June 25, 1968 F. W. JOHN 3,389,712

RINSER

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FIG. 1

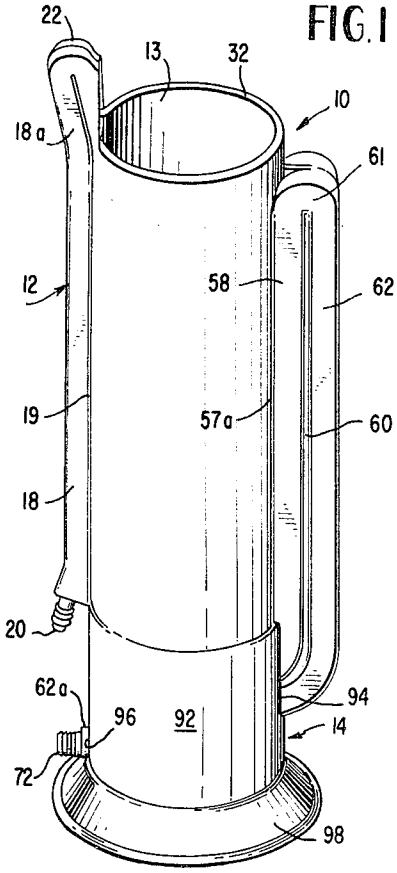
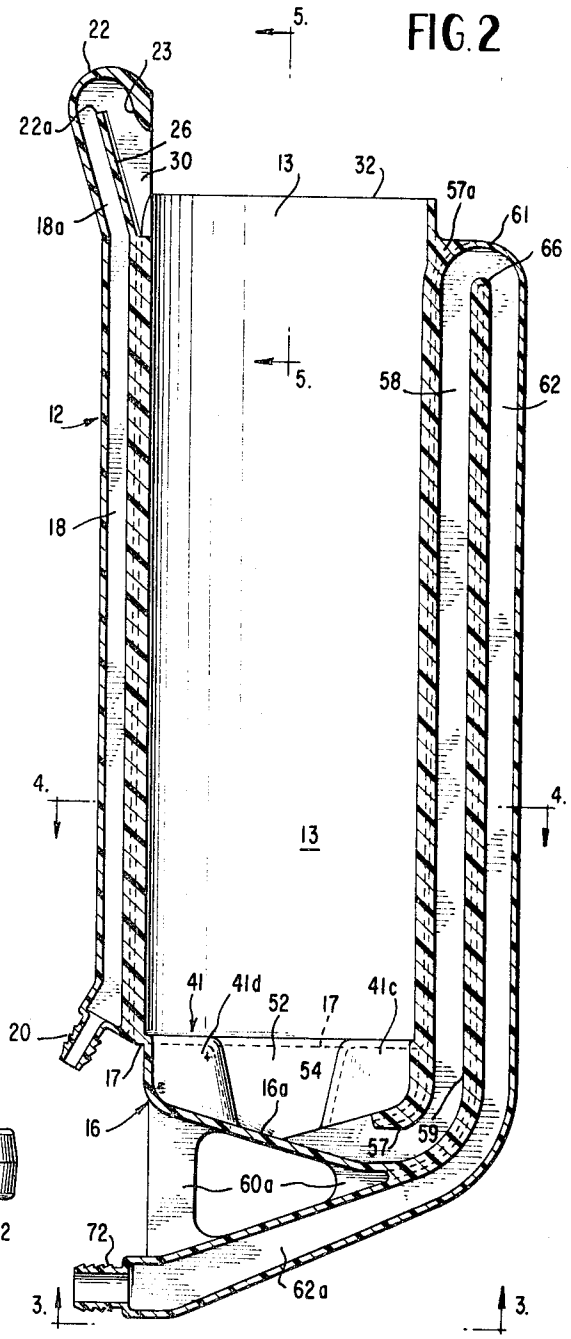


