Feb. 8, 1966 R. C. BURKE 3,233,785

RINSING PIPETTE

Filed Sept. 13, 1962

Fig. 1.

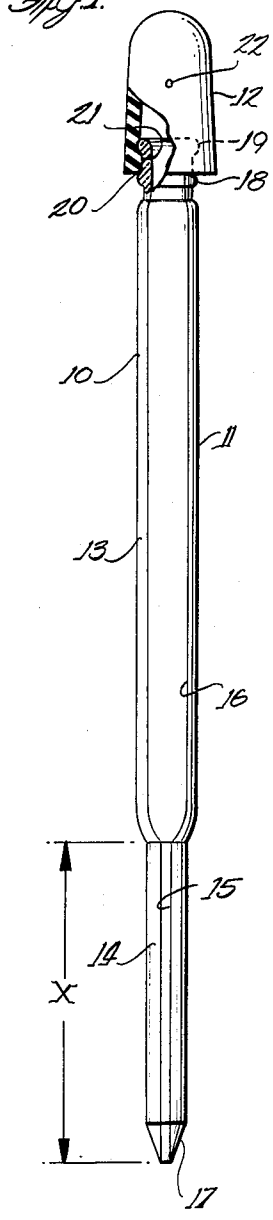


Fig. 2.

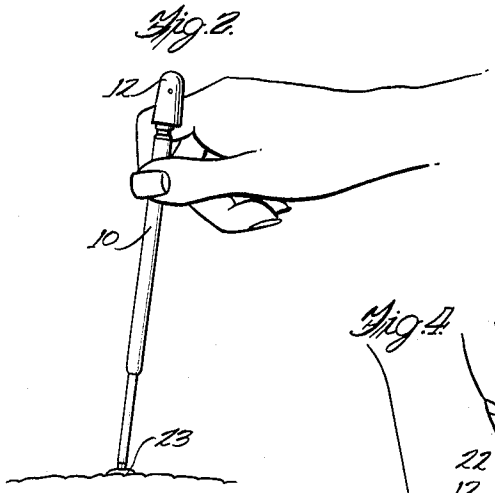


Fig. 3.

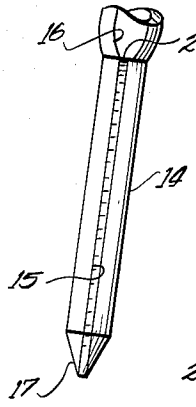


Fig. 5.

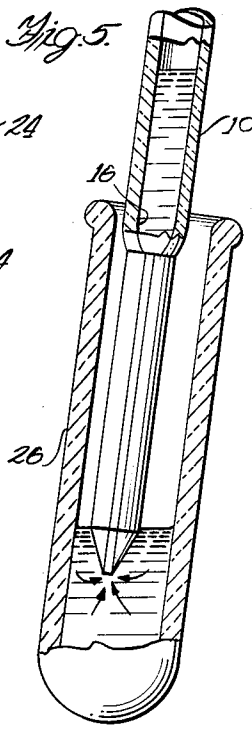
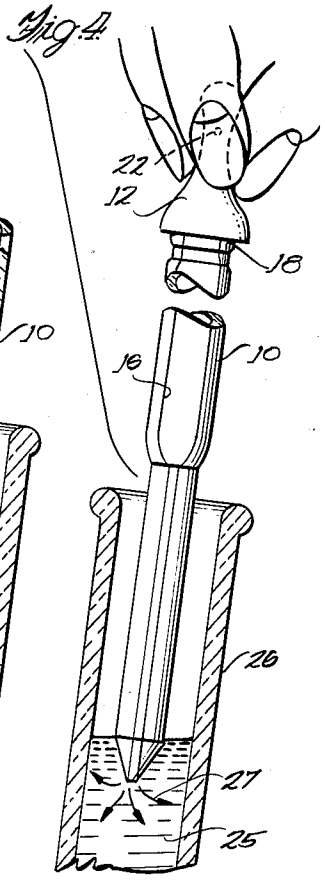


Fig. 4.



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RINSING PIPETTE

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2 Claims. (Cl. 222—158)

This invention relates to a rinsing pipette, and more specifically, to a pipette adapted to be used in drawing a measured quantity of liquid and thereafter mixing the same with a diluent. The pipette of the present invention is particularly useful in the field of analytical chemistry where a final solution is to be prepared with all of the liquid first drawn and contained within the pipette.

A principal object of the present invention is to provide a squeeze rinse pipette which is capable of self-filling by reason of capillary attraction. Another object is to provide a pipette which is much easier and faster to use in mixing and rinsing than a conventional pipette equipped with a mouth tube. A further object is to provide a pipette which is suitable for use in diluting blood specimens and which may be used without the dangers attending the use of conventional mouth tube pipettes of contaminating either the technician, as where a part of the solution enters the technician's mouth during drawing or mixing, or of contaminating the specimen, as where moisture or bacteria are carried from the technician's mouth to the specimen.

Other objects will appear from the specification and drawings in which:

FIGURE 1 is a side elevational view of a rinsing pipette embodying the present invention;

FIGURE 2 is a side elevational view in reduced scale illustrating the step of drawing a test sample into the pipette;

FIGURE 3 is a broken side elevational view illustrating a pipette containing a measured amount of the specimen liquid prior to a rinsing or mixing step;

FIGURE 4 is a broken elevational view illustrating the discharge of the specimen during a rinsing operation;

FIGURE 5 is a broken elevational view taken partly in section and showing the intake of the diluted specimen during the rinsing operation.

