

Dec. 13, 1966

A. R. PURSELL

3,290,946

PIPETTING DEVICE

Filed May 25, 1964

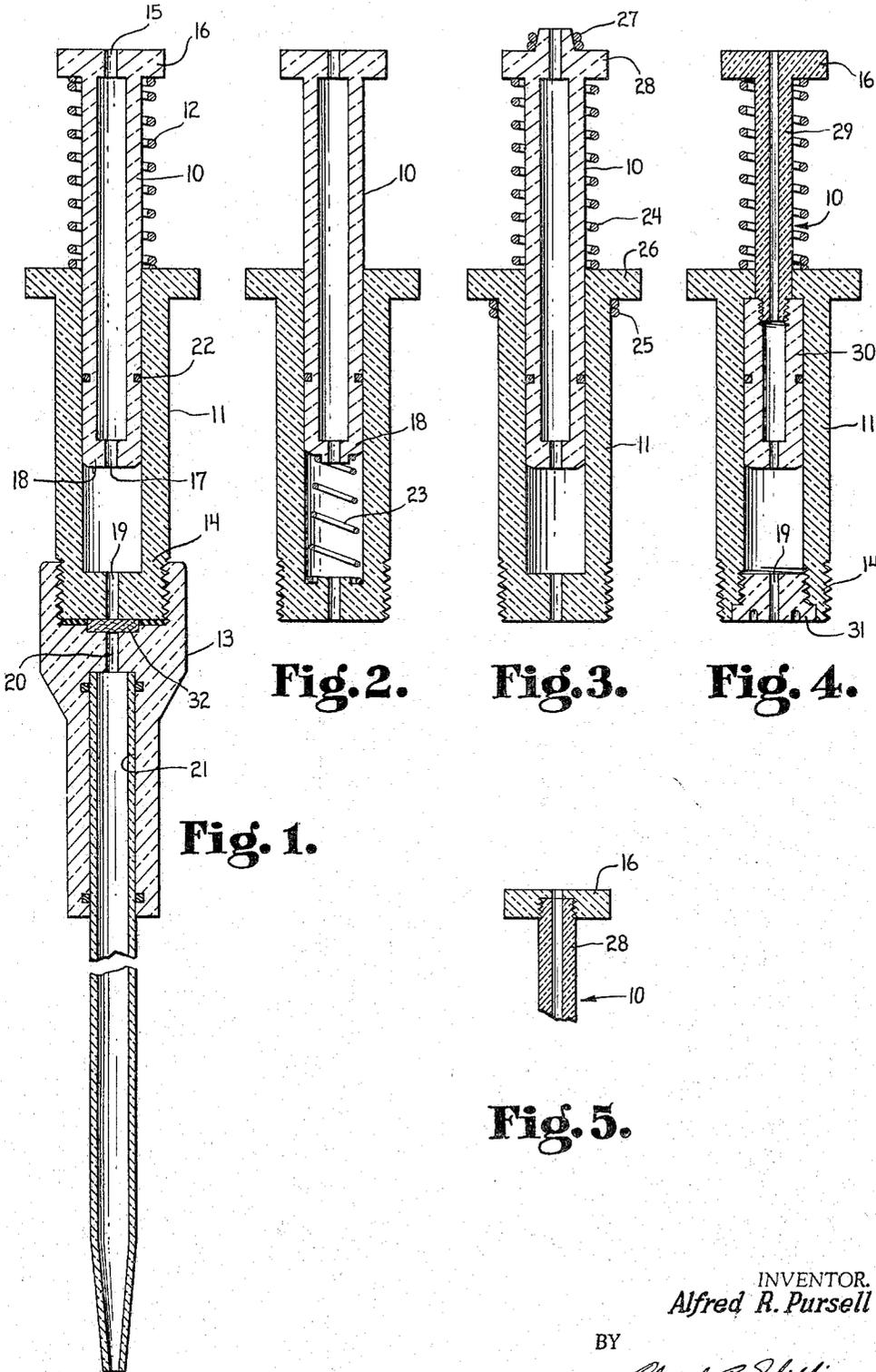


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1.