FIG. 2



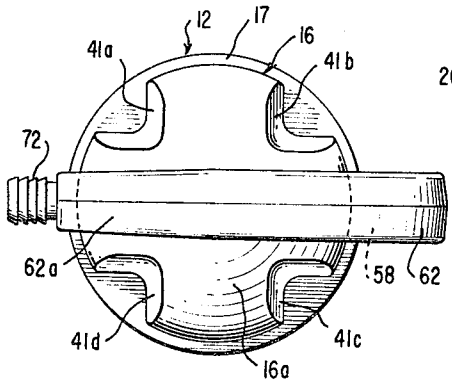


FIG. 3

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FIG. 4

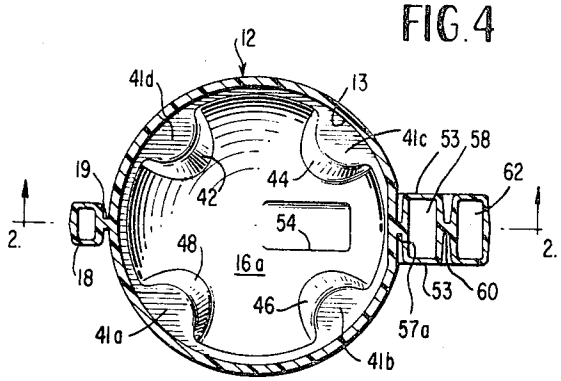
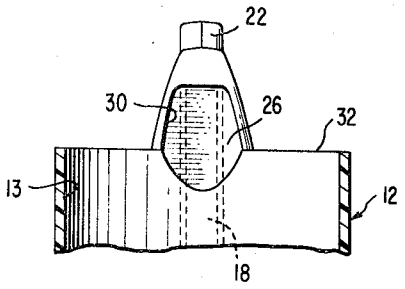


FIG. 5



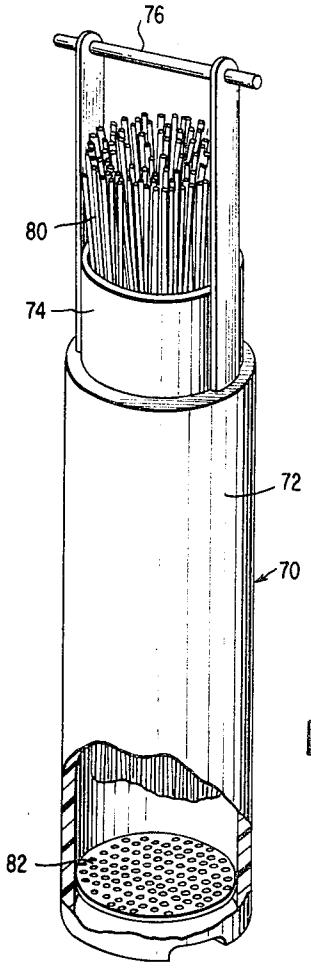


FIG. 7

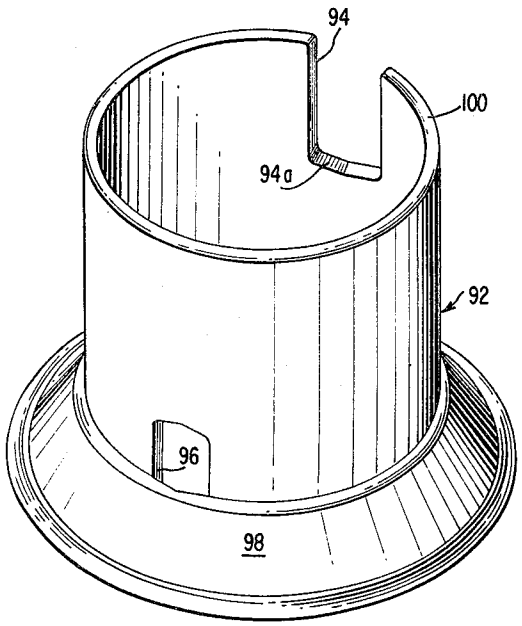


FIG. 6

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3,389,712

RINSER

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Filed Sept. 9, 1966, Ser. No. 578,351
12 Claims. (Cl. 134—166)

This invention relates to a novel improved automatically cyclical rinsing apparatus for washing laboratory pipets and the like.

