

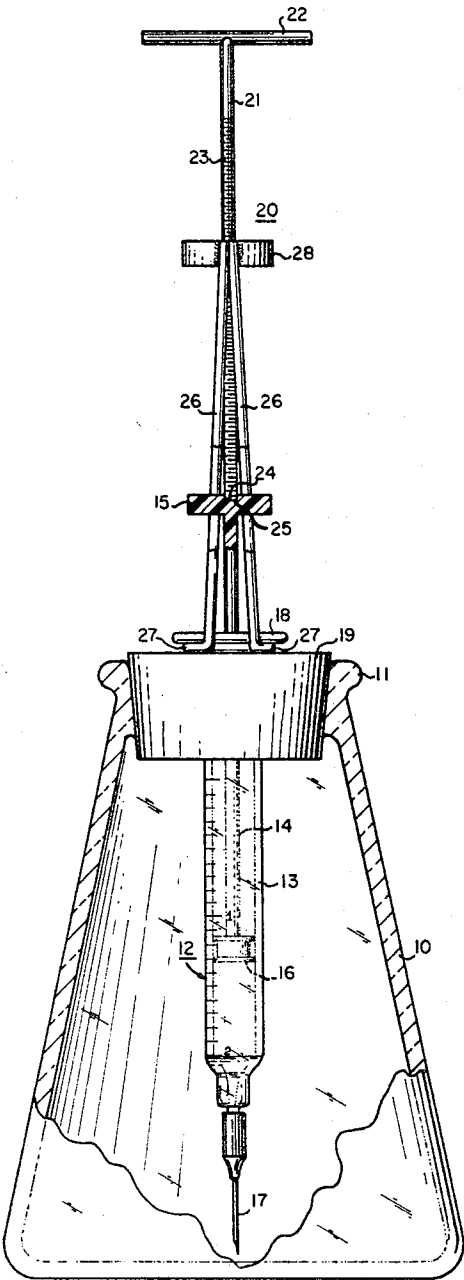
Nov. 12, 1968

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3,410,664

TITRATION APPARATUS

Filed Oct. 29, 1965



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3,410,664

TITRATION APPARATUS

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Filed Oct. 29, 1965, Ser. No. 505,767

3 Claims. (Cl. 23—253)

This invention relates to titration apparatus suitable for field use in making on site quantitative chemical determinations.

For monitoring in the field, ship or shore, of protective clothing which is impregnated with a protective chemical it is desirable that there be available a simple, low cost titration apparatus which in the hands of nontechnical military personnel can be used to readily achieve a high degree of accuracy in determining by chemical analysis the residual protective impregnate in the clothing. In addition to simplicity and low cost, the titration apparatus should be of small size and light in weight for handling and portability and have readily replaceable components.

It is an object of the present invention to provide a small, lightweight titration apparatus which in all respects meets the above requirements.

The above and other objects are achieved in the apparatus of the invention which in a presently preferred form is described hereinafter and illustrated in the single figure of the accompanying drawing.

The apparatus of the invention comprises, broadly stated, a small, flat bottom flask or bottle for containing the sample to be analyzed by titration and of a size which can be readily grasped in one hand and manually operable means having readily separable parts including a small syringe which is detachably connected to the flask for dispensing graduated amounts of a reagent to the sample in the flask in a slow and well-controlled manner.

Referring to the drawing the apparatus of the invention has a small glass flask or bottle 10 for containing the sample to be analyzed. The flask 10 is of a design to provide balance to the apparatus when its parts are assembled and in use. For this purpose the flask has a relatively wide flat bottom to give stability. While as shown, the flask is of tapered design it need not be of this conformation provided the base of the flask is flat and of sufficient width to provide stability as indicated above. The flask should be sturdy enough to resist breakage in use or storage. Suitably the flask is a standard urine specimen bottle stocked by the Navy Medical Corps. As shown, the flask has an annular lip 11 which facilitates gripping of the flask when the apparatus is in use.

The reagent which is to be added to the specimen in the flask 10 is contained in a small syringe 12 which may be of glass or plastic. The syringe as shown is of conventional design and of 2 milliliter capacity. The tubular portion 13 of the syringe has a 2½ inch length of graduated section. The syringe has a rod 14 which slides axially in the tube 13 to which a plate 15 is connected at the one end and a plunger 16 at the other end for axial movement of the plunger in the syringe to dispense the reagent through the orifice or needle section 17 into the sample in the flask. The syringe has an integral flange at 18, the function of which will be later described herein.

The syringe is held in suspended position in the flask by means of a resilient holding element 19, which as shown is a rubber stopper, inserted in the mouth of the flask and through which the syringe extends in a friction-tight fit.

