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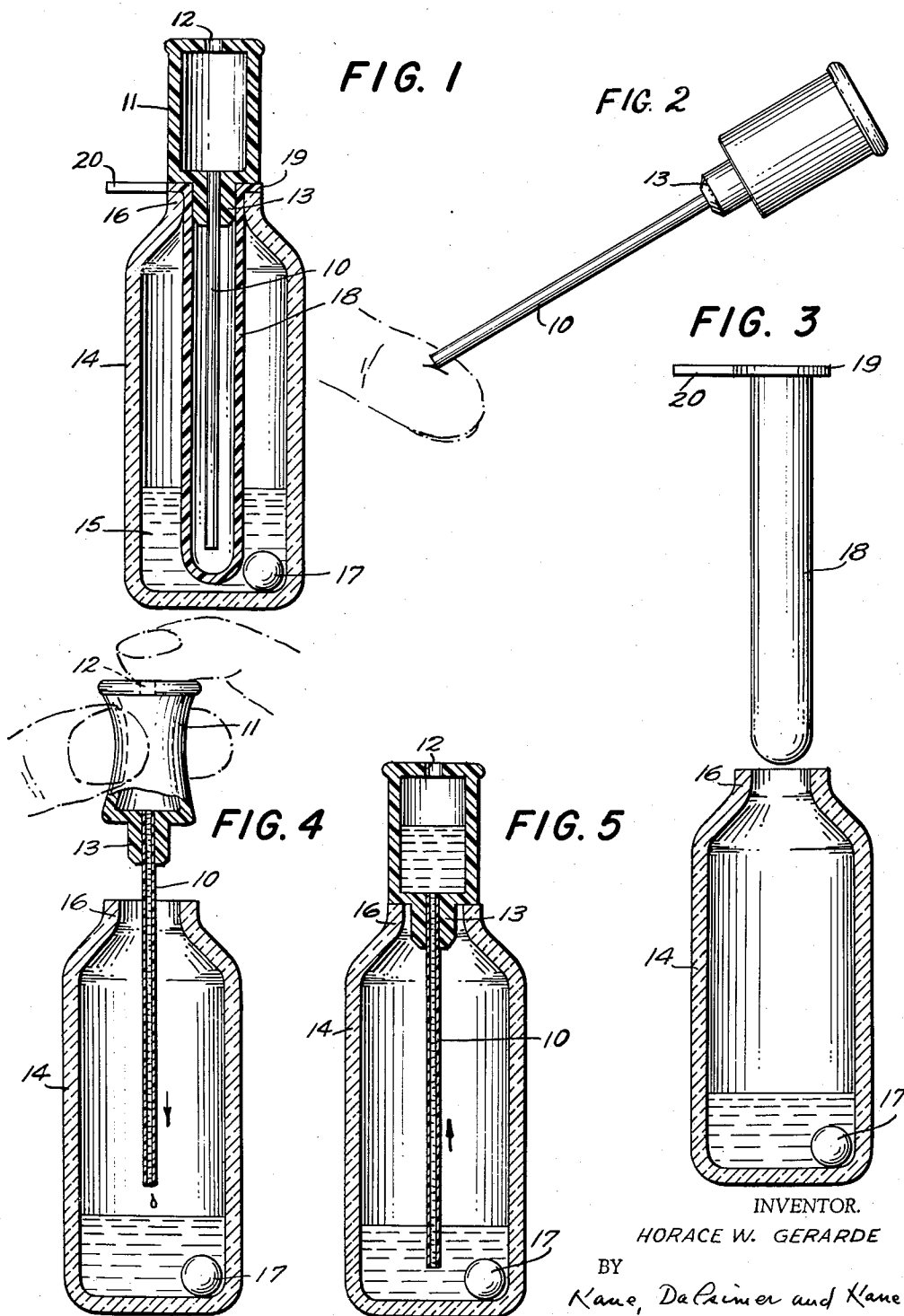
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PIPETTE ASSEMBLY