The need for apparatus capable of thorough quick low cost rinsing of laboratory instruments such as pipets has long existed. Cleaning of pipets or like laboratory instruments by hand is relatively costly in time and money, besides being subject to reliability of personnel hand rinsing or washing such used equipment, and tying up equipment and personnel which could be used for other projects. Also, hand rinsing and cleaning pipets or like laboratory equipment is likely to result in considerable breakage with attendant possibility of injury.

To overcome these and other deficiencies of hand rinsing an automatic pipet rinser capable of repetitive rinsing of pipets or like laboratory equipment has been successfully marketed for some time by The Nalge Company of Rochester, New York (of which applicant is chief engineer), as shown on page 12 of Nalge Catalog No. J–1060. That prior rinser apparatus provides for automatic siphon discharge of the rinsing water when it attains a predetermined elevation in the rinsing compartment, with automatic repetitive operation, and limits breakage or damage of pipets. However, that prior Nalge automatic pipet rinser is relatively costly to fabricate and has a number of structural and functional disadvantages which have been known to laboratory equipment users and suppliers for some time. For example, such prior automatic rinsing apparatus is not capable of positively preventing backflow of contaminated rinsing liquid into the water supply whereby extra precaution must be taken to comply with some sanitary codes. Also it does not provide a reservoir for limiting backflow which occurs at the end of the rinsing operation, to insure against re-soiling of the cleaned equipment.

It is therefore a primary object of this invention to provide a new improved siphon type automatic rinser for pipets and like laboratory equipment which solves various shortcomings of, and provides various advantages over, prior available methods and apparatus for rinsing pipets and the like.

More particularly, it is an object of the present invention to provide a novel automatic siphon type rinser apparatus incorporating a main container plus a cooperating water inlet tube and pair of water outlet tubes in a manner so that inlet water will be accumulated around the pipets so as to maximize hydrostatic head and rate of siphon discharge of the water for rapid surging and increased cleaning effectiveness, on a repetitive time cycle, without attendance. It is a related object to provide such a rinser in which the water inlet and outlet means are designed to assure a high rate of rinse water flow at the end of the siphon discharge cycle to assure effective washing of lower portions of pipets or the like disposed in the rinser, and also to assure discharge of rinse water from below the lowest portion of the pipet basket used to load and unload the rinser.

It is another object of this invention to provide such an automatic rinser in which the point at which rinse water enters the main pipet basket container is at a vertical elevation above the "weir" between the siphon tubes, thereby positively preventing contaminated rinse water from being able to flow back into the water supply, as required by some sanitary codes.

It is still another object to provide such a rinser incorporating means for redirecting the water input jet against a splash plate thereby diminishing its velocity and causing it to splash down over the glass pipets or the like in the rinser rather than being directed against the same in the form of a relatively small jet of relatively high velocity.

It is yet another object to provide such a novel improved rinser for laboratory pipets or the like incorporating water inlet tube and siphon tubes and outlet so arranged in conjunction with a sump in the main container so that the sump accommodates all rinse water backflow upon break of the siphon discharge stage, thereby preventing contaminated rinse water from contacting pipets or like items in the rinser loading basket.

It is another principal object of this invention to provide such a new improved pipet rinser apparatus which in effect incorporates four tubes (main container, water inlet tube, and two siphon tubes) whereby the main part of the rinser can be integrally blow molded by a new technique hereafter more fully discussed, thereby achieving a major breakthrough in reduced cost of production for such rinser apparatus. It is a related object to provide such an improved rinser apparatus and method for making same wherein the entire rinser comprises only two parts, namely the aforementioned integral blow molded made portion and a simple injection molded base for the same which may be made at low cost and quickly assembled by relatively unskilled workers.

