

June 3, 1952

M. H. CAULFIELD

2,599,370

DEVICE FOR OPERATING PIPETTES

Filed Nov. 24, 1948

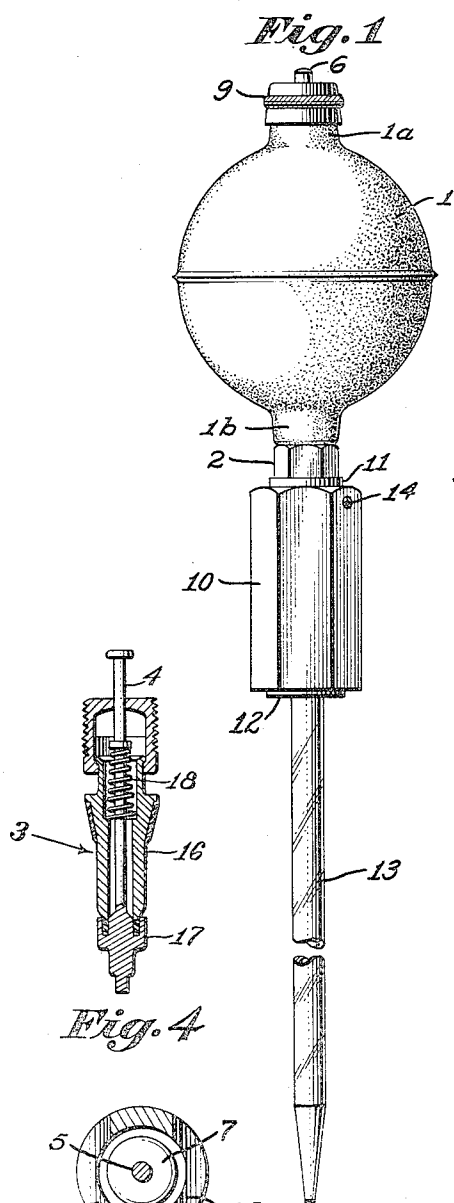


Fig. 4

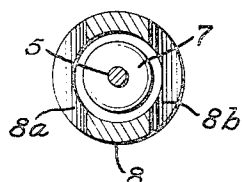
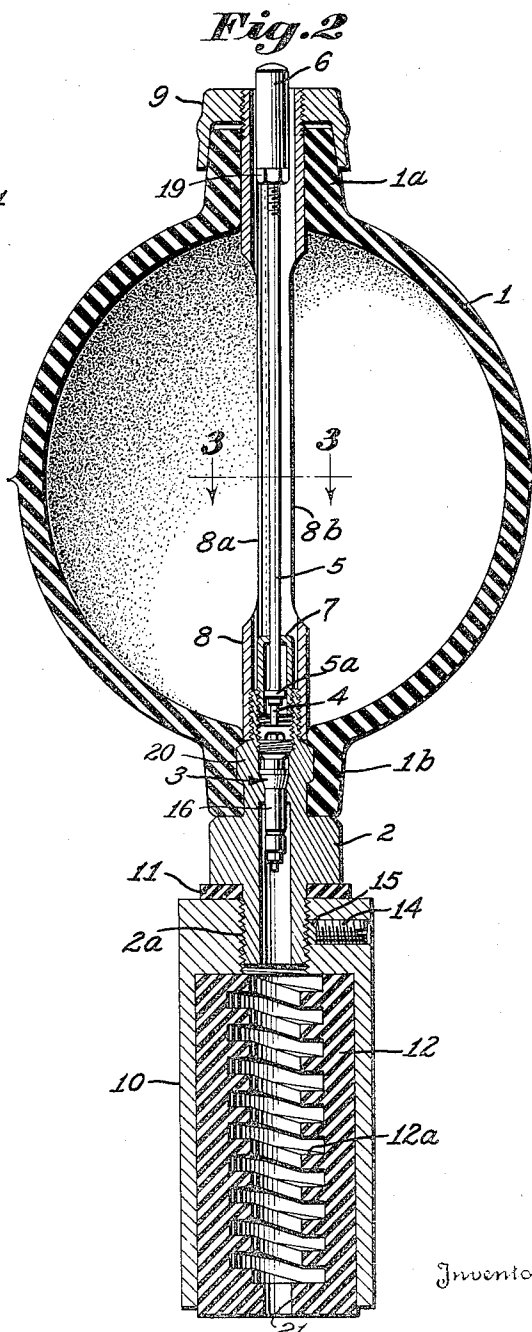


Fig. 3



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UNITED STATES PATENT OFFICE

2,599,370

DEVICE FOR OPERATING PIPETTES

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Application November 24, 1948, Serial No. 61,853

2 Claims. (Cl. 73—425.4)

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This invention relates to a suction device, and more particularly, to a suction device for operating a pipette or the like, and constitutes an improvement over the device shown in my prior Patent No. 2,172,575, issued September 12, 1939.

