ABSTRACT OF THE DISCLOSURE

A container for single-handedly aseptically collecting and processing samples by techniques which include centrifugation and/or micro pipetting. The container is a transparent integral one-piece, non-wettable, plastic structure including a graduated parabolic vial portion and a cap portion joined by a tether strap. The cap can be closed over the vial upon bending the tether strap. Snap-lock beads are provided on the cap and vial for lock sealing the container. The cap can be placed on the vial without lock sealing, leaving the vent groove in the cap wall open for sterilization of the container.

BACKGROUND OF THE INVENTION

Field of the invention.—This invention relates to a device which serves both as a specimen collection vial and a laboratory container which derives its dual function from its vial shaped captive cap design.

Description of prior art.—In common use in hospitals and laboratories are many devices used to collect body fluid specimens from a dripping source; but these devices are usually made of two separate pieces, a cap and a vial. Due to the design of the prior devices, it is impossible to use them to aseptically collect a specimen while opening and closing the device with one hand. This is particularly important since the other hand is usually needed to control shut-off devices or to hold the penetration needle which creates the source of the dripping. Between uses; the vials must be sterilized, and this involves the disassembling of the vials and caps, subjecting them to sterilization procedures, and reassembling to keep them sterile for reuse. A considerable amount of handling of the vials and caps is involved for sorting and reassembling them, and this increases the changes of contamination by handling. Further, the caps often can be easily removed from the vials through rough handling or dropping during use, resulting in contamination or even spillage of the contents.

Most prior devices do not take into consideration the fact that the container must both be transported to the point of analysis as well as convenient during the specimen collection procedure. That is, the container must be unbreakable and nonleaking during transport and still be easily disassembled of the sample and during subsequent processing requirements. Examples of such prior devices are plastic containers with screw top closures and rubber stoppered glass vials wrapped in foam.

In addition, many prior devices had pointed or rounded bottoms that required special racks to support them in the upright position. This required additional equipment and occasionally loss of a specimen by spilling due to the inconvenience of racking the container.

SUMMARY OF THE INVENTION

The present device was developed for the purpose of overcoming problems of commercially available sample analysis containers such as those problems discussed above. The new and useful device of the present invention is a transparent integral one-piece plastic container which includes a vial element and a captive cap element with a bendable tether element interconnecting the vial and cap element. The integral assembly is of a resilient plastic material, preferably nonwetting, with the tether member sufficiently stiff and resilient to normally support the cap element in an uncovering position spaced laterally of the vial element. A snap lock system can be provided so that when the cap element is moved to its covering position on the vial element, it can be snap locked to the vial. The cap is so shaped that it can be moved from its uncovered position to its covering and lock position with one hand, utilizing the thumb without contaminating the vial lip.

The cap can be removed from the end of the vial in an aseptic manner and swung sideways, still facing downward, as the vial receives the sample or has a sample removed therefrom whereupon the cap is swung back over the vial and snapped down into the sealed position.

In the preferred form of the device, the snap-lock system includes an inwardly projecting ring element integral with the inner surface of the cap element and spaced from the lip of the cap element, and an outwardly projecting bead at the lip of the vial member which the ring element can snap over. Also from the preferred form, the cap element can be telescopically received by the vial to cover the vial without moving the cap element all the way to its snap-locked position, and a vent is included for venting the vial with the cap in unlocked covering position; means are also provided for closing and sealing the vent when the cap is moved all the way to its snap-lock position. This provision permits the vial and cap assembly to be sterilized with the cap on the vial in its unlocked covering position and, after sterilization, the cap can readily be moved to its locked position thereby maintaining the vial interior in sterile condition.

The preferred form is so designed that after the sample is collected and the vial sealed by the one hand manipulation method, the container is transported to the laboratory without fear of contamination of the sample, breakage of the vial or spillage of the contents. In addition, the same container is used for laboratory studies wherein centrifugation and/or micro pipetting techniques are performed.