These and other objects and advantages of the invention will become more apparent upon reference to the following description and claims and appended drawings, wherein:

FIGURE 1 is a perspective view of a new improved rinser apparatus constructed according to the invention;

FIGURE 2 is a vertical section of the main body of the rinser in FIGURE 1, illustrating in detail the structural relationship of various components (without the base, and along line 2—2 in FIGURE 4);

FIGURE 3 is a bottom plan view looking along the plane 3—3 of FIGURE 2, illustrating the relationship of the discharge tube to the container bottom;

FIGURE 4 is a horizontal cross sectional view taken along the line 4—4 of FIGURE 2, and illustrates the construction of inlet and siphon tubes and formation of a siphon port in a well at the bottom of the container;

FIGURE 5 is a partial vertical section and elevation view taken substantially along the line 5—5 in FIGURE 2, and illustrates the arrangement at the end of the water inlet tube for converting input water from a jet stream into a spray falling upon the pipets or other laboratory instruments contained in the main rinser compartment;

FIGURE 6 is a perspective view of the rinser base shown in FIGURE 1; and

FIGURE 7 is a perspective of a pipet basket which is removably receivable within the main compartment of the rinser shown in FIGURE 1, with parts broken away to illustrate the perforated bottom thereof for passage of rinsing water.

Referring especially to FIGURE 1 of the drawings, there is shown a rinser device made according to this invention, generally indicated by the numeral **10**. The rinser **10** includes a main body section **12** providing a rinser tub or compartment **13** mounted on an upright base **14**.

Referring more particularly to FIGURES 2 through 5, main body section **12** has a substantially cylindrical section **13** for most of its length, with an attached bottom section **16** including a sloped bottom **16***a* and other structural features more fully described later. The height of cylinder **13** may be varied according to particular intended applicatioin, and to rinse pipets, chamber **12** would have a height capable of accommodating standard sized commercial pipets, e.g., **16–33** inches, loaded through the

open top **32**. As shown in FIGURES 1, 2 and 4, extending vertically along the cylindrical side wall **13** of rinser body **12** is a rinse water inlet tube or duct **18** which is integrally joined to the outer surface of cylindrical section **13** of rinser body **12** by a narrow web **19**, with a suitable cross sectional shape and area. A grooved or threaded connector **20** is fixedly attached to the lower terminal end of inlet tube **18** for direct or indirect connection to a fresh water source. Water inlet tube **18** extends vertically to an elevation above the open top **32** of cylindrical section **13**, and has an upper portion **22** having a configuration as shown in FIGURES 1, 2, and 4. Thus, the upper tube end **18***a* is angularly disposed upwardly and outwardly of the cylindrical chamber **12**, and is then turned back upon itself in substantially a U-shaped bend at **22** to direct the water passing therethrough into the chamber **12**. As shown in FIGURE **2**, the U-shaped bend or turn **22** has a radius of curvature at **23** so that input water emerging from inlet tube **18**, **18***a*, 22 is redirected to impinge on a delta shaped splash plate **26** which is formed to one side of a hood-like inlet port **30** substantially at the junction of cylindrical chamber **13** and the end of inlet duct bent end **22**. Thus, input water hits splash plate **26** as a jet which is broken up so that the fresh rinse water splashes and cascades in spray form upon the pipets or other objects contained in tube **12**, thus avoiding impinging a jet-like stream of input rinse water directly onto the pipets or like objects within the rinser body **12**.

Referring to FIGURES 2, 3, and 4, the bottom section **16** of rinser body **12** includes a sloped bottom **16***a* with a plurality of sloped risers **42**, **44**, **46**, and **48** extending upwardly from sloped bottom **16***a* and terminating in substantially coplanar projections **41***a*, *b*, *c*, and *d*, thus providing a horizontal base or floor for receiving a basket such as shown at **70** in FIGURE 7 containing the pipets for rinsing. Also, the sloped bottom **16***a* and spaces between risers **42**, **44**, **46** and **48** form a well or sump **52**, which has sufficient volume (due to diameter across bottom **16***a* and height of walls formed by sloped risers **42**, **44**, **46** and **48**) to accommodate water backing up after termination of siphoning action hereafter described, so that no contaminated rinse water will reach the pipets, or other instruments, contained in the basket **70** which rests upon floor **41***a–d* of rinser body **12** as later discussed.

