

[54] LIQUID WASH INJECTOR

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[51] Int. Cl. B05b 1/28; B05b 15/04

[58] Field of Search 134/24, 152, 177, 172; 239/33, 288, 288.3, 288.5, 289, 532, 587, 602

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[57]

ABSTRACT

There is disclosed a device for adding a liquid, wash water for instance, to a receptacle such as a cuvette or test tube which contains centrifugally-packed particles. The device comprises an elongated tube adapted for communication with a flexible conduit which in turn is connected to a source of liquid. The device has a flange for controlling the depth of ingress into the receptacle and a nozzle at the distal end constructed to admit the liquid against the inner side wall of the receptacle.

4 Claims, 7 Drawing Figures

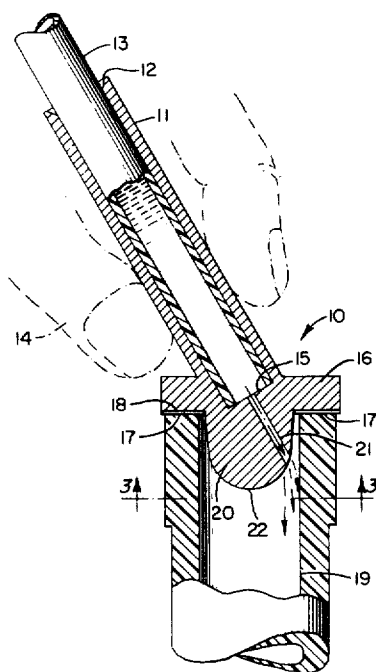


FIG. 4.

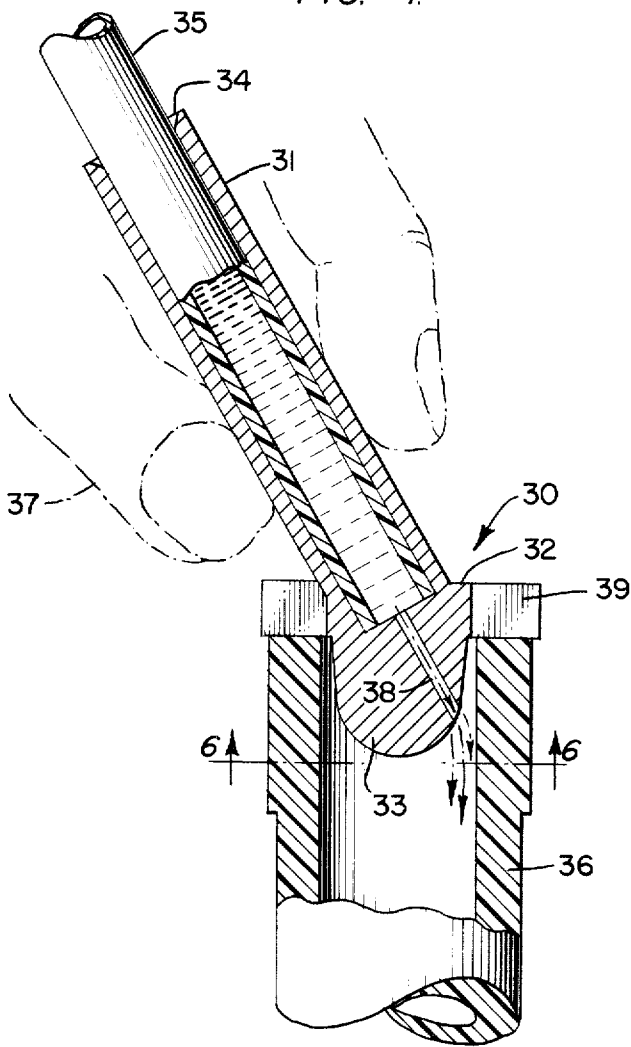


FIG. 5.

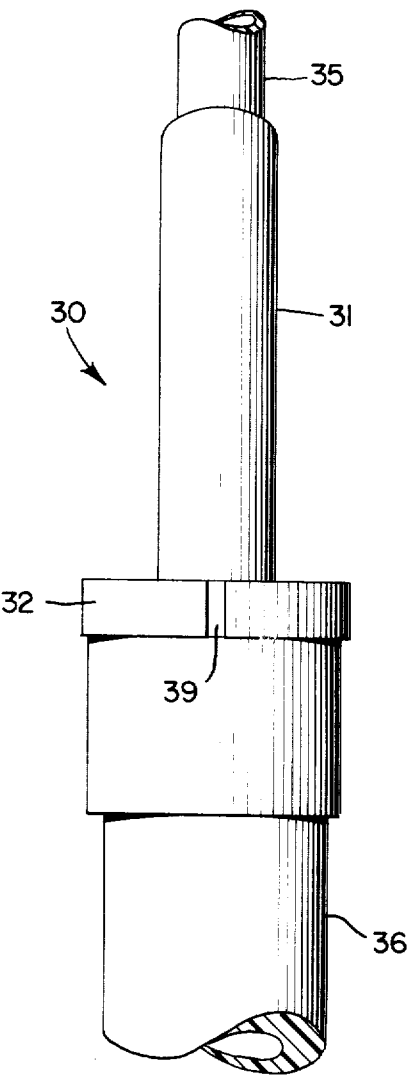


FIG. 7.