Fig. 5.

INVENTOR.
Alfred R. Pursell

BY
Edward E. Schilling
Agent

1

3,290,946

PIPETTING DEVICE

Alfred R. Pursell, Indianapolis, Ind., assignor to The Dow Chemical Company, Midland, Mich., a corporation of Delaware

Filed May 25, 1964, Ser. No. 369,865

7 Claims. (Cl. 73-425.6)

The invention relates to a manually operated device for drawing a liquid into a pipette.

It has long been a desideratum in the art to provide a manual device for filling pipettes which will satisfactorily replace pipetting by mouth and its attendant dangers. The devices as known to the prior art have generally suffered from the disadvantage that they must be disconnected if the pipette is to be discharged by gravity flow and controlled by the fingertip of the operator for maximum accuracy. Devices which are not designed to be disconnected before discharging the pipette generally operate so as to discharge a fixed volume or will discharge varied volumes as desired only on making a cumbersome change in parts or fittings or settings.

It is, therefore, a principal object of the invention to provide a pipetting device for the manual filling of a pipette which overcomes the disadvantages of the prior art devices.

A specific object of the invention is to provide a pipetting device by which a pipette is manually filled but which permits fingertip control of the discharge of the pipette without disconnecting the device from the pipette.

Another specific object of the invention is to provide a pipetting device which permits the operator to mix the sample, employing the assembled pipette device, and thereafter to fill the pipette without changing the assembly.

A further specific object of the invention is to provide a manual pipetting device which is conveniently suited to repetitive or volume work, whether uniform or varied amounts are to be dispensed.

Another object of the invention is to provide a manual pipetting device which is flexible enough in operation to permit fingertip control of gravity flow discharge of the pipette without disengaging the device or to accomplish blowout delivery from the pipette if desired.

These and other objects and advantages of the invention will be more clearly understood on becoming more familiar with the following description and claims and the appended drawings in which like numerals identify like parts.

FIG. 1 is a sectional view in side elevation of the pipetting device of the invention having a pipette operatively attached, and

FIG. 2 is a sectional view in side elevation of a different embodiment of the invention showing only the plunger and barrel with spring return means disposed inside the barrel, and

FIG. 3 is a sectional view similar to FIG. 2 showing the plunger and barrel of the device and illustrating different means for attaching and employing the spring means, and

FIG. 4 is a sectional view similar to FIG. 3 showing another means for limiting the outward movement of the plunger, and

FIG. 5 is a fragmentary sectional view showing another means of assembling the plunger.

The pipetting device as shown in FIG. 1 consists broadly of a hollow plunger 10, a complementary barrel 11, spring means 12 adapted to urge the plunger 10 outwardly of the barrel 11 throughout a substantial stroke relative to the barrel, and an adapter 13 connected to the dispensing end 14 of the barrel. There are provided, as essential features, an opening 15 through the finger-engag-

2

ing end 16 of the plunger 10, an opening 17 through the lower end 18 of the plunger 10 and an opening 19, through the dispensing end 14 of the barrel 11, which communicates with a channel 20 through the adapter 13 which in turn communicates with the pipette receiving opening or cavity 21 in the adapter 13.

If desired, the hollow plunger 10 may be provided with O-ring means 22 to provide a good resilient seal between the plunger 10 and the barrel 11. Also, any suitable pipette attaching means may be employed in place of adapter 13. For example, in place of the adapter shown in FIG. 1, there may be employed a Luer-lok connector if pipettes are employed having the appropriate top to engage such a connector. Or, if desired, the adapter may be in the form of a standard tapered glass joint in the event pipettes having ground tapered tops are employed. The adapter may be attached in any suitable manner: by a threadable connection, as shown in FIG. 1; by employing resilient material as the body of the adapter which slides onto the barrel; or by rigidly attaching the adapter to the barrel in a more permanent manner as by sealing or cementing.