As illustrated in FIGURES **2** and **4**, a suitably shaped aperture or passage **54** is formed in well **52**, providing a liquid passage between rinser chamber **13** and a pair of discharge siphon tubes or ducts **58** and **62**. Tube **58** extends vertically along the outer wall of cylindrical rinser chamber **13**, secured thereto at web **57***a*, preferably at a position diametrically opposite to that of water inlet tube **18** so that rinser body **12** may be integrally made by blow molding as hereafter discussed.

As shown in FIGURES 2, 3, and 4, siphon tube **58** is formed with vertically extending front and back walls **57** and **59** respectively and sidewalls **53**; the lowermost end of front wall **57** converges into well **54**, as do the lower ends of sidewalls **53**, and back wall **59** is connected to bottom section **16***a* in a gradual curve. Rinser bottom **16***a* is downwardly sloped to opening **54** so that well **52** is formed with its deepest portion feeding the siphon discharge tubes **58—62** for most efficient removal of rinsing water from chamber **12**.

Upwardly directed siphon tube **58** is connected to the downwardly directed siphon tube **62** by a vertically extending web **60** with intermediate U-section **61** between upward tube **58** and downward tube **62**. The siphon tubes **58** and **62** are of rectangular or other suitable cross section as shown, but each of siphon tubes **58** and **62** has a substantially larger cross sectional area than that of inlet tube **18** to provide a considerable greater rate of volumetric flow through the siphon discharge than the water inlet as hereafter amplified.

Web **60** extends between upwardly directed siphon tube **58** and downwardly directed siphon tube **62** to a point of junction **66** between these tubes below interconnecting U-section **61**. The cross sectional area at junction **66** and U-section **61** is at least as great as that of tubes **58** and **62**; and the height of these components **61**, **66** controls the siphoning action between duct **58** and **62**, as well as being a factor in determining rates of siphon discharge.

The lower end of downward siphon tube **62** terminates in a suitable grooved or threaded siphon outlet nozzle or fitting **72** adapted for connection by flexible tubing or like means to a suitable drain. As shown in FIGURES 1, 2, and 6, siphon discharge tube lower section **62***a* extends below the bottom **16***a* of rinser body **12**; tube **62–62***a* preferably is oriented so that outlet connector **72** is in line with inlet tube **18** and connector **20**, whereby rinser body **12** can be integrally blow molded as hereafter discussed. As shown in FIGURE 2, a web **60***a* is provided between the outlet duct **62***a* and the rinser bottom **16***a* for added strength (a portion of web **60***a* may be open or discontinuous to save material if desired). Positioning the outlet connector **72** of siphon duct **62–62***a* substantially below the bottom **16***a* of rinser body **12** provides an increase in differential water pressure head which speeds up the siphoning discharge rate for more efficient pipet rinsing, especially at the end of a discharge cycle, and also assures that the siphon discharge flow will empty rinser chamber **13** to a level below projections **41***a–d* forming the supports for pipet basket **70**.

Previously described well **52** at the bottom of rinser body **12** has at least enough volume to provide a reservoir which can accommodate all of the water which is contained in upwardly extending siphon tube **58** during siphon discharge action and would not be siphoned out when the siphon "breaks." That is, when siphon discharge action causes the water in rinser chamber **13** to fall below the level of outlet **54** communicating with upward siphon tube **58**, air would be sucked into tube **58** causing a siphon break, whereby water contained in upwardly extending siphon tube **58** below junction **66** will flow back along tube **58** into well **52**. Because the pipet basket **70** is vertically positioned on floor segments **41***a–d*, above well **52**, contaminated rinse water received within well **52** does not contact the cleaned instruments.