In the embodiment of the invention illustrated in the drawings, the numeral **10** generally designates a rinsing pipette consisting essentially of a glass body **11** and a resilient bulb or cap **12** formed from rubber or any other suitable material. The glass body is elongated and is provided with an upper portion **13** and a lower portion **14**. The reduced lower portion of the tubular body is provided with a longitudinally-extending capillary passage **15** and the enlarged upper portion **11** has a longitudinally-extending chamber **16** which communicates at its lower end with the upper end of the capillary passage **15**, as shown in FIGURES 1 and 3–5.

The capillary passage **15** is of the same length "*x*" as lower section **14** and is of predetermined and preselected volume. The particular volume of the capillary passage for any given pipette will depend upon the pipette's intended use, the material or materials intended to flow into the passage, and the desired position of the pipette during filling. For example, a capillary passage having a capacity of 50 cubic millimeters is generally considered a practical size limit for use in drawing blood samples, although the capacity may be as much as 100 cubic millimeters if considerable tipping of the pipette can be tolerated during a filling and measuring step. Normally, a capacity of .001 to 0.1 milliliter (1 to 100 cubic millimeters) is considered to be a practical size range.

At its free lower end, the pipette is provided with a tapered point **17**. In the illustration given, the conical

surface of the point tapers at an angle of approximately 30 degrees with respect to the pipette's longitudinal axis, although other angles of taper might be used.

The capacity of the chamber **16** of the pipette's upper section may be varied considerably and is limited only by practical considerations and the intended use of the pipette. At its upper end, the pipette is provided with a pair of integral and axially-spaced annular shoulders **18** and **19** which define an annular recess **20** therebetween. This recess receives and sealingly contacts the inwardly directed end flange or lip **21** of bulb **12**, the bulb being stretched slightly about the end of the pipette so that the tension of the material from which the bulb is formed will tend to maintain the parts in air-tight sealing contact.

As shown in FIGURE 1, the bulb is provided with a single small hole **22** which extends through the wall of the bulb and normally places the chamber **16** in communication with the outside. In the illustration given, the hole is located in the side wall of the bulb intermediate the upper and lower ends thereof. While other locations for the hole may be provided, it has been found that this location is particularly desirable in facilitating manipulation and operation of the pipette.

In the use of the pipette, a doctor, nurse or other technician grasps the device as shown in FIGURE 2 and, without squeezing bulb **12**, places the tip of the pipette into a drop or body **23** of blood or other liquid to be collected. The liquid flows upwardly into the capillary passage **15** by capillary attraction and automatically stops flowing when its concave meniscus **24** has reached the upper limits of the capillary passage (FIGURE 3). Since the chamber **16** of the upper section is substantially wider than the capillary passage, the forces of capillary attraction are not sufficiently strong to elevate the liquid level above the indicated point. This is particularly important in providing a rinsing pipette since there is no danger of a possible wetting of the walls of chamber **16** with blood or other liquid during the sample-taking step; if such wetting occurred, the amount of blood retained by the pipette would be uncertain and the accuracy of the test would be directly affected.

After a sample has been taken, the technician wipes off the end of the tip **17** and then flushes the sample into a measured quantity of water or other liquid **25** contained within tube **26**. The discharge of blood from the capillary tube is easily accomplished by simply closing off the opening or hole **22** with a finger and then squeezing the resilient bulb, thereby expelling the contents of the pipette as represented by arrows **27** in FIGURE 4. Thorough mixing of the diluent and blood is achieved by drawing the diluted sample back into chamber **16** of the pipette and well above the upper limits of capillary passage **15** (FIGURE 5), and then, in the manner already described, expelling the contents of the pipette back into the test tube. This rinsing action is repeated until the sample is uniformly diluted; ordinarily, three or four rinsing steps are sufficient. Since the capacity of chamber **16** exceeds the volume of the diluted sample, there is no danger that the pipette will become over-filled or that liquid will pass upwardly into bulb **12**.

In drawing liquid from the test tube upwardly into the pipette, a technician merely permits the squeezed bulb to return to its normal condition while at the same time holding a finger over port or opening **22** so that air cannot flow therethrough. As a result, the resiliency of the bulb, as it expands into a tension-relieving conditon, lowers the pressure within chamber **16** and permits the liquid from the tes tube to surge upwardly into the chamber.

While in the foregoing I have disclosed an embodiment of the present invention in considerable detail for purposes

of illustration, it will be understood by those skilled in the art that many of these details may be varied without departing from the spirit and scope of the invention.

I claim:

1. A rinsing pipette comprising a transparent tube having an upper rinsing section and a lower sample-receiving section, said lower sample-receiving section having a tapered lower end and having a narrow bore capillary passage of uniform cross section extending therethrough, said capillary passage being of a predetermined volumetric capacity within the range of .001 to 0.1 milliliter and being fillable under forces of capillary attraction when said tapered end is inserted into a body of liquid to be sampled, said upper rinsing section having an enlarged chamber of substantially greater diameter and volume than said capillary passage and communicating with said passage, said chamber and passage meeting along a line defining the automatic limit line for the intake of liquid into said passage by capillary attraction, whereby, said passage may be completely filled with a liquid sample of predetermined volume simply by inserting the lower end of said pipette into a body of liquid, and a collapsible bulb mounted at the upper end of said tube and communicating with said chamber, said bulb having an opening in the wall thereof and being adapted to be squeezed and released for rinsing said capillary passage with a sample-diluting solution and for thoroughly mixing a sample with said solution.

2. The structure of claim 1 in which said upper rinsing section and lower sample-receiving section of said tube are integrally formed of glass, said upper section having a volumetric capacity substantially exceeding the volume of a collected sample after dilution with a sample-diluting solution.

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