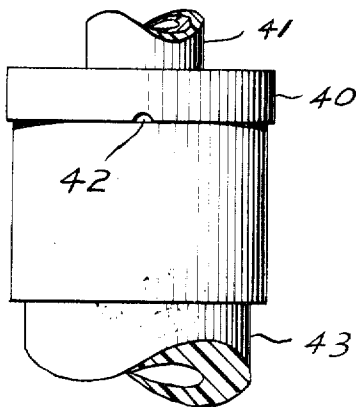
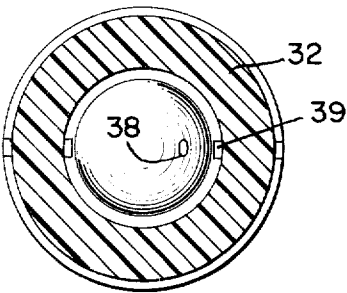


FIG. 6.



LIQUID WASH INJECTOR

BACKGROUND OF THE INVENTION

Clinical chemistry of modern vintage is designed to rapidly undertake a maximum number of tests. These tests are conducted on hundreds of samples all requiring a number of individual treating steps. To accomplish this efficiently, relatively small cuvettes are now in vogue. These cuvettes when containing a two-phase liquid-solid system are centrifuged in order to separate and pack the solid material which, of course, is accumulated at the bottom. Any supernatant liquid is decanted or aspirated from the cuvette by suitable means. Usually after this step, it has been found desirable to wash the remaining precipitate with a small quantity of wash liquid such as water or buffer. A laboratory technologist having to deal with a plurality of cuvettes will find such an operation tedious if individual aliquots must be dispensed by means of a pipette, for instance. Also, the use of a pipette does not provide sufficient liquid impingement to dislodge the packed solid material. At the same time, an uncontrolled liquid jet can cause spillage and loss of some of the packed material by excessive disruption of said material.

SUMMARY OF THE INVENTION

The present invention relates to a biaxially oriented liquid wash injector for permitting the introduction of wash water into a receptacle having at the bottom thereof a quantity of a precipitate. The injector comprises an elongated tubular section at the proximal end disposed in one axis. Communicating therewith and offset therefrom in another axis at the distal end is a projecting means such as a relatively short nozzle. The proximal end is adapted for communication with a source of wash liquid, buffer or other fluid which can be a flexible tubular conduit with suitable attachment means. The distal end is adapted for insertion into a cuvette or a test tube or other receptacle containing the material to be washed. A radially disposed flange positioned below the elongated tubular section and above and normal to the axis of the nozzle serves to seat the device on the mouth of the receptacle and position the nozzle in the receptacle to a controlled depth. The nozzle has a bore therethrough in axial alignment with the elongated tubular section for liquid impingement on the upper part of the inner sidewall of the receptacle.

The injector device is constructed to admit liquid through the bore at a high velocity in impingement on the inside of the receptacle wall so that it flows downwardly to the bottom thereof without excessive disruption of the precipitate. At the same time the mentioned flange is a stop abutment to control the depth that the device may be inserted into the receptacle as it abuts against its mouth so that the liquid impingement is near the top of said receptacle.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the device of the present invention in cross section.

FIG. 2 is a front elevational view of the device of FIG. 1.

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 1.

FIG. 4 is a side elevational view of another embodiment of the device of the present invention in cross section.

FIG. 5 is a front elevational view of the device of FIG. 4.

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 4.

FIG. 7 is a fragmentary front elevational view of another embodiment of the device of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, reference numeral 10 refers generally to the liquid wash injector of the present invention. The injector 10 is seen to comprise three integrally formed parts, elongated tube 11, annular flange 16 and nozzle 20. The upper part of the wash injector is the elongated tube 11, of which the proximal end 12 communicates with conduit 13, shown in fragmentary form. Conduit 13, in turn, leads to a source of wash water or other liquid. Conduit 13 can be a flexible plastic tube conveniently inserted in tube 11 and solvent sealed therein. Elongated tube 11 is sufficiently long to permit easy manual handling of the injector such as by the fingers 14 of a hand shown in dotted lines. The distal end of the elongated tube 11 terminates in well-like bottom 15. At this locale, the tube 11 also terminates in an outwardly extending annular flange 16. The axis of tube 11 is shown to project at an angle of 60° with respect to the diameter of flange 16.

