United States Patent [19]

Gerarde

[11] **3,902,477**

[45] **Sept. 2, 1975**

[54] **BLOOD SPECIMEN CONTAINER**

[75] Inventor: **Horace W. Gerarde**, Tenafly, N.J.

[73] Assignee: **Becton, Dickinson and Company**, East Rutherford, N.J.

[22] Filed: **Sept. 26, 1973**

[21] Appl. No.: **400,882**

[52] **U.S. Cl.** ..... **128/2 F**; 128/272; 215/355

[51] **Int. Cl.²** ... **A61B 5/14**; A61J 1/00; B65D 39/00

[58] **Field of Search** ..... 128/2 F, DIG. 5, 272, 275, 128/276; 233/26; 215/6, 41, 47, 83, 99, 362, 306, 355, 292, 200; 23/259, 292; 73/425.4, 427

[56] **References Cited**

UNITED STATES PATENTS

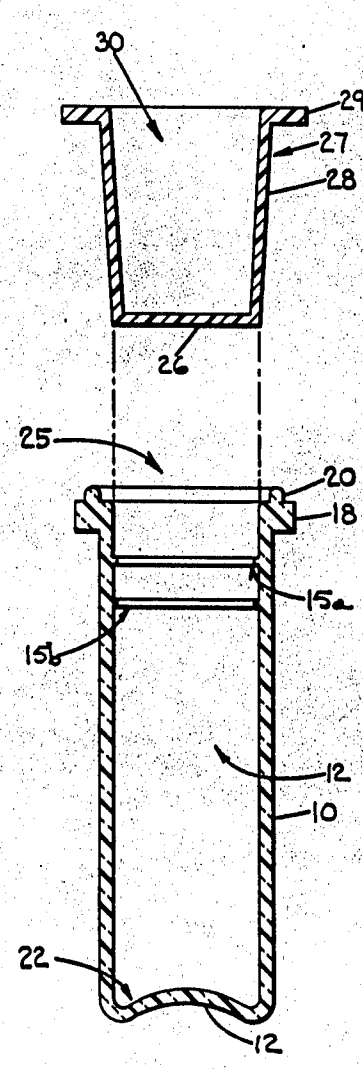
664,746	12/1900	Heath	215/362 X
2,876,775	3/1959	Barr, Sr. et al.	128/272
3,005,564	10/1961	Weichselbaum	215/41
3,017,050	1/1962	Barr, Sr. et al.	215/6 X
3,104,681	9/1963	Gray, Jr.	215/47 X
3,199,707	8/1965	Folkman	215/41 X
3,407,956	10/1968	Linkletter et al.	215/99 X
3,481,712	12/1969	Bernstein et al.	23/259 X
3,593,909	7/1971	Bergmann	215/47 X
3,615,222	10/1971	Mead	23/259 X
3,718,133	2/1973	Perry et al.	128/2 F
3,771,965	11/1973	Grams	23/259

Primary Examiner—Richard A. Gaudet
Assistant Examiner—J. C. McGowan
Attorney, Agent, or Firm—Kane, Dalsimer, Kane, Sullivan and Kurucz

[57] **ABSTRACT**

A novel container for the collection and storage of capillary blood is disclosed. The container meets the requirements for the collection of minute quantities of capillary blood, safe storage thereof without contaimination from airborne contaminants and ready accessibility of the entire specimen when removal is desired.