While the present invention is susceptible of embodiment in many different forms, there is shown in the drawings and will be discussed in detail in specific embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a form of the container of our invention;

FIGURE 2 is an enlarged fragmentary section taken along line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged fragmentary top plan view of the container shown in FIGURE 1 but with the cap member removed from the vial portion; and

FIGURE 4 is a fragmentary section of the top portion of the container with the cap removed as in FIGURE 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to the drawings, the illustrated sample container includes a vial element 10, a cap element 12 and a tether element in the form of a stiff bendable strap 14 interconnecting the vial element 10 and cap element 12. The device is of an integral one-piece non-wetting plastic construction, e.g., of the plastic material known as "Surlyn A," an ionomer resin by E. I. du Pont de Nemours and Co.
Surlon A is a transparent polymer of ethylene having a polymer structure of both covalent bonds and ionic bonds in which there are present strong interchain forces. The ionic bonds produce thermally reversible interchain linkages through a variety of cations derived from Group I and II metals.

Vial element 10 is comprised of a cylindrical side wall 22 having its outer edge chamfered as a conical surface at the bottom edge 24. The bottom edge 24 serves as a support surface for the vial whereby the vial is able to be stood on end or inserted in a standard centrifuge. A graduated scale 26 and a marking surface 28 are provided on the outer surface of wall 22. A bottom wall 30 of generally parabolic cross section spans the cylindrical wall 22 above bottom edge 24 and includes a rounded inner surface at 30a defining the lowest most extent of wall 30. Thus, the wall 30 is a conical wall with the rounded inner surface 30a at its lowest extent. The inside bottom wall is designed to enable centrifugation of very small quantities of specimen and the use of the unwettable plastic material in construction permits good beading to facilitate easy and complete removal of the specimen by pipetting.

At the upper end of wall 22 an outwardly beaded top lip is provided at 32 and a longitudinal rib 34 extends upwards with rim 33 from the junction 40 of tether strap 14 with the side wall 22. The other end of strap 14 is joined at 42 integrally with cap 12.

The cap element 12 is cup-shaped and has cylindrical side wall 52 closed at the cap top by a flat top wall 54 having its peripheral portion projecting outwardly as a flange at 53. An annular bead or ring 56 is provided on the inner surface of wall 52 and extends completely around the wall except at gap 58, which is provided for receiving rib 34 of vial 10 when cap 12 closes vial 10.

It should be noted that with the vial 10 held in one hand, the cap 12 can be engaged by a thumb or finger of that hand to bend tether strap 14 and telescopically place the cap 12 over the vial 10 to close the vial in an unlocked covering position shown in phantom in FIGURE 2. The inward edge of the lip of cap element 12 is chamfered at 60 to help guide the cap element over the beaded rim 32 of the vial element 10. The stiffness of the rib of strap 14 causes the closely fitting vial and cap walls to bind so as to resist removal of the cap during normal handling, e.g., during sterilization procedures. A longitudinal groove 64 defines a vent for the vial 10 while the cap 12 is in covering unlocked position.

As the cap element is forced down further over the vial element to the locked position shown in full line in FIGURE 2, bead 56 snaps over beaded lip 32 and longitudinal rib 34 completely seals groove 64 to seal the interior of the container and keep it sterile. Stop elements in the form of internal ribs 62 are provided in cap element 12 to abut the top of lip 32 with the cap in proper snap-locked position so that bead 56 is maintained in sealing engagement with beaded rim 32. To unlock and uncover the vial, the cap can be engaged by a thumb beneath the flange and urged upward to first unlock the cap and then remove the cap from covering position. The cap can be moved to one side of the vial in the downward facing position by means of the operator's thumb or can be permitted to swing freely away from the end of the vial on the end of the tether.

It will be apparent from the foregoing description that the device can readily be manipulated with one hand leaving the other hand free for other work involved in the collection of the sample, addition or removal of materials in the subsequent laboratory analysis. Assuming the container has just been sterilized, the container can be picked up by one hand and opened with the thumb of that hand and can be filled with the cap held out of the way of the container mouth by the thumb or by strap 14 and with the vial in aseptic condition. The top can then be engaged by a digit of the hand at its top surface 54 and bent over the vial to close the vial, and the cap can be moved to a snap-lock position to aseptically seal the vial closed. The vial lip will never be engaged by a hand or an unsterile portion of a cap. In locked closed condition, the container is spill-proof even when handled roughly or dropped by a pneumatic tube system.