The underside of the flange 16 possesses two downwardly extending radially disposed ribs 17. These ribs are constructed to abut against the upwardly extending surface 18 of the mouth of a cuvette 19 shown in fragmentary form. The ribs 17 are useful in permitting a small air space between the said mouth and the underside of the flange 16.

As mentioned above, the injector device of the present invention comprises three parts. Whereas the elongated tube 11 is the upper part, the second is the annular flange 16 and, finally, on the underside of the flange is the lower, centrally-disposed nozzle 20. Nozzle 20 has a relatively short, generally cylindrical configuration terminating in a rounded tip 22. The diameter of the nozzle is slightly smaller than the inner diameter of the cuvette 19 and the vertical axis of the nozzle is at an angle of 150° with respect to the axis of the tube 11. Nozzle 20 has a small bore 21 therethrough to provide a high velocity fluid flow. The bore 21 at one end communicates with the elongated tube 11 and is axially aligned therewith. The other end of the bore 21 terminates toward the tip 22. Due to the mentioned angularity of the nozzle the tip is sufficiently displaced so that the bore 21 does not terminate directly at the tip thereof.

From FIG. 1 it will be seen that bore 21 is in direct alignment with the upper part of the inner side-wall of the cuvette. Liquid being dispensed from the injector device of the present invention strikes forcibly the said inner side-wall to set in motion a swirl of wash water which flows downwardly, as shown by the arrows, to dislodge and wash particle centrifuged packed material at the bottom of the cuvette. At the same time the packed material is not subjected to direct jet action as would be the case if the wash water would be introduced axially to the cuvette. Bore 21 also can be

canted, if desired, to provide increased swirling motion of the wash water.

The angularity of the axis of tube 11, which can range from about 55° to about 75° with respect to the diameter of flange 16, makes it possible for the laboratory technologist at a table top to easily, comfortably and successively introduce selected amounts of wash water or any other liquid to the cuvette. The laboratory technologist need only position the flange 16 against the mouth of the cuvette and thereby be informed that the device is accurately and uniformly in position for dispensing liquid. Displaced air from the cuvette may escape through the space afforded by the ribs 17.

FIGS. 4-6 illustrate another embodiment in which the reference numeral 30 refers generally to the liquid wash injector of the present invention which comprises elongated tube 31, flange 32 and nozzle 33. The proximal end 34 of tube 31 communicates with conduit 35 and is adapted for manual introduction of fluid into cuvette 36 by fingers 37. Nozzle 33 has a small bore 38 communicating and in axial alignment with tube 31. Flange 32 of this embodiment has slot 39 which serves the same function as ribs 17 in the embodiment of FIGS. 1-3 by preventing complete closure of cuvette 36 with said flange.

FIG. 7 illustrates still another embodiment of the present invention in which flange 40 at the distal end of tube 41 is provided with groove 42 to prevent complete closure of cuvette 43 with said flange.

In the preferred embodiments of the invention, the outwardly extending annular flange has means disposed therein in confronting abutment with the mouth of the receptacle to prevent the flange from completely covering the mouth of said receptacle. These abutment means, which can be downwardly depending rib members, an upwardly depending groove or a slot extending through the flange, as described above, will prevent complete coverage of the mouth of the receptacle so that air displaced with liquid can escape from the receptacle during introduction of said liquid.

The structural materials for the device can be ther-

moplastic for ease of molding and inexpensive for disposal, if this is desired. Polyolefins such polyethylene and polypropylene are illustrative suitable thermoplastic materials. Of course, the materials of fabrication can be of metal or other materials having self-sustaining properties. Preferably, thermoplastic materials are employed which have translucent or transparent properties so that the liquid being dispensed may be readily observed.

It will be appreciated that the invention as described can be further modified to meet the requirements of specific testing procedures. Still other modifications, adaptations, and alterations which will become apparent to those of ordinary skill in the art are possible within the spirit and the scope of the invention.

What is claimed is:

1. A device for introducing liquid into an open mouthed elongated receptacle comprising an elongated tubular means adapted and constructed to have attached thereto at the proximal end a liquid carrying conduit, said tubular means terminating at the distal end with an outwardly extending annular flange for seating on the mouth of said receptacle, said tubular means being inclined with respect to said flange, said flange having at the other side thereof a projecting means having an axis normal to the flange, said projecting means having a bore therethrough communicating internally with said tubular means and in axial alignment therewith, for liquid impingement on the upper part of the inner side-wall of said receptacle.

2. The device of claim 1 wherein the projecting means is a relatively short, generally cylindrical nozzle with a rounded tip.

3. The device of claim 2 wherein the axis of the tubular means is inclined at an angle of from about 55° to about 75° with respect to the diameter of the flange.

4. The device of claim 3, said annular flange having means thereon in confronting abutment with said mouth of said receptacle to thereby prevent complete coverage of said mouth with said flange.

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