In order to overcome the hazards attending the drawing of liquid into a pipette by suction created by the mouth, and in order to provide an accurate control for measuring the amount of liquid discharged from the pipette, my prior patented device was provided, having a rubber bulb with an opening in each end, one of which openings is controlled by a spring closed check valve having a short stem extending bulbward. A rod extends through the bulb having one of its ends in proximity to the said valve stem for opening the check valve, and having its other end accessible at the other opening so that by manual depression of the rod the valve may be opened. Upon squeezing the bulb to exhaust the air therein, and thereafter depressing the rod with the finger, and simultaneously with the same finger closing the opening in the bulb from which the rod projects, suction is created on release of the bulb which acting through the valve will draw liquid into the pipette.

An outstanding disadvantage of the construction in my aforesaid prior patent is that an external bulb supporting frame is provided which encompasses a substantial outer surface area of the bulb, thereby interposing an obstruction when it is desired to squeeze the bulb, and at the same time unnecessarily adding to the weight, unbalance and cost of manufacture of the device. A further disadvantage is that the rod portion which extends through the bulb is subject to being bent if the bulb is excessively squeezed, which bending will interfere with the subsequent operation of the device.

One of the objects of the present invention is to provide a novel suction device which is particularly useful for operating a pipette or the like, and which is devoid of the disadvantages hereinabove mentioned.

A further object of the invention is to provide a suction device for a pipette, which device is relatively simple in construction, economical to manufacture, and which provides facility and accurate control of the measured amount of liquid discharged from the pipette.

A more specific object of the invention is to provide a suction device for use with a pipette wherein the external frame structure of my former patent is substituted by a simple tube extending axially through the bulb, in communica-

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tion with the chamber of the bulb and with the openings at the end of the bulb.

A still further object of the invention is to provide an internal tubular member extending through the bulb, which has the dual function of supporting the portion of the bulb surrounding one of the end openings, and serving as a protective shield for a valve operating rod extending axially through the bulb, and which might otherwise become bent as a consequence of the act of collapsing the bulb.

Other objects and advantages will become apparent from a study of the following specification, taken with the accompanying drawing, wherein:

Figure 1 is a vertical elevational view of a preferred embodiment of the invention as applied to a pipette;

Figure 2 is an enlarged sectional view of the structure shown in Figure 1 with the pipette omitted;

Figure 3 is an enlarged cross-sectional view taken along the line 3—3 of Figure 2;

Figure 4 is a longitudinal section through the valve assembly.

Referring more particularly to the drawing, numeral 1 denotes a bulb of rubber or the like, having an opening in each end defined by the boss-like portions 1a and 1b. In the lower opening, as viewed in the drawing, there is tightly embraced a nipple 2 in which a valve assemblage 3 is screwed, said assemblage including a cage 16 secured in said nipple having an annular valve seat at its lower end, a valve 17 with a stem 4 extending upward through said cage and beyond its upper end, said valve being normally pulled against its seat by a spring 18. A valve operating rod 5 having a lower head 5a is arranged to rest on the end of the valve stem 4, and the tension of the spring 18 is preferably not greatly in excess of what is necessary to sustain the weight of the valve and rod 5. The upper end of rod 5 extends through the upper opening of the bulb 1, and has a button 6 screwed on its upper end, by means of which the rod 5 is adapted to be manually depressed by the operator's finger. Since a single finger is employed to simultaneously depress the rod 5 and occlude the opening in the bulb through which the rod extends, the degree of extension is rather critical, so the button 6 can be adjusted in or out by virtue of its threaded connection with the rod 5, being held adjusted by the lock nut 19.

The nipple 2 carries a thimble 7 having a hole through which the rod 5 passes, serving as a guide for the rod, and preventing complete withdrawal of said rod from above, it being noted

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that the head 5a serves as a stop to limit the range of upward movement of the rod 5. On an outer threaded portion of the nipple 2, a tube 8 is screwed. The upper end of the tube 8 is externally threaded. Said tube extends through the bulb along the axis of the opposite openings in the bosses 1a and 1b. The latter boss is stretched in sealed relation about a headed extension 20 of the nipple 2. A cap 9 engages the upper threaded end of the tube 8 and telescopes fittingly over the boss 1a. The interface between said boss and the cap 9 is tapered so that an airtight seat is created between said cap and boss when the cap is screwed down upon the tube 8. The lower end of the tube 8 communicates with the valved opening and the boss 1b, while the upper end communicates with atmosphere. The chamber of the bulb 1 is placed in communication with the tube 8 by means of longitudinally extending openings 8a, 8b in the sides of the tube 8 which reduces the diameter of the central portion of said tube in certain planes so as to permit the bulb 1 to be collapsed to the maximum extent without interference by the tube 8. Said tube surrounds the rod 5 and acts as a shield to prevent the rod from becoming bent through excessive or uneven force applied to the bulb by the operator in collapsing it.