Filed Oct. 9, 1958

2 Sheets-Sheet 1



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FIG. 6

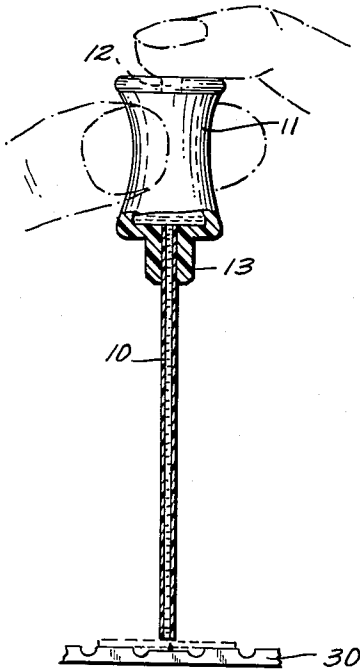


FIG. 7

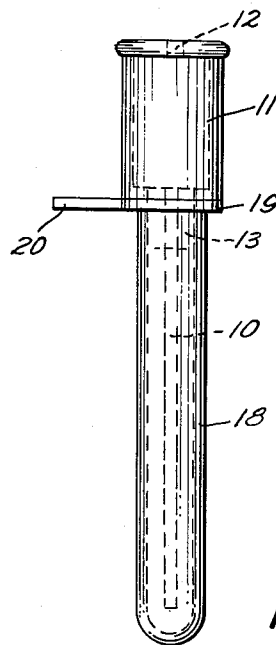


FIG. 9

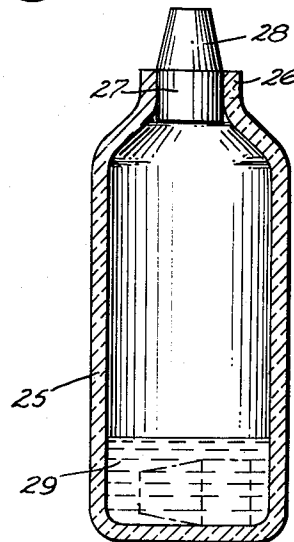
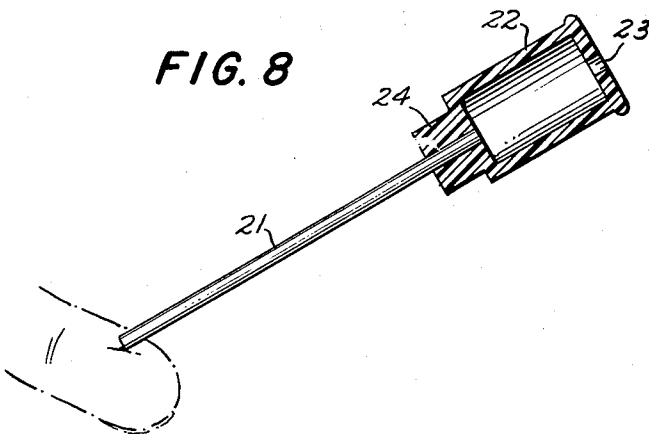


FIG. 8



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PIPETTE ASSEMBLY

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5 Claims. (Cl. 215—6)

This invention relates to a structurally and functionally improved pipette assembly especially intended for use in connection with blood counts.

It is an object of the invention to furnish a structure which will not require the services of a skilled operator, although the results obtained by the use of the improved apparatus will be entirely reliable and the accuracy may be depended upon.

Another object is that of providing a structure which will include relatively few components each individually simple and rugged in construction and capable of ready assemblage to furnish an economical and unitary apparatus. Accordingly, the assembly will have a "one-time" use, after which it is discarded. Therefore, the complications heretofore existing in connection with cleaning, sterilization, and dangers of inaccurate results obtained are completely avoided.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating practical embodiments, and in which:

Fig. 1 is a sectional side view of a complete assembly prior to use;

Fig. 2 is a perspective view illustrating an initial step in the technique;

Fig. 3 is a sectional side view of the receptacle and shield of the assembly in separated condition;

Fig. 4 is a view similar to Fig. 1, but showing an operational step subsequent to that illustrated in Fig. 3;

Fig. 5 is a similar view showing a still further operational step;

Fig. 6 illustrates the technique of expelling solution onto a hemocytometer;

Fig. 7 is a side elevation of the capillary and shield units in association with each other;

Fig. 8 is a view similar to Fig. 2, but showing a capillary unit of slightly different construction; and

Fig. 9 is a sectional side view of a receptacle for use with the unit as illustrated in Fig. 8.

