July 24, 1973 H. E. HORLACH 3,748,099

LIQUID HANDLING DEVICE

Filed Sept. 7, 1971

Fig. 1

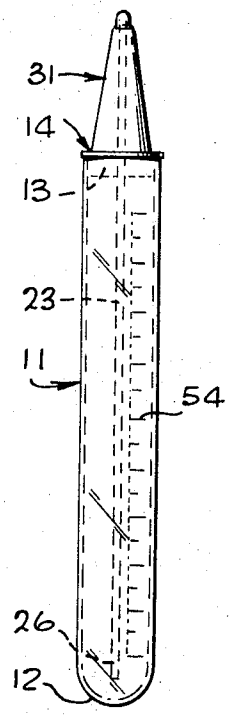


Fig. 2

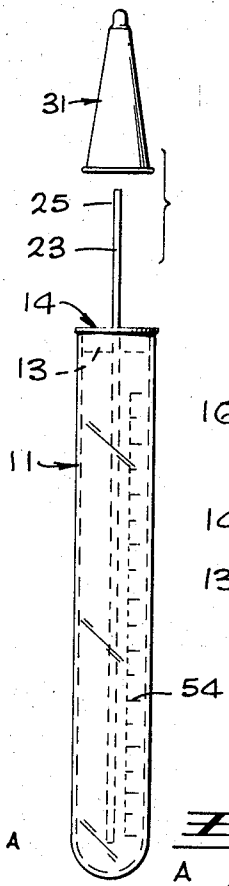


Fig. 3

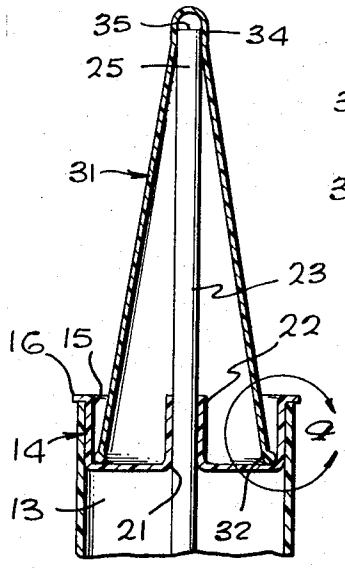


Fig. 4

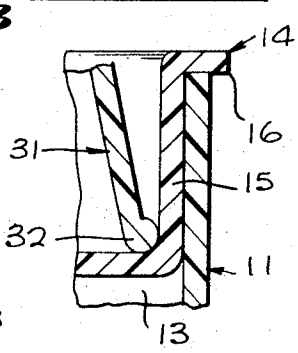


Fig. 5

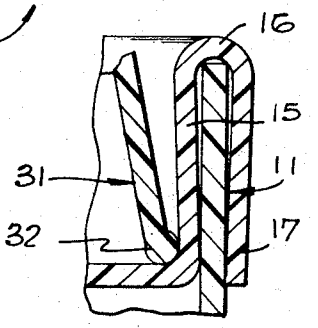


Fig. 8

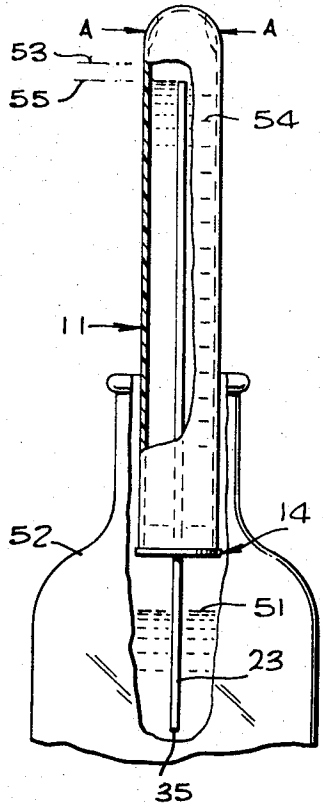


Fig. 9

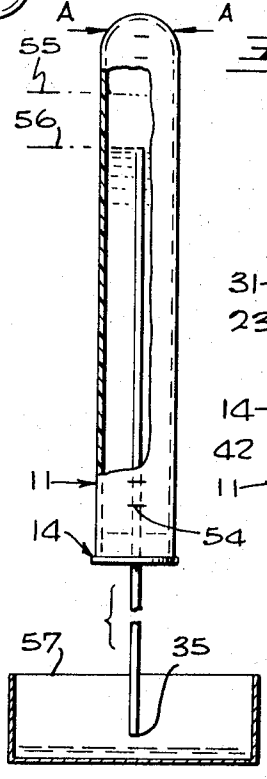


Fig. 6

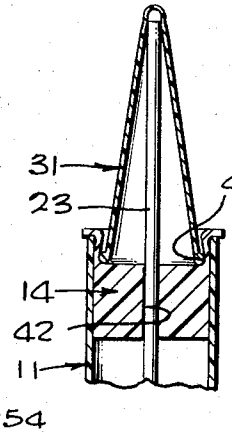
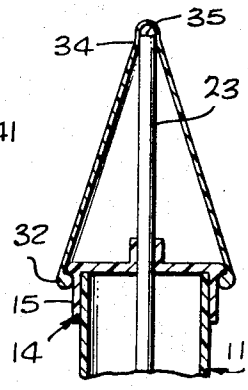


Fig. 7



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LIQUID HANDLING DEVICE

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U.S. Cl. 23—259 3 Claims

ABSTRACT OF THE DISCLOSURE

A device for storing and transferring liquids, comprising an elongated container of resilient material, having an open end sealed by a removeable closure provided with a sleeved port through which a thin, flexible pipette is slidably inserted with one end extending outwardly therefrom, and a hollow cap adapted to be seated releasably on the closure over the port and and the exposed portion of the pipette and to engage and seal the end of the pipette when so seated.

SUMMARY OF THE INVENTION

This invention relates to devices for storing and transferring liquids, and more particularly to containers for receiving and storing liquid clinical specimens and dispensing aliquot portions therefrom.

Modern medical diagnostic and therapeutic technology places heavy emphasis on the clinical laboratory analysis of biological fluids by means of a variety of procedures. The number and complexity of these procedures and the sophistication of the instruments used to perform them have led to the development and widespread use by the medical profession of large remotely located commercial clinical laboratories. Specimens, such as blood or urine samples, are taken from patients in physicians' offices, clinics, public health facilities, and in some cases by the patients themselves in their homes, and are transported to these laboratories for analysis.

Previously specimen jars, test tubes and other containers of glass were used for specimen collecting, transferring and storage. The use of such containers created an ever present danger of breakage and spillage, and the relatively high cost of their manufacture necessitated their re-use with the attendant requirement for costly washing and sterilizing equipment. Where the distance to the laboratory was substantial, their weight and bulk added considerable mailing or transportation costs to the basic laboratory charges.

