such soluble material may flow out through such foraminous wall, a spray nozzle mounted to spray water into said container in position to fall partly into one of said baskets and partly into the other of said baskets, and a movable deflector plate for deflecting a portion of the spray water which would otherwise fall into one of said baskets.

2. A construction as described in claim 1, in which said deflector plate is mounted for substantially rotary adjustment substantially about said axis of said container as an axis of rotation.

3. A construction as described in claim 2, in which said deflector plate is approximately sector shaped and has an apex located approximately at said axis of said container.

4. Apparatus for supplying separate solutions to separate baths, said apparatus including a container having a partition therein for dividing at least the lower part of said container into two separate compartments, separate outflow means leading from one of said compartments to one of said baths and from the other of said compartments to the other of said baths, two receptacles for holding material to be dissolved, one receptacle being removably mounted in each compartment, each receptacle being spaced from a wall of its compartment so that water may flow downwardly in the space between the receptacle and such wall without entering the receptacle, both receptacles having substantially open tops, a plurality of openings in each receptacle through which solution may flow out from the receptacle into the compartment in which the receptacle is mounted, a spray nozzle associated with said container for spraying water into the upper part of said container so that it falls partly in the receptacle in one compartment of the container and partly in the receptacle in the other compartment thereof, and a deflector plate near the top of said container for intercepting part of the spraying water which would otherwise fall into one of said receptacles and directing the intercepted water to the space between the receptacle and the wall of its compartment.

5. Apparatus for supplying separate solutions to separate baths, said apparatus including a container having a partition therein for dividing at least the lower part of said container into two separate compartments, separate outflow means leading from one of said compartments to one of said baths and from the other of said compartments to the other of said baths, two receptacles for holding material to be dissolved, one receptacle being removably mounted in each compartment, each receptacle being spaced from a wall of its compartment so that water may flow downwardly in the space between the receptacle and such wall without entering the receptacle, both receptacles having substantially open tops, a plurality of openings in each receptacle through which solution may flow out from the receptacle into the compartment in which the receptacle is mounted, a spray nozzle associated with said container for spraying water into the upper part of said container so that it falls partly in the receptacle in one compartment of the container and partly in the receptacle in the other compartment thereof, and a movable deflector plate extending obliquely downwardly from a narrow end near the center of said container to a wider end near a side wall of said container,

for deflecting part of the water that would otherwise fall in one of said receptacles, so that such water flows down the space between the receptacle and the wall of its compartment instead of falling into the receptacle.

6. A construction as described in claim 5 in which said movable deflector plate is shiftable from a position entirely over one receptacle to a position partly over one receptacle and partly over another.

7. Apparatus for supplying separate solutions to separate baths, said apparatus including a container subdivided into a plurality of compartments, a separate discharge conduit leading from each compartment, a plurality of receptacles for containing material to be dissolved, one of said receptacles being mounted in each compartment, means for supplying water concomitantly to the tops of all of said receptacles, and means including a shiftable deflecting member overlying a portion of one of said receptacles for by-passing a portion of the water which would otherwise flow into one of said receptacles so that said water will not flow thereinto.

8. Unitary apparatus for supplying different solutions, said apparatus including a container of generally cylindrical shape having its axis approximately vertical, a partition arranged substantially diametrically for subdividing said container into two compartments, a receptacle removably mounted in each compartment for holding material to be dissolved, each receptacle being of generally semi-cylindrical shape and of smaller radius than that of the compartment in which it is placed so that the curved wall of each receptacle is spaced inwardly from the corresponding wall of the container, each receptacle having an approximately flat side lying close to said partition of said container and also having a foraminous wall through which solution formed in said receptacle may discharge therefrom, liquid supply means for spraying liquid in the upper portion of said container to fall partly into one receptacle and partly into the other receptacle so as to form solutions of the respective contents of the respective receptacles, and an approximately sector-shaped deflecting member mounted in overlying relation to at least one of said receptacles and serving to deflect liquid which falls thereon so as to flow down the space between the curved wall of the receptacle and the container, rather than to fall into the receptacle.

9. A construction as described in claim 8, in which said deflecting member has its apex resting on said receptacles substantially at the center of said container and has its outer end supported by a hook engaging the upper edge of said container.

HENRY W. LEHMKUHL.

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