A coupling 10 of metal or other suitable material is screwed to a reduced extension 2a of the nipple 2, through the bore of said nipple extension. Said coupling is preferably of polygonal shape on the outside, to prevent the device rolling off when placed upon a table. In the drawing the coupling is shown secured by means of a set screw 14. 15 is a lead washer which seals the bore in which the set screw is threaded. A sealing washer 11 intervenes between the coupling and the adjacent end of the nipple 2.

The coupling 10 has a wide and deep counter-bore opening at its lower end, in which is pressed a sleeve 12 of rubber or other elastic material having a bore therethrough, the wall of which is formed with a spiral ridge 12a, as shown, and the lower end of which constitutes a washer having a restricted bore 21. One end of a pipette 13 which may be in the form of a graduated transparent tube, is inserted into the sleeve 12 frictionally fitting therein, and crowding the material of the spiral ridge 12a into the intervening helical groove forming a sealed joint between the pipette and sleeve.

In operation of the device, the lowermost or tapered end of the pipette 13 is immersed in the liquid to be drawn into the pipette. The bulb 1 is then collapsed by pressure of the fingers, the air being allowed to escape through the uppermost opening surrounding the button 6. While the bulb is in the collapsed state, the operator's finger is placed over the top opening of the tubular frame element 8 to seal the opening and at the same time the button 6 is depressed so as to open the valve 3. The pressure on bulb 1 is then released and the resulting expansion of the bulb creates a suction on the tubular pipette 13, which draws liquid into the latter. The extent of rise of the liquid in the pipette is clearly visible to the operator, due to its transparency. When sufficient liquid has entered the pipette, as indicated by the graduations thereon, the flow may be stopped by removing the finger from the top opening of the bulb and releasing the button 6 which allows valve 3 to close, and admits air to the interior of the bulb through the upper opening.

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When it is desired to measure out a portion of the liquid drawn into the pipette, this is accomplished by depressing the button 6, maintaining the finger in such position that the adjacent opening in the bulb is not sealed. Under these conditions, the liquid will flow by gravity from the pipette, and can be instantly cut off by relieving pressure upon the button 6, closing the valve.

If it is desired to accelerate the discharge of liquid from the pipette, the top opening may be completely sealed with the finger while exerting pressure on the bulb to collapse the latter, whereby the air in the bulb is forced downwardly into the top portion of the pipette. Thus, complete and accurate control of the flow of liquid into and from the pipette is afforded which movements are entirely visible to the operator.

Thus, it will be seen that I have provided an efficient, simple, and inexpensive suction device which is useful for operating a pipette or other liquid containing device wherein a simple support is provided within the bulb, which eliminates obstruction to the outer surface of the bulb that might otherwise interfere with the squeezing of the bulb, and at the same time, serves as a shield for protecting a valve operating rod enclosed by the bulb; also wherein such support is so shaped as to enable the bulb to be collapsed to a maximum extent to afford substantial suction.

While only a single embodiment of the invention is shown, it will be apparent that modifications will be readily suggested to others skilled in the art, after having had the benefit of the teachings of the present specification within the purview of the present invention, hence I do not wish to be limited except insofar as set forth in the following claims.

What I claim as my invention is:

1. Suction device for operating a pipette comprising a resilient bulb having a pair of openings at opposite ends, a rigid open ended tubular bulb supporting member passing axially through said bulb, frictionally fitting the walls of both of said openings in airtight manner, a normally spring closed valve in said tubular member adjacent one of said openings controlling the air flow through that opening, the opposite end of said tubular member being adapted to be stoppered by the finger, the wall of said tubular member within said bulb having an opening therethrough, a rod within said tubular member having one end in operative proximity to said valve and the other extending a short distance outside of the finger stoppered end of said tubular member in position to be depressed by the finger for opening said valve.

2. Suction device for operating a pipette, as claimed in claim 1, the wall of said tubular member within said bulb being cut away on opposite sides symmetrically with respect to an axial plane through said tubular member.

MERVILLE H. CAULFIELD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,172,575	Caufield	Sept. 12, 1939