Once the container with its enclosed specimen arrived at the laboratory, aliquot portions were removed by decanting or pipetting. Carried out repeatedly, and with a large number of containers, this process was both tedious and time-consuming and necessitated the use, storage, maintenance, cleaning and stirilizing of a substantial supply of the not-inexpensive pipettes themselves.

One of the objects of this invention is the provision of a liquid handling device for clinical laboratory use, which provides means for both storing and transferring liquid specimens. Another object is the provision of such a device which is substantially unbreakable and nonspillable and which is sufficiently light in weight and compact to be stored and transported conveniently. A further object is the provision of a liquid handling device of this type which can be manufactured inexpensively in disposable form. Other and further objects will become apparent from a reading of the specification which follows, as illustrated by the attached drawing in which:

DESCRIPTION OF THE DRAWING

FIG. 1 is a side view illustrating a flexible transparent test tube, closure, pipette and cap embodying the subject invention;

FIG. 2 is an exploded view of the device of FIG. 1 with the cap removed;

FIG. 3 is an enlarged side sectional view showing the construction of the upper portion of the device illustrated in FIG. 1;

FIG. 4 is a still further enlarged fragmentary view of the portion of FIG. 3 designated by the numeral 4;

FIG. 5 is a view similar to that of FIG. 4 illustrating a modified form of the embodiment of the invention illustrated in FIG. 4;

FIG. 6 is a fragmentary side sectional view of a modified form of the device shown in FIG. 3;

FIG. 7 is a fragmentary side sectional view of another embodiment of the device illustrated in FIG. 3;

FIG. 8 is a fragmentary side view illustrating the operation of the device shown in FIG. 1 to withdraw liquid from another container; and

FIG. 9 is a fragmentary side view illustrating the operation of the device of FIG. 8 to discharge an aliquot portion of its contents.

