Dec. 28, 1954 N. DOVAS 2,697,945

SUCTION DEVICE FOR BLOOD DILUTING PIPETTES

Filed Aug. 5, 1952

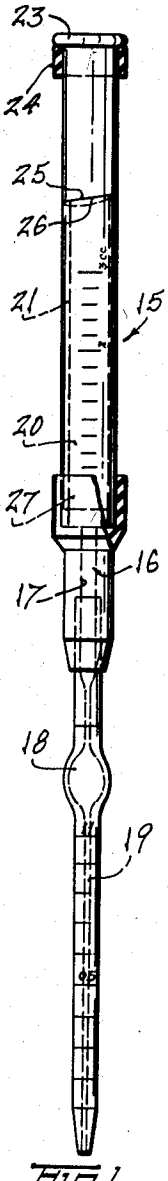

Fig. 1.

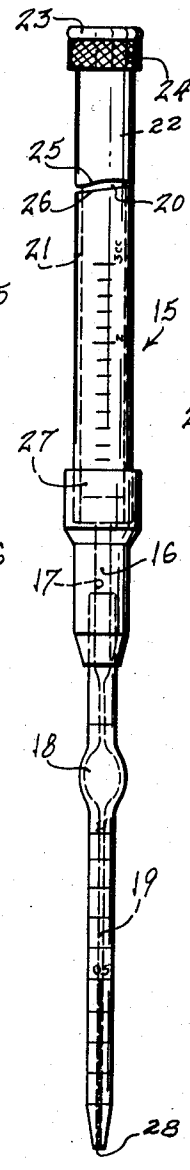

Fig. 2.

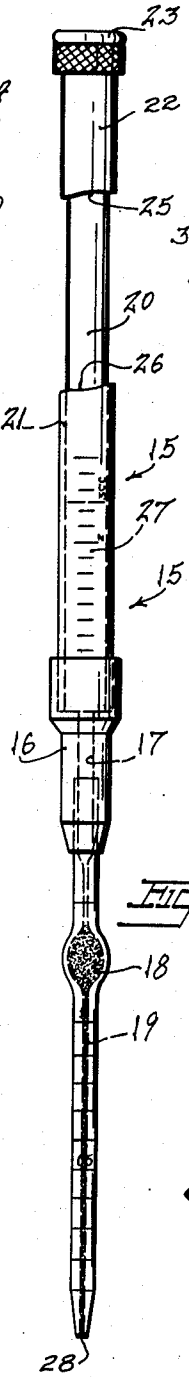

Fig. 3.

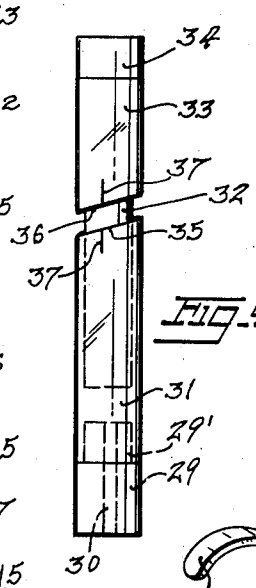

Fig. 4.

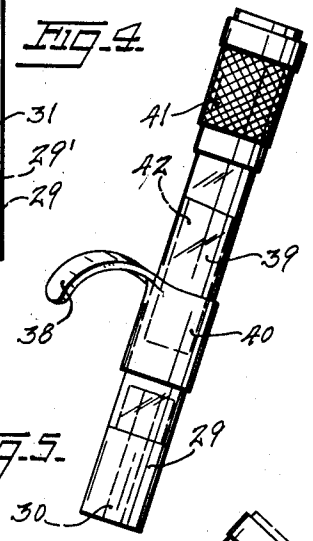

Fig. 5.

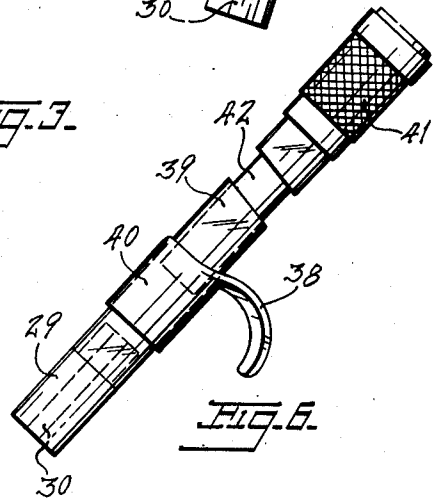

Fig. 6.

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SUCTION DEVICE FOR BLOOD DILUTING PIPETTES

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8 Claims. (Cl. 73—425.6)

This invention relates to new and useful improvements in suction devices for blood diluting pipettes.

More particularly, the present invention proposes the construction of an improved suction device which will hold a blood diluting pipette and which can be operated with one hand to draw a definite amount of fluid into the pipette quickly, accurately, conveniently, and safely.