As shown particularly in FIGURE 2, the top **61**, **66** of siphon ducts **58** and **62** is vertically below the inlet aperture **22***a* at the upper end of inlet duct **18**, the latter also being above top edge **32** of rinser chamber **13**. Since the rinser **10** will undergo siphon discharge action when the level of water in rinser chamber **13** rises above siphon U-section **61**, this difference in elevation between rinse water inlet port **22***a* and the siphoning tubes **58–61–62** insures against a back flow of contaminated rinse water into inlet water duct **18** and the water source. Also, inlet water contamination is prevented in the event of a blockage in the siphon tubes **58–61–62**, as water would then overflow upper end **32** of rinser compartment **13**.

Looking now to FIGURES 1, 2, and 6, main rinser body **12** is mounted on a base **14** in upright position, with lower siphon outlet duct **62***a* extending through base **14**, in a manner now amplified. Turning to FIGURE 6, base **14** comprises a cylindrical upright section **92** having a suitable downwardly sloped conical base flange section **98** formed integrally therewith. Base **14** is provided with a suitably shaped aperture **96** in cylindrical side wall section **92** near the top of conical base flange **98**, as shown. A slot **94** is provided in cylindrical section **92** at its upper edge, at a position diametrically opposite and above opening **96**. Slot **94** extends downwardly from the top of cylindrical section **92** a suitable distance to receive and support the lowermost portion of siphoning ducts **58** and **62** with the underside of duct section **62***a* resting on the horizontal slot section **94***a*. Upon insertion of rinser body **12** into base **14**, rinser body **12** is manipulated so that siphon outlet tube section **62***a* and end connector **72** project through lower opening **96** while siphon ducts **58** and **60** are seated within slot **94**.

Referring especially to FIGURE 2, rinser body **12** is provided with a flange or shoulder **17** extending circumferentially around the lower end of cylindrical chamber **13** at its junction with bottom **16**, just below web **19** and inlet duct **18** (excepting in the region of siphon tubes **58** and **62**). This shoulder **17** provides means for seating rinser body **12** upon base unit **14**, with the upper edge **100** of cylindrical base member **92** being contiguous with shoulder **17** to provide solid support. To prevent accidental disengagement of the main rinser body **12** from base **14**, the two are preferably secured together by spot welding them at selective points, or by any other suitable means for fixedly connecting them together.

Turning now to FIGURE 7, there is shown a suitable pipet basket **70** used to facilitate loading and unloading pipets **80** into and from rinser chamber **13**. Basket **70** is of a type known to the art (see aforementioned Nalge catalog), and is therefore shown and described herein only to extent necessary for illustrating the present invention. As shown, basket **70** includes a main cylindrical shaped container **72** having a cylindrical projecting section **74** of reduced diameter extending therefrom, with a handle **76** suitably attached to cylindrical section **74** as shown. The lower portion of cylindrical container **72** is provided with a perforated bottom **82** to permit the flow of rinsing water therethrough. Dirty pipets **80** or the like are loaded into basket **70**, and the basket **70** is placed on the floor sections **41***a–d* of the rinser **10** prior to initiation of the rinsing cycle.