In another embodiment of the invention as shown in FIG. 2, spring means 23 is disposed inside the barrel 11 below the end 18 of the plunger 10. Placing the spring inside the barrel has the advantage that it is not contacted by the hands of the operator so as to interfere in any manner with the manual operation of the pipette.

The embodiment of the device shown in FIG. 3 is provided with spring means 24 which performs two functions. The spring means 24 resiliently urges plunger 10 outwardly from barrel 11 but limits the outward movement of the plunger upon the spring reaching its normal uncompressed state. The spring means 24, as shown retains the plunger 10 by having one end 25 of the spring 24 wrapped around the barrel 11 below the flange 26 thereof and by having the other end 27 of the spring means 24 wrapped one or two turns around the plunger 10 above the flanged top 28 thereof. This embodiment of the device with retaining means provides the advantage that the plunger cannot fly completely out of the barrel if the operator's finger should slip from the top of the plunger while the spring is in the compressed condition.

In FIG. 4, there is illustrated another embodiment of the plunger and barrel portion of the invention in which a different retaining means is used to prevent untimely flight of the plunger. In this embodiment, the plunger indicated generally by the numeral 10 is provided with a smaller shank portion 29 adjacent the finger-engaging flanged top 16 and an enlarged lower portion 30 disposed within the barrel 11 and adapted to sealingly and slideably engage the walls thereof.

In order to fabricate a plunger-barrel combination with this type of retaining means, it is necessary to provide means of manufacturing and assembling the parts. As shown, the enlarged portion 30 of the plunger 10 is threadably attached to the smaller portion 29. The plunger is brought into the barrel through the dispensing end 14 which is thereafter substantially closed by a plug 31, which threadably fastens in place inside the end 14 and is provided with an opening 19 therethrough similar to the other embodiments. In another manner of assembling the apparatus with this type of retaining means, the finger-engaging end 16 of the plunger 10 is threadably attached, as shown in FIG. 5, to the smaller shank portion 29 in lieu of the threadable connection to the larger plunger portion 30 as shown in FIG. 4. The embodiments as illustrated in FIGS. 4 and 5 have the advantage that the extent of reciprocated motion of the plunger 10 is precisely limited and not subject to substantial

3

change as might occur if the spring means 24 should become substantially elongated permanently.

The apparatus may also be provided, if desired, with a biological filter 32 disposed transversely across the end of the opening 19 in the dispensing end 14 of the barrel 11 so as to filter all fluid, air or liquid passing through the opening 19.

The plunger and barrel of the apparatus of the invention may be prepared from any material which is suitably fabricated and which is not structurally deformed by sterilization techniques, e.g., autoclaving. Thus, the plunger and barrel will customarily be made of glass or stainless steel or aluminum or heat resistant polymeric material. The spring means is made of corrosion resistant steel, preferably stainless steel. The adapter is made of any suitable material appropriate to the design employed. The adapter shown can be made of metal or glass, or heat resistant, flexible, polymeric material. A Luer-lok type connector, of course, can be made of stainless steel, while a standard tapered joint connection will usually be made of glass but may be made of metal if desired.

In operating the present pipetting device, the device is ordinarily grasped about the barrel between the thumb and middle finger, ring finger and little finger, leaving the index finger free for the operation of the plunger. A pipette is inserted into or operatively attached to the adapter. The index finger is brought down upon the finger-engaging top of the plunger so as to depress the plunger into the barrel. The pipette is inserted in the liquid to be sampled. If it is desired to mix the liquid, as is frequently desired in serological work, the index finger is placed sealingly over the opening in the finger-engaging end of the plunger and the plunger is reciprocated up and down several times. If it is desired not to disturb or mix the liquid, the index finger may be rolled slightly to one side so as not to close the opening in the plunger. When the operator is ready to fill the pipette, the index finger is placed or maintained sealingly over the opening in the finger-engaging end of the plunger and the plunger is allowed to move out of the barrel under the urging of the compressed spring means. When the pipette has filled somewhat above the predetermined mark or graduation, the operator simply releases the index finger pressure momentarily so that the plunger rises to the normal position of rest, i.e., with the spring no longer compressed, while the index finger is removed momentarily from the opening in the plunger so as not to draw up more liquid into the pipette. The operator then brings the index finger into sealing relationship with the opening in the top of the plunger, raises the pipette out of the liquid and proceeds to pipette as is customary with normal mouth pipetting.