Another object of the present invention proposes forming the suction device with a hollow cylinder or barrel and a plunger and providing cam surfaces on the two so that a precise amount of blood can be drawn into a blood diluting pipette merely by twisting or turning the plunger. The pipette can then be quickly and accurately filled with diluting fluid by pulling outwardly on the plunger.

Still further, the present invention proposes constructing the tube and plunger so that two degrees of suction can be obtained by mechanical actions easy to initiate and simple to understand.

As a further object, the present invention proposes arranging the suction device so that it will be compact to carry and efficient to use.

The present invention further proposes a novel arrangement of a suction device having a cylinder and cam operated sliding plunger with means to hold the cylinder firmly and securely with one hand while the plunger is rotated with the same hand to cause the plunger to be moved through a portion of its suction stroke.

For further comprehension of the invention and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a side view of a suction device for blood diluting pipettes constructed and arranged in accordance with the present invention with a pipette inserted therein and with parts of the device broken away.

Fig. 2 is a view similar to Fig. 1 with no parts broken away and illustrating the revolved position of the plunger with blood drawn into the pipette to a corresponding degree.

Fig. 3 is a view similar to Fig. 2 but showing the plunger drawn out and the pipette filled the rest of the way with diluting fluid.

Fig. 4 is a side view of a suction device similar to that shown in Figs. 1 to 3 inclusive but illustrating a modification of the present invention.

Fig. 5 is a view similar to Fig. 4 but illustrating a further modification of the present invention.

Fig. 6 is a view generally similar to Fig. 5 but showing the other side and the plunger partly withdrawn from the cylinder.

The suction device for blood diluting pipettes, in accordance with the first form of the invention illustrated in Figs. 1 to 3 inclusive, has a hollow cylinder **15** which may be of plastic or metal but preferably is a transparent glass. The cylinder **15** may be graduated as shown.

A resilient tube or nipple **16**, of rubber or flexible plastic, is secured to one end of the cylinder **15** as by having one end of the tube or nipple **16** stretched over or frictionally engaging the cylinder end.

Tube **16** has a passageway **17** through it extending from the cylinder engaging end to the other end. A blood diluting pipette **18** is secured to this tube **16**, one end of the pipette being frictionally held in the passageway **17** at the free end of the tube or nipple.

Pipette **18** has a passageway **19** through it and this passageway is connected with the hollow cylinder when the pipette is in the tube or nipple **16** and the tube or nipple is on the cylinder.

A plunger **20** slidably fits in the cylinder **15** extending in the end of the cylinder opposite from that to which the connecting tube **16** is secured. Preferably the plunger is made solid and of material such as ground glass, plastic, or metal. The portion of the plunger slidably fitting into the bore **21** of the hollow cylinder is of a diameter only slightly less than the diameter of the cylinder bore **21** to make a sliding fit therein.

The outer end **22** of the plunger **20** is of a larger diameter and terminates in a flange **23**. A resilient gripping band **24**, preferably of rubber, fits on the outer end **22** of the plunger adjacent the gripping band **24**.

A cam surface **25** is provided on the enlarged outer end portion **22** of plunger **20** adjacent the end of the cylinder **15** receiving the plunger and a like cam surface **26** is provided on this end of the cylinder too. When the plunger is fully inserted into the cylinder the two cam surfaces fit together making a continuous contiguous surface of the outer surface of the cylinder **15** and the outer surface of the enlarged outer end **22** of the plunger **20**. Preferably, the plunger's outer end **22** is of the same diameter as the outer diameter of the cylinder. The inner end **27** of the plunger **20** does not need to extend to the nipple or tube encased end of the cylinder but may be of any length desired depending on the stroke wanted.

The plunger **20** is not only slidable in the cylinder **15**, it is also rotatable therein. Thus, as indicated in Fig. 2 when the pointed free end **28** of the pipette **18** is inserted in a drop of blood on a slide or other surface (not shown) and the plunger **20** rotated in the cylinder, it will be apparent that the cam surfaces **25** and **26** will interact to cause the plunger **20** to be forced rearwardly for a portion of its stroke.

By regulating the slope of the cam surfaces, any predetermined amount of plunger travel can be provided. In the illustration shown in Fig. 2, the cam surfaces on the cylinder and on the plunger are sloped or beveled to such a degree that the suction created by rotating the plunger will be sufficient to draw up the blood to the desired level or mark for either the red or white celled diluting pipette.

It will also be apparent that the laboratory technician or other operator can hold the cylinder in one hand to draw up blood into the pipette and can rotate the plunger by turning the grasping band **24** between the thumb and index finger of the same hand drawing up an accurate predetermined amount of blood. Once this amount is drawn into the pipette as by rotating the plunger, the plunger **20** may be pulled out as shown in Fig. 3 to rapidly fill the pipette the rest of the way with blood diluting fluid. This makes the operation of drawing and diluting blood a quick and accurate one.