Referring primarily to Fig. 1, there has been illustrated a complete assembly in the form in which it will be initially presented to the technician. In that view, the capillary unit includes a tube 10 preferably of glass and having a bore of accurate dimension. The upper end of this tube is secured to a bulb 11 having a vent opening 12. This securing is conveniently effected by extending a portion of the bulb to provide a plug or stoppering part 13. Bulb 11 is formed of rubber or plastic material having the characteristic of automatically restoring to its initial shape. Tube 10 having a uniform bore of small diameter, it follows that for a given length of tube, a liquid column accurately conforming to a predetermined volume may be achieved by filling that bore with liquid. In view of its small diameter, it will function as a true capillary and cause liquid to automatically rise within it to a point where it fills the complete tube.

A receptacle has been illustrated which conveniently takes form of a bottle 14 of glass. Within this receptacle a volume of liquid diluent 15 is disposed. The quantity

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of such liquid is accurately related to the capacity of bore 10 so that the desired solution consistent with the test being performed will be accurately achieved. The receptacle 14 conveniently terminates in a neck portion 16. Disposed within the receptacle is a mixing bead 17 formed of any suitable material and preferably having a specific gravity such that it will sink through the body of liquid 15 to the base of the receptacle.

As will be observed in Fig. 1, the diameter of the plug or stoppering portion 13 is less than the internal diameter of the neck 16. Also, a shield in the form of a tubular member 18 is provided, having its lower end closed and its upper end open. This member is formed of any desired material such as a suitable plastic. It is preferably made with an outstanding flange 19 adjacent its open end. This flange throughout one zone is continued as a tab 20.

The internal diameter of member 18 is such that it will accommodate the plug portion 13 snugly within its bore. The external diameter of this member corresponds to the internal diameter of neck portion 16. The major portion of flange 19 may have a diameter equal to the external diameter of the neck, with tab 20 extending materially beyond the surface of the latter. As shown, the length of tubular member 18 is adequate to accommodate the body of tube 10. The parts are proportioned so that ample space is provided for the pellet or mixing bead 17 to be positioned within the receptacle without interference.

Substantially the same structures insofar as the capillary unit and receptacle are concerned is shown in Figs. 3 and 9. In the first of these views, a tube 21 corresponding to tube 10 is provided. This tube has attached to it a bulb 22 provided with a vent opening 23. In common with the structure shown in the earlier figures, this vent opening is disposed in a surface of the bulb such that the finger of an operator may engage that surface for the purpose of sealing the vent. A stoppering or plug portion 24 preferably forms a part of the bulb and generally corresponds to portion 13.

Insofar as the receptacle of Fig. 9 is concerned, it involves a suitably shaped body 25 including a neck portion 26 normally closed by a stopper 27. This stopper is formed of a material such as "Teflon," and preferably has a reduced outer end portion 28. Within the receptacle 25, a body of liquid diluent 29 is provided. The volume of that body is precisely related to the volume of the liquid column defined by the bore of tube 21. It is preferred that the stopper 27 have such a specific gravity that it will sink through the body of liquid 29 and come to rest on the base of the receptacle to thus function as a mixing bead.

Considering now the technique of using the device as shown in Fig. 1, the operator will lance the finger of a patient, to produce on the skin surface a drop of blood as shown in Fig. 2. At that time or prior thereto, the bulb 11 will have been grasped to withdraw the capillary unit from receptacle 14. At the same time the shield 18 may be removed. This is effected by simply grasping tab 20 and exerting a pull to effect its withdrawal from the receptacle.