Summary of operation

Fresh water inlet connector **20** is connected by suitable means, such as flexible piping, to a fresh water source, and siphon outlet connector **72** is similarly connected to a suitable drain for discharge of used rinsing water. A pipet filled basket **70** is placed in rinser chamber **13** as discussed and automatic cycle rinsing is initiated by turning on the fresh water source, whereby water flows through inlet tube **18** and is redirected by surface **23** in the U-shaped inlet tube section **22** to impinge on the splash plate **26**, whereby the jet-like water input is broken up into a water spray which falls into rinser chamber **13** and begins to fill it. The water inlet tube **18** has a suitable cross section to permit a suitable volumetric rate of flow of input water with normal laboratory water sources. The input water will fill rinser chamber **13** at a predetermined volumetric rate, and at the same time water will pass through outlet port **54** and rise in upward siphon tube **58** at the same rate. When the water rises in rinser chamber **13** and in siphon tube **58** to the height of junction **66** and then to the inside of U-section **61**, siphoning action is automatically initiated as water flows from duct **58** down siphon discharge tube **62**. Thus, with siphon ducts **58** and **62** filled, there is then a continuous siphoning of water from rinser chamber **13**. Since the inner cross section area of each of siphon tubes **58** and **62** is substantially greater than the inner cross section area of inlet water duct **18**, the volumetric rate of flow of water through siphon ducts **58** and **62** is substantially greater than it is in inlet water tube **18**. The volumetric rate of flow through siphon ducts **58** and **62** is sufficiently greater than the volumetric rate of water input into rinser chamber **13** so that water in main chamber **12** rapidly surges down through the pipets **80** in basket **70** and is discharged from the lowermost portion of chamber **13** at opening **54** in rinser well **52**. Since the discharge end of siphon duct **62** terminates substantially below the bottom **16***a* of rinser chamber **13**, there is a continuing rapid water discharge from rinser chamber **13** so that water rapidly surges through the lower portion of pipets **80** in basket **70**, since the siphoning action continues until rinser chamber well **52** has been evacuated due to continuing differential hydrostatic head which drives the siphon. As water is eliminated from well **52**, air is sucked into aperture **54** breaking the siphon action, whereafter water contained in upwardly siphon duct **58** will fall back into chamber **13** but is totally retained within well **52**. In the meantime, water falls into chamber **13** from inlets **18**, **22**, **30**, and plate **26**, and the cycle can be automatically repeated as often as desired. The volumetric rate of discharge flow through siphon ducts **58** and **62** is a function of the head of water between the outlet connector **72** and the liquid level in chamber **12**, which is substantially equal to the height of section **66** at the beginning of the siphoning action and thereafter decreases as the water level in the rinser chamber **13** progressively decreases due to siphoning from the chamber **13**, until the water in the chamber is lowered to expose the outlet port **54** to atmosphere and break the siphon. In operation of a typical unit connected to a typical source of fresh rinsing water, the siphoning action is automatically repetitive at about a 60 to 70 second rate per rinsing cycle, depending upon the size of the rinsing chamber, etc., thus providing automatic, rapid, repetitive surging of water through the pipets, or the like, for as many rinses as is desired.

Upon completion of the desired number of cycles to satisfactorily wash pipets **80**, the basket **70** may be removed from rinser chamber floor sections **41***a–d* which maintain basket **70** above well **52** and the back flow from duct **58** of contaminated rinse water.

An illustrative suitable rinser **10** would have a main body with chamber **13** about 18 inches high and 6 inches in diameter and base well section **16** about 2½ inches high, with other components proportional thereto and with configuration as illustrated and described.

Rinser **10** may be made of any suitable material which is capable of withstanding considerable physical abuse, usage, and corrosion under a widely varying temperature range. A preferred embodiment is made of conventional commercial polyethylene of low, medium or high density.

The rinser base **14** is preferably made in one piece by injection molding. The rinser body **12** may be made of individually molded or otherwise fabricated sub-components which are welded together in a manner apparent to one skilled in the art in light of the disclosure herein. The new improved rinser **10** made in such manner will achieve the various objectives and advantages discussed above.

However, an important aspect of this invention is to provide a novel rinser **10** incorporating a novel rinser body **12** which can be made as an integral unit including main container section **13**, tubes **18**, **58**, **62**, and **62***a*, and base section **16** by blow-molding the same from a single parison using an extension of the method and apparatus disclosed in my co-pending United States application, Ser. No. 477,692, filed Aug. 6, 1965, entitled Methods, Apparatus and Products.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristic thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A rinser apparatus comprising: a main rinser chamber adapted to receive objects to be rinsed; a well below said main rinser chamber having a floor with a plurality of support means extending upward from said floor and adapted to support objects disposed in said main rinser chamber; water inlet means for supplying water to said main chamber; siphon means including a first siphon tube having its lower end connected to said well through an aperture therein and a second siphon tube connected to the upper end of said first tube and extending downwardly therefrom, the cross-sectional area of each of said siphon tubes being greater than the cross-sectional area of said water inlet means, and the volume of said rinser well

below the level of said support means being greater than the volume of said first siphon tube.