A screw-type plunger-advance mechanism for downward movement of the plunger 16 of the syringe with a slow, well-controlled movement in dispensing the reagent from the syringe to the flask is indicated generally at 20.

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The plunger-advance mechanism 20 has a metal drive rod 21 which is provided with a handle or turning element 22 and a screw thread 23. The rod 21 is tapered at 24 to move into a small circular depression 25 in the upper surface of the plate 15 for engaging the plate for downward movement of the plunger 16 of the syringe.

The plunger-advance mechanism has a spring clamp for engaging the flange 18 on the syringe whereby to complete assembly of the apparatus. The spring clamp has a pair of rebent resilient metal rods 26, 26 in which the rebent section is flared outward in arcuate geometry at 27, 27 for engaging the flange 18. The upper ends of the rebent rods 26, 26 are attached to the periphery of a circular metal plate 28 as by brazing thereto. The metal plate 28 is drilled centrally and screw-threaded for movement of the screw-threaded drive rod 21 therethrough.

Assembly of the apparatus may be carried out by springing the arcuate ends 27, 27 of the resilient rods 26, 26 over the flange 18 of the syringe to engage the syringe with the plunger-advance mechanism 20. The lower portion of the syringe is then pushed through the rubber stopper or other resilient holding means 19 to the desired extent and this assembly engaged with the flask 10 for operation by insertion of the resilient stopper in the mouth of the flask.

A suitable flask for use in the apparatus is, for example, one having a volume of about 8 ounces and a mouth of about 1½ inches diameter. The over-all length of the plunger-advance mechanism 20, with the drive rod 21 advanced all the way toward the arcuate rebent portions 27, 27 of the resilient rods 26, 26, may be of the order of about 4½ inches. The over-all width of the rebent rods 26, 26 may be of the order of about ⅝ inch. The drive rod 21 may have a screw thread of 32 threads per inch. With a 2½ inch length of graduated section in a 2 milliliter syringe, a 32 threads per inch screw advance will result in the delivery of one milliliter of the liquid reagent per 80 turns of the drive rod 21, or 0.0125 ml. per turn from the syringe to the sample in the flask 10.

In the use of the titration apparatus of the invention, the syringe is filled within the graduated section with the liquid reagent for the test by drawing in the liquid in the usual way and then assembled to the plunger-advance mechanism 20 with the resilient stopper in place over the lower end of the syringe. This assembly is secured by means of the resilient stopper in the mouth of the flask containing the sample to be analyzed by titration with the liquid reagent. The liquid reagent is dispensed from the syringe to the sample in the flask by downward turning of the screw-threaded drive rod 21 until it contacts the plate 15 at 25. The downward turning of the drive rod 21 is continued with axial downward movement of the plunger 16 at a rate which is determined by the number of turns per inch of the screw thread on the rod 21 to deliver an amount of the liquid reagent to the sample in the flask which is measured by the graduated scale on the syringe.

In a specific application of the titration apparatus of the invention to the determination of chloramide in a protective clothing a sample, 1" x 1", is punched out of the clothing and placed in the flask 10 along with chloroform, glacial acetic acid and aqueous potassium iodide solution, followed by addition of an aqueous starch suspension. The chloramide reacts with the potassium iodide to form free iodine (brown color) in the solution. The starch reacts with the iodine to give a characteristic blue color to the sample liquid. Addition of an aqueous solution of sodium thiosulfate of known concentration is made from the syringe until the blue color is discharged in the sample liquid. The total amount of sodium thiosulfate solution added is read from the graduated scale on the

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syringe and by calibration gives the content of chloramide in the cloth sample.

While the invention has been described with reference to a specific embodiment thereof, the same is intended by way of illustration and not in limitation except as may be required by the appended claims.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. An apparatus for titration which comprises:

a flat wide bottom glass flask,

resilient means closing the mouth of said flask,

a syringe suspended in said flask by extending through

said resilient closure means in friction fit therewith,

said syringe having an axially movable rod therein,

a plunger attached to said rod at one end and arranged

on axially downward movement to cause liquid to

be delivered from said syringe,

means for moving said plunger downwardly in said

syringe at a slow, measured rate and including a

spring clamp having resilient arms for releasable

attachment to said syringe.

2. An apparatus as defined in claim 1, wherein the axially movable rod in said syringe has a plate attached thereto at the end opposite to that at which the plunger is attached thereto, and

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said means for moving said plunger downwardly at a slow, measured rate includes a rotatable rod having a screw thread thereon of a predetermined thread count and arranged to contact the upper surface of said plate for downward axial movement of said plate.

3. An apparatus as defined in claim 2, wherein the rotatable rod of said means for moving the plunger of the syringe downwardly at a slow, measured rate extends through a threaded guide plate and the resilient arms of the spring clamp are fixed at one end to said guide plate.

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