We claim:

1. A laboratory device for containing a fluid sample which device comprises a transparent, integral, one-piece plastic container member including a vial element having a wall defining a portion of diminished cross section at the bottom of the vial element, an elongate bendable tether element integral at one end with said vial element, a cup-like cap element integral with the other end of said tether member for telescopically receiving and covering said vial element, integral element means for snap locking said cap element in position covering said vial, and a hand engageable element on said cap element spaced from a lip of the cap for engaging said cap element to move it between an uncovering position and a snap locked covering position.

2. The device of claim 1 wherein said snap-locking means comprises an inwardly projecting ring element integral with said cap element spaced from the lip thereof and an outwardly projecting bead at the lip of said vial member.

3. The device of claim 1 including a stop in said cap for abutting the vial lip with said cap in snap-locked position.

4. The device of claim 1 including means for guiding the cap lip over the vial lip.

5. A laboratory device for containing a fluid sample for aseptically collecting, transporting and analyzing said sample, which device comprises a transparent, integral, one-piece plastic container member including a vial element having a conically tapered bottom wall with a rounded innermost inner surface, a cylindrical wall defining the side wall of the vial and extending beyond said bottom wall and terminating below said bottom wall at an edge having the outer corner chamfered, an elongate plastic tether element of bendable plastic material integral at one end with the outer surface of said side wall at a position spaced from the top lip of said side wall, a cup-like cap element integral with the other end of said tether element and having a lip and inner diameter proportioned for telescopically receiving the cylindrical side wall of the vial by its lip portion, said cap member having the inner corner of its lip edge chamfered, snap receiver means in said side wall of the vial between said lip and tether element defining an outwardly projecting annular bead at said lip, an annular inwardly projecting bead element on the inner surface of said cap element of proper size to be snapped over the bead of said side wall and snap-received in said receiver means, blocking means in said cap member for engaging the lip of said vial with said cap in snap-locked position and properly spacing said cap with said head element within said receiver, a groove in the cap inner side wall extending from said lip through a gap in said bead element for venting the interior of the assembled cap and vial before movement of the cap to snap-locked position with said cap bead element resting on the vial lip bead, the engagement said bead element in the receiver sealing said groove and the container with said cap moved to snap-locked position, and a rib on the outer side of said vial extending from the vial lip bead downwardly for extending through said gap and spanning and sealing said vent groove with said cap in snap-locked position, the cap bead element having a sufficient extent between the bead element and cap lip to permit said cap to telescopically receive said lip end in unlocked position without moving fully to snap-locked position with said vent bypassing said lip bead for releasing pressure from the covered unlocked vial, a grad-
5 nated scale impressed in said side wall extending upward from said bottom wall, and a roughened surface portion on the outside of said side wall for receiving marking.

6. A laboratory device for containing a fluid sample which device comprises a transparent, integral, one-piece plastic container member including a vial element having a wall defining a portion of diminished cross section at the bottom of the vial element, an elongate bendable tether element integral at one end with said vial element, a cup-like cap element integral with the other end of said tether member for telescopeically receiving and covering said vial element, integral element means for snap locking said cap element in position covering said vial, a hand engageable element on said cap element spaced from a lip of the cap for engaging said cap element to move it between an uncovering position and a snap locked covering position, said cap element telescopeically receivable on said vial element in an unlocked position above snap locked position, and having a vent for venting the vial interior in said unlocked position and a sealing element for sealing said vent in snap-locked position.

7. The device as claimed in claim 6 wherein said plastic container is comprised of a non-wetting plastic.

8. The device as claimed in claim 6 having a roughened exterior marking surface.

9. A laboratory device for containing a fluid sample which device comprises a transparent, integral, one-piece plastic container member including a vial element, an elongate bendable tether element integral at one end with said vial element, a cup-like cap element integral with the other end of said tether member for telescopeically receiving and covering said vial element, integral element means for snap locking said cap element in position covering said vial, a hand engageable element on said cap element spaced from a lip of the cap for engaging said cap element to move it between an uncovering position and a snap locked covering position, said cap element telescopeically receivable on said vial element in an unlocked position above snap-locked position, and having a vent for venting the vial interior in said unlocked position and a sealing element for sealing said vent in snap-locked position.

References Cited

UNITED STATES PATENTS
2,958,439 11/1960 Yochem 220—38.5
3,107,805 10/1963 Asher 215—1.5
3,288,318 11/1966 Corbin et al. 215—1.5

FOREIGN PATENTS
733,440 10/1953 Great Britain.

JAMES B. MARBERT, Primary Examiner.