Wherever practicable like numerals are used to identify the same or similar features in the several views.

DETAILED DESCRIPTION OF THE INVENTION

As illustrated in FIGS. 1–3, a preferred form of the invention comprises a thin walled generally cylindrical test tube **11** formed by conventional means of a resiliently flexible material, such as polyethylene plastic, having a rounded closed end **12** and an open end **13**. A detachable closure **14**, preferably molded of the same material as the test tube, is adapted to fit and releasably seal the open end **13** of test tube **11**.

Closure **14** is formed with a resilient side wall **15** having an annular flange **16** around its periphery adapted to be seated around the open end **13** of test tube **11** when closure **14** is inserted, and is tapered downwardly outwardly to conform closely around its lower edge with the inner wall of test tube **11**. A port **21** is provided centrally in the undersurface of closure **14**, and a resilient sleeve **22** is formed around it. Port **21** and sleeve **22** are sized to receive a capillary tube or finely bored pipette **23** in a fluid-tight sliding fit. Preferably pipette **23** is of the same flexible resilient material as test tube **11** and closure **14**, and it is of a length such that a portion of its upper end **25** extends outwardly of sleeve **22** when its lower end **26** engages the closed end **12** of test tube **11**.

A cap **31**, preferably of the same resilient material as test tube **11** and closure **14**, is formed with an annular rib **32** surrounding its open end sized to be inserted into closure **14** and to exert a resilient force radially outwardly against resilient wall **15**, thereby urging it against the wall of test tube **11**. The force thus exerted by rib **32** serves both to enhance the fluid-tight seal between closure **14** and the wall of test tube **11** and, by increasing the total frictional force exerted between the wall of test tube **11** and wall **15**, to prevent closure **14** from being withdrawn from open end **13** of test tube **11** through accident or inadvertence.

FIG. 5 shows a modification of the closure **14** illustrated in FIGS. 1–4, wherein flange **16** is provided with a resilient, downwardly depending skirt **17** tapered inwardly at its lower edge to engage the outer surface of the wall of test tube **11** frictionally. The result of this construction is effectively to clamp the test tube wall between the wall **15** and skirt **17**, thereby securing closure **14** firmly to test tube **11**.

The tip of cap **31** is formed with an internally constricted portion adapted to receive releasably and seal the tip **35** of the upper end **25** of pipette **23**.

As shown in FIGS. 6 and 7, the configuration of closure **14** and cap **31** may be modified if desired. Thus, in FIG. 6 closure **14** takes the form of a solid resilient stopper

having an annular groove **41** in its upper surface adapted to receive the open end of cap **31**. The extended bore **42** within the stopper **14** serves as the sleeve through which pipette **23** is journalled and sealed.

In the embodiment of FIG. 7 closure **14** is adapted to fit over, rather than into, the open end **13** of test tube **11**, with its resilient wall **15** tapered downwardly inwardly against the wall of test tube **11**. Cap **31** is formed with rib **32** on the inner face of its open end, and exerts a resilient force radially inwardly against wall **15** to enhance its seal and frictional contact with test tube **11**. As in the other forms of the invention, cap **31** is adapted at its tip **34** to receive and seal the tip **35** of pipette **23**.