Among the advantages of the assembly is the fact that it is used with the same hand movements as the common laboratory pipettes now in use, and it is thus easy for technicians to readily acquire facility in the use of the apparatus.

The apparatus of the invention having been thus fully described, modifications thereof will at once be apparent to those skilled in the art, and the scope of the invention is to be considered limited only by the claims appended hereinafter.

I claim:

1. In a syringe employed as a manual pipette filling and dispensing device and having a hollow cylindrical plunger and a complementary barrel, said plunger and barrel fitting together in sliding, sealing relation, and said barrel having a dispensing end, the improvement which consists in:

- (a) spring means adapted to resiliently urge the plunger outwardly of the barrel of the syringe throughout a substantial stroke relative to the barrel;
- (b) an adapter sealingly attached to the dispensing end of the barrel, said adapter being adapted to re-

4

ceive and hold a pipette in sealing relationship in an opening therein;

(c) and a first opening through the finger-engaging top of the plunger for fingertip control of dispensing, said first opening communicating through the hollow plunger with a second opening provided through the bottom of the plunger, said second opening in turn communicating through the barrel with an opening through the dispensing end of said barrel, and said opening through the dispensing end of the barrel communicating with a channel in the adapter which communicates with the pipette receptive opening.

2. The improvement as in claim 1 in which the spring means is disposed inside the barrel of the syringe.

3. The improvement as in claim 1 in which the spring means is disposed around the plunger of the syringe and external to the barrel.

4. The improvement as in claim 3 in which the outward movement of the plunger is limited by attaching the spring means to the barrel and to the finger-engaging top of the plunger.

5. The improvement as in claim 3 in which the outward movement of the plunger is limited by the plunger having a smaller upper portion, and an enlarged lower portion, said lower portion being disposed slideably within the barrel and retained therein by an inwardly extending flange comprising the upper end of the barrel.

6. The improvement as in claim 1 having a biological filter disposed between the adapter and the dispensing end of the barrel of the syringe so as to filter all fluid passing through the dispensing end of the barrel.

7. An improved manual pipette filling and dispensing device which comprises:

a syringe comprising a hollow cylindrical plunger and a complementary barrel, said plunger having a finger-engaging top, a shank portion having a lower end, and said barrel having a dispensing end and a plunger receiving end, and said barrel receiving said plunger in sliding, sealing relation;

spring means disposed in conjunction with said plunger and said barrel so as to resiliently urge the plunger outwardly of the barrel throughout a substantial stroke of the plunger relative to the barrel;

an adapter sealingly attached to the dispensing end of the barrel, said adapter having a channel there-through, said channel communicating with an opening in the adapter, said adapter being adapted to receive and hold a pipette in sealing relationship in said opening;

a first opening through the finger-engaging top of the plunger for fingertip control of dispensing, said first opening communicating through the hollow plunger with a second opening provided through the bottom of the plunger, said second opening in turn communicating through the barrel with an opening through the dispensing end of the barrel, and said opening through the dispensing end of the barrel communicating with said channel in the adapter which communicates with the pipette receptive opening.

References Cited by the Examiner

UNITED STATES PATENTS

2,335,049	11/1943	Finkelstein	73—425.6
2,410,552	11/1946	Rosen	73—425.6

FOREIGN PATENTS

914,790	7/1954	Germany.
---------	--------	----------

LOUIS R. PRINCE, *Primary Examiner.*

DANIEL M. YASICH, *Assistant Examiner.*