The modification of the invention illustrated in Fig. 4 is characterized by having a resilient plug **29** with a central opening **30** large enough to receive and frictionally hold the rear end of a blood diluting pipette. Plug **29** preferably is of the same diameter as the outside diameter of a hollow cylinder or tube **31** and abuts the bottom edge thereof and has an end portion **29'** of smaller diameter to frictionally fit within the inner diameter of one end of the tube **31**, to retain the plug therein.

Plunger **32** is of substantially the same diameter as the inside diameter of the tube so that the plunger is slidable in the tube through the other end of the tube. The outer end portion **33** of the cylinder is enlarged and of the same diameter as the outer diameter of the tube. A gripping band **34** is secured to this outer end portion **33** of the plunger and cam surfaces **35** and **36** are provided on the cylinder or tube and on the outer end portion **33** of the plunger. Aligned markings **37** are also provided on the cylinder or tube and the outer end portion **33** of the plunger readily to tell when the plunger is "bottomed" or at the beginning of its stroke.

The modification of the invention illustrated in Figs. 5 and 6 is characterized by the provision of a finger grip **38** secured to the cylinder or tube **39** as by a band **40** clamped to or frictionally held on the tube or cylinder

39. The gripping band 41 on the plunger 42 is also made wider to accommodate any size hand. The grip 38 may be an integral part of the cylinder or tube 39.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a suction tube for blood diluting pipettes, a plunger slidable and rotatable in the tube, said plunger being provided with a cam surface and said tube with a coacting cam surface, said cam surfaces when in contact being adapted to move the plunger through a predetermined portion of its suction stroke in the tube when the plunger is rotated.

2. In a suction tube for blood diluting pipettes, a plunger slidable and rotatable in the tube, said plunger being provided with a cam surface at the outer end and said tube with a coacting cam surface at the adjacent end, said cam surfaces being arranged so that rotation of the plunger in the tube moves the plunger through a predetermined portion of its suction stroke in the tube, and a resilent gripping band on the plunger adjacent its cam surface for rotating the plunger.

3. In a suction tube for blood diluting pipettes, a plunger slidable and rotatable in the tube, said plunger being provided with a cam surface and said tube with a coacting cam surface, said cam surfaces when in contact being adapted to move the plunger through a predetermined portion of its suction stroke in the tube when the plunger is rotated, and a resilient gripping band on the plunger adjacent its cam surface for rotating the plunger.

4. A suction device for blood diluting pipettes comprising a hollow cylinder, a plunger slidable in the cylinder, said cylinder having a cam surface at its other end and the plunger having a coacting cam surface abutting the cylinder cam surface when the plunger is fully inserted in the cylinder, said plunger also being rotatable in the cylinder to move the cam surface on the plunger against that on the cylinder and force the plunger partially out of the cylinder and through a predetermined portion of its suction stroke, said plunger being solid and having one end enlarged in diameter with the cam surface of the plunger formed on said end.

5. In a suction tube for blood diluting pipettes, a plunger slidable and rotatable in the tube, said plunger being provided with a cam surface and said tube with a coacting cam surface, said cam surfaces when in contact being adapted to move the plunger through a predetermined portion of its suction stroke in the tube when the plunger is rotated, said plunger being solid and having one end enlarged in diameter with the cam surface of the plunger formed on said end.

6. A suction device for blood diluting pipettes comprising a hollow cylinder, said cylinder having a cam surface at its other end and the plunger having a coacting cam surface abutting the cylinder cam surface when the plunger is fully inserted in the cylinder, said plunger also being rotatable in the cylinder to move the cam surface on the plunger against that on the cylinder and force the plunger partially out of the cylinder and through a predetermined portion of its suction stroke, said plunger being solid and having one end enlarged in diameter with the cam surface of the plunger formed on said end, said enlarged portion of the plunger being of the same diameter as the tube and there being aligning markings on the cylinder and plunger to indicate the aligned position of the cam surfaces and the starting position of the plunger stroke.

7. A suction device for blood diluting pipettes comprising a hollow cylinder having open ends, a plunger slidable through an open end of the cylinder into the cylinder, said plunger having an end portion of enlarged diameter extending from the cylinder, said plunger having a cam surface on the enlarged end portion adjacent the end of the cylinder receiving the plunger and said cylinder having a like cam surface on said end, said cam surfaces being adapted to move the plunger through a predetermined portion of a suction stroke in the cylinder when the plunger is rotated, said enlarged portion of the plunger being of the same diameter as the cylinder, there being aligning markings on the cylinder and the plunger to indicate the aligned position of the cam surfaces, and a gripping band on the enlarged end of the plunger for rotating it in the cylinder.

8. In a suction tube for blood diluting pipettes, a plunger slidable and rotatable in the tube, said plunger being provided with a cam surface and said tube with a coacting cam surface, said cam surfaces when in contact being adapted to move the plunger through a predetermined portion of its suction stroke in the tube when the plunger is rotated, and a finger grip on the tube to hold it as the plunger is rotated.

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