2. A rinser apparatus as defined in claim 1 wherein said water inlet means is vertically located above the highest vertical point of said siphon means.

3. A rinser apparatus as defined in claim 2 further comprising: splash means associated with said water inlet means so that input water is directed against said splash means and thereafter cascades downwardly into said main rinser chamber.

4. A rinser apparatus as defined in claim 1 wherein said second siphon tube extends a substantial distance below said aperture in the floor of said rinser well connected with said lower end of said first siphon tube, said distance being sufficient to provide a substantial head to drive the siphon as the water level in said main rinser chamber decreases to below the level of said support means rising from the floor of said well.

5. A rinser apparatus as defined in claim 1 wherein said water inlet means comprises a tube joined to and extending vertically along said main rinser chamber to a point above the highest vertical point of said siphon means.

6. A rinser opparatus as defined in claim 1, wherein: said second siphon tube extends a substantial distance below said aperture in the floor of said rinser well connected with said lower end of said first siphon tube, said distance being sufficient to provide a substantial head to drive the siphon as the water level in said main rinser chamber decreases to below the level of said support means rising from the floor of said well; said water inlet means comprises a tube joined to and extending vertically along said main rinser chamber to a point above the highest vertical point of said siphon means; and said water inlet tube and said first and second siphon tubes are substontially aligned with each other and with the center of said main rinser chamber.

7. A rinser apparatus as defined in claim 6, said rinser apparatus being integrally blow-molded from plastic material.

8. A rinser apparatus as defined in claim 7, further comprising a base for said integral blow-molded rinser.

9. A rinser apparatus as defined in claim 8, wherein: said second siphon tube has an outlet portion extending across and below said rinser well bottom in substantial alignment with said linet tube and first and second siphon tubes and center of said main rinser chamber; and said base is substantially hollow and includes means for supporting part of the main rinser chamber body, means for accommodating said first and second siphon tubes, and apertured means for accommodating said outlet end of said second siphon tube.

10. A rinser apparatus comprising: a rinser chamber having vertically extending sidewall and bottom and adapted to receive objects to be rinsed; water inlet means for supplying water to said rinser chamber; siphon means including a first siphon tube having its lower end connected to an aperture in the bottom of said rinser chamber and a second siphon tube connected to the upper end of said first tube and extending downwardly therefrom, the cross-sectional area of each of said siphon tubes being greater than the cross-sectional area of said water inlet means; said water inlet means being disposed above the highest point of said siphon means; and a splash plate in association with said water inlet means so that input water is directed against said splash plate and thereafter cascades downwardly into said rinser chamber; said second siphon tube extending below said aperture in the bottom of said rinser chamber connected with the lower end of said first siphon tube a distance sufficient to provide enough head to drive the siphon as the water level in said rinser chamber decreases towards the bottom thereof; said water inlet means and said first and second siphon tubes being substantially aligned with each other and with the center of said rinser chamber.

11. A rinser apparatus as defined in claim 10, wherein the above described rinser components are integrally blow-molded from plastic material, and said apparatus further comprises a base for said integral blow-molded rinser.

12. An apparatus as defined in claim 11 wherein said second siphon tube has an outlet portion extending across and below the rinser bottom in substantial alignment with said inlet means and first and second siphon tubes and the center of said rinser chamber; and said base is substantially hollow and includes means for supporting part of the rinser chamber sidewalls, means for accommodating said first and second siphon tubes, and means for accommodating the outlet end of said second siphon tube.

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ROBERT L. BLEUTGE, *Examiner.*