The outer end of tube 10 is immersed in the drop of blood. With the vent 12 being unobstructed, blood will be automatically drawn upwardly within the bore of tube 10 under capillary action. The inflow into the bore will cease when the latter has been filled with blood.

The tube 10 is now introduced into the receptacle body and the vent 12 is sealed by the finger, as shown in Fig. 4. Now, by compressing bulb 11, the column of blood is forced from within tube 10 into the body of diluent 15. If thereupon, tube 10 has its lower end projected to a point where it is immersed in the solution, a column of liquid will again be reestablished within the bore under capillary action.

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Following this, the procedure illustrated in Fig. 4 may be again resorted to. With the repetition of these steps, it is apparent that the bore of the tube will be cleaned so that any blood which would tend to adhere to that bore will pass into the solution. Of course, a definite scavenging action may be resorted to by maintaining the finger over the vent and releasing and compressing the bulb several times. This, however, is liable to result in a condition such as has been shown in Fig. 5, in which the bulb has been partially filled with the solution. Obviously, under those circumstances the capillary unit should be manipulated to assure a substantially complete expulsion of any solution within the bulb or the bore of tube 10.

Now, by agitating the assembly, the mixing bead or pellet will assist in the creation of a uniform solution. Thereafter, by aspirating the bulb a certain amount of solution may be drawn up into tube 10 and subsequently expelled out the surface of a hemacytometer 30, as illustrated in Fig. 6. Obviously, if instead of a count being immediately resorted to, a physician desires to forward the solution to a laboratory, then the parts may be properly stoppered. This is achieved, for example, as in Fig. 3, after the establishment of the solution by inserting shield 18 into the receptacle and thereupon inserting the tube and stoppering portion of the capillary unit into the shield. Under these circumstances, the condition of the parts shown in Fig. 1 is reestablished. The solution will be amply protected and may be used without difficulty by the laboratory technician.

Precisely the same general technique is followed in the use of the apparatus as shown in Figs. 8 and 9. In other words, under capillary action blood fills the bore of tube 21. However, an operator will push inwardly on stopper 27 to cause the tapered zone of the latter to lie adjacent the bore of neck 26. Under these circumstances, the stopper will be freed from frictional retention by the receptacle wall and will drop into the solution body 29 to function as a mixing pellet or bead. It will be observed that the plug or stoppering portion 24 of bulb 22 has a diameter corresponding to the bore face of neck 26. Therefore, with this stoppering portion disposed within the neck 26, it will in effect seal the receptacle (except for the passage provided by vent 23) and will serve to retain the capillary unit in position.

Thus, among others, the several objects of the inven-

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tion as specifically aforementioned are achieved. Obviously, numerous changes in construction may be resorted to and the steps of the method may be varied without departing from the spirit of the invention as defined by the claims.

I claim:

1. A pipette assembly including in combination a capillary tube having a bore of constant cross-sectional area and of a reduced diameter such that liquid will rise throughout its length solely as a result of surface tension to furnish a liquid column of predetermined volume, a compressible bulb mounted by the upper tube end and formed with a venting opening such that the aforesaid rise of liquid may occur, a receptacle having an open end and to contain a diluent in a quantity precisely related to the liquid volume of said capillary tube, and means for supporting such tube within said receptacle and with the bulb extending exteriorly thereof.

2. In an assembly as defined in claim 1, said bulb including a surface contactable with an operator's finger to seal said opening, under which conditions, pressing of said bulb will create air pressure interiorly of said bulb.

3. In an assembly as defined in claim 2, said opening and surfaces being included in an end of said bulb opposite such tube.

4. In an assembly as defined in claim 1, a tubular member having a closed and an open end, an outwardly extending flange forming a part of said member, said capillary tube extending into said member with said bulb seating against its flange and said member projecting into said receptacle with its flange overlying and in engagement with the surfaces adjacent the open end of the latter.

5. In an assembly as defined in claim 4, the diameter of said flange being substantially equal to the diameter of the surfaces defining the receptacle opening, and a tab portion projecting from said flange radially of and beyond the receptacle surfaces.

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