FIGS 8 and 9 demonstrate the operation of the subject invention. A biological fluid, for example a urine specimen **51**, is collected in connection bottle **52**. A clean, preferably sterile, test tube **11** is taken in one hand and its cap **31** is grasped between the thumb and fingers of the other hand and removed from closure **14** by a twisting, pulling movement. The same motion will generally release tip **35** of pipette **23** from the tip **34** of cap **31**; however, if it does not, the exposed portion of upper end **25** of pipette **23** may be grasped and tip **35** released with the exertion of a slight additional pulling force on cap **31**. Test tube **11** is inverted and upper end **25** of pipette **23** inserted through the neck of bottle **52** until its tip **35** is immersed in the liquid **51**. Simultaneously the resilient wall of test tube **11** is squeezed gently between the thumb and fingers as indicated by the arrows designated A. When this force is released the resilient wall returns to its original shape and fluid is drawn upwardly through pipette **23** by virtue of the pressure differential created thereby. Additional fluid may be drawn into the test tube **11** by repeating the process. When the liquid level in test tube **11** reaches a desired level **53** the tube **11** is withdrawn from bottle **52**.

Tube **11** may be calibrated in its inverted position and graduations **54** provided along its wall to indicate its volumetric content.

To adjust the liquid content of test tube **11** the tube **11** is grasped in one hand and the exposed end portion **25** of pipette **23** between the thumb and fingers of the other and pipette **23** slipped inwardly or outwardly of sleeve **22** until the opposite end **26** is aligned with the appropriate graduation **54**. With tube **11** inverted over the mouth of bottle **52**, slight pressure exerted in the direction of arrows A of FIG. 8 will force fluid out of tube **11** through pipette **23** and back into bottle **52** until the fluid level **55** in tube **11** reaches the tip **26** of pipette **23**, whereupon the discharge will be terminated. Tube **11** is then reinverted and its cap **31** replaced over tip **35** of pipette **23** until its constructed tip **34** engages and seals the end **35** of pipette **23**. Force exerted downwardly on cap **31** causes pipette **23** to slide into tube **11** until cap **31** is seated securely on closure **14**. As indicated earlier, this effectively seals the liquid contents in test tube **11**, and it may be transported without fear of breakage or spillage, preferably in a semi-rigid or rigid wrapper or container which will protect it from abuse. With its cap in place the tube may be stored indefinitely.

When aliquot portions are desired to be withdrawn from tube **11** for test purposes, cap **31** is removed and the tube inverted as shown in FIG. 9. The fluid level **55** is noted and pipette **23** drawn out of sleeve **22** until its tip **26** is aligned with a new graduation **56**, the difference between graduations **55** and **56** representing the volume to be withdrawn. With tip **35** held over a test vessel, such as culture dish **57**, gentle pressure is applied to test tube **11** as indicated by the arrows A and the liquid discharge into the dish **57** until the level within tube **11** reaches tip **26**. In this manner any desired volume may be withdrawn with accuracy. The process may be repeated when and as desired until the entire contents of tube **11** have been withdrawn. If it is desired to terminate the testing and store the specimen until some later time, all that is necessary is to reinvert the tube **11** and replace cap **31** in the manner described earlier.

I claim:

1. A device for storing and transferring liquids, comprising:

an elongated thin-walled tube of resilient material having an opening formed at one end thereof;

a removeable closure adapted to be inserted into said opening, said closure having a port therethrough, a resilient sleeve surrounding said port, and a resilient wall adapted to conform closely with the inner wall of said container adjacent the opening therein;

a pipette slidably inserted through said port and sleeve with one end extending outwardly thereof; and

a cap having an open end adapted to be seated releasably in said closure over the outwardly extending end of said pipette and a closed end adapted to receive releasably and seal the tip of said outwardly extending end, said cap having an annular rib formed around its open end and adapted to engage the resilient wall of said closure and urge said resilient wall into intimate fluid-tight frictional contact with the inner wall of said container.

2. The device defined by claim **1** wherein the resilient wall of said closure is tapered downwardly outwardly.

3. The device defined by claim **2** wherein the resilient wall of said closure extends over the lip of the opening of said container and terminates in a skirt adapted to conform closely with the outside of the wall of the container.

References Cited

UNITED STATES PATENTS

2,768,762	10/1956	Guinet	215—41
2,799,434	7/1957	Malko	222—211
3,066,834	12/1962	Kingsbury	222—215
3,241,663	3/1966	Kaepernik	215—41 X
3,297,184	1/1967	Andelin	215—41

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U.S. Cl. X.R.

215—48, 100 R; 222—211