6 Claims, 2 Drawing Figures



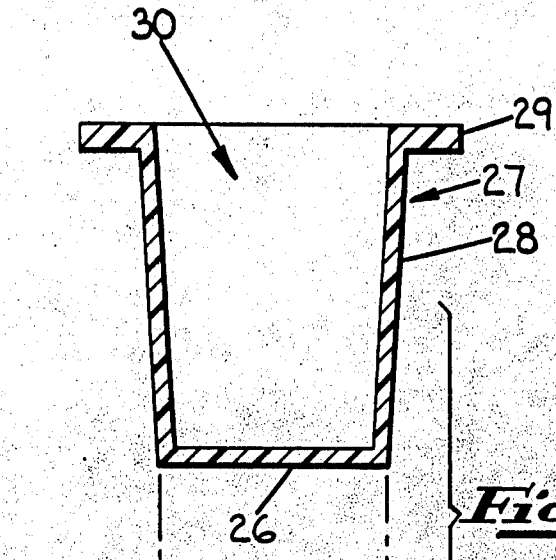


Fig. 1

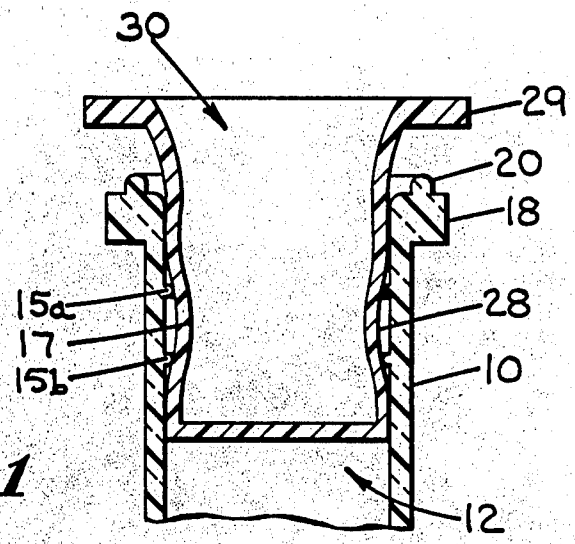


Fig. 2

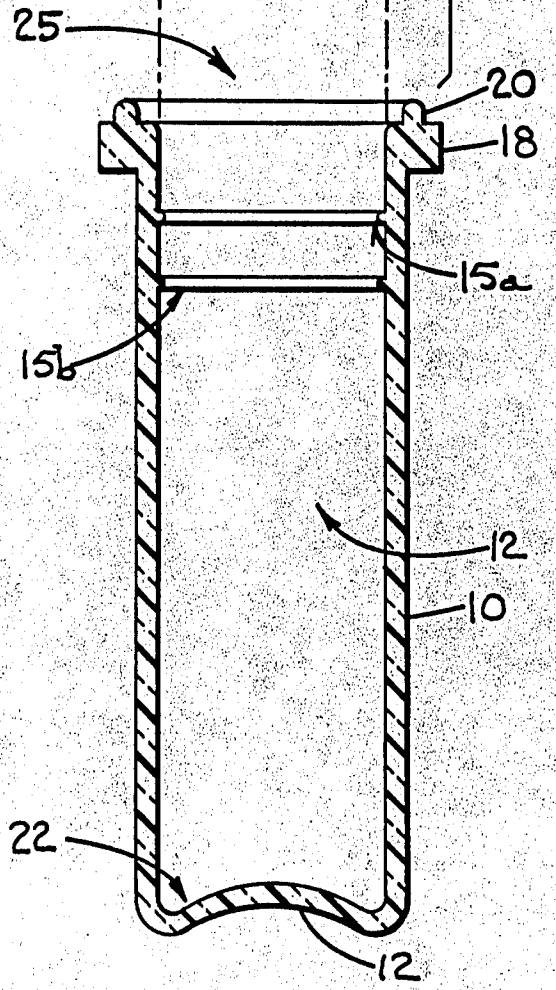


Fig. 3

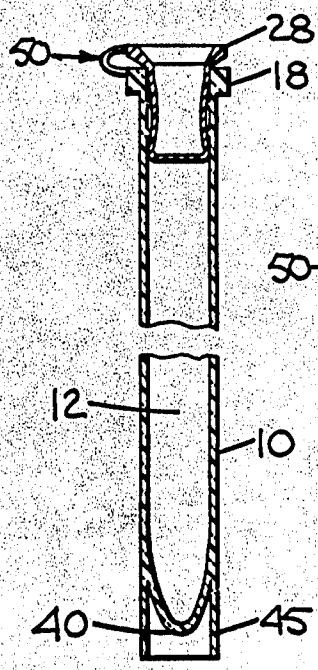


Fig. 4

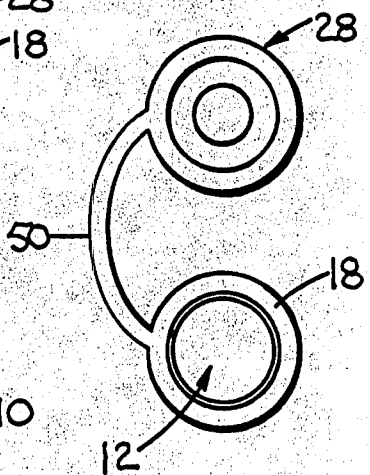
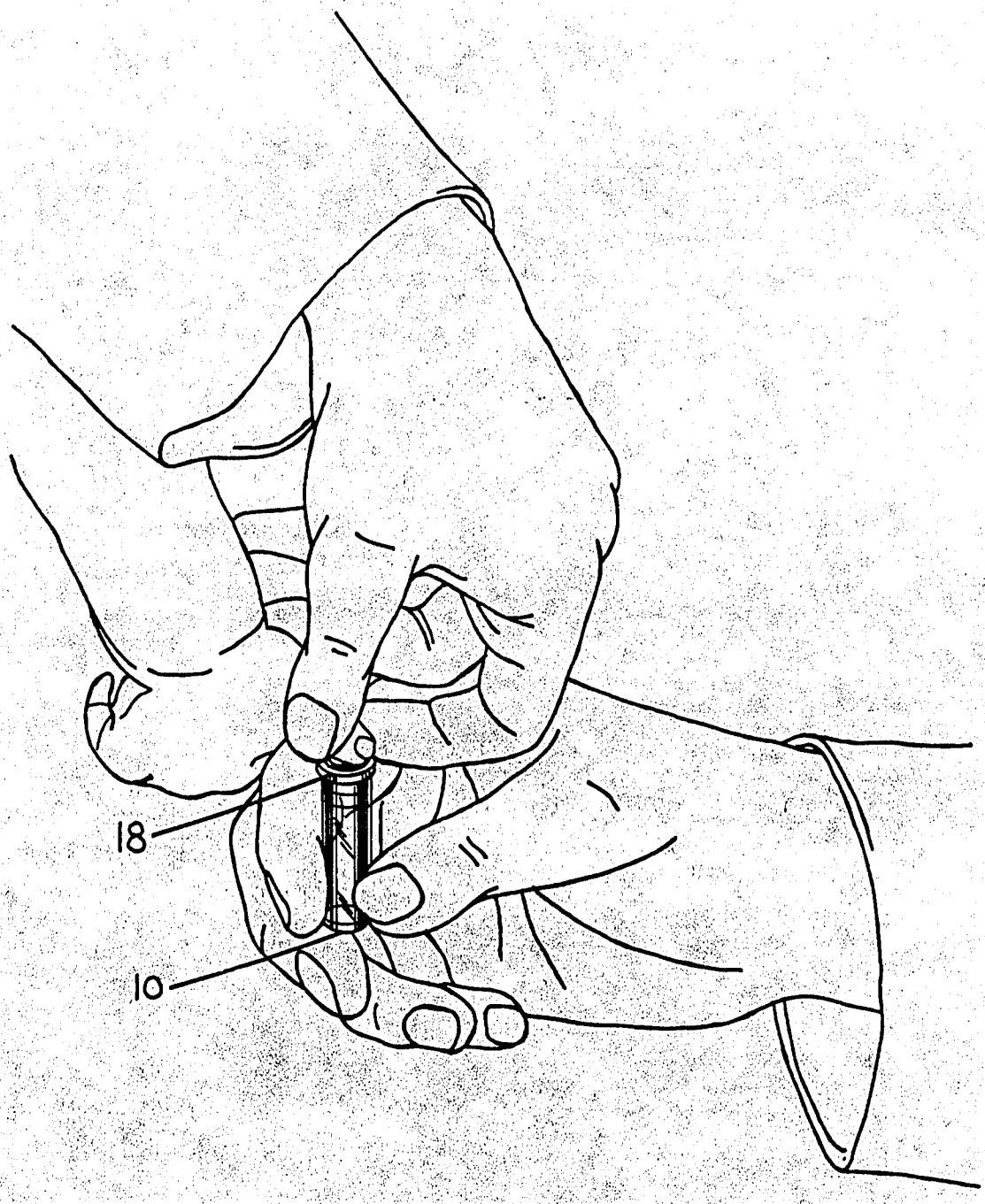


Fig. 5



BLOOD SPECIMEN CONTAINER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention concerns storage containers and more specifically concerns a novel container for the collection and storage of capillary blood specimens.

2. Description of the Prior Art

Recent advances in analytical instrumentation have made it possible to carry out a variety of hematological, chemical and toxicological diagnostic procedures on very small quantities of blood; thereby obviating the need to withdraw venous blood from patients. Instead the smaller quantities of blood conveniently obtained from capillary blood sources such as from a finger tip or ear lobe may be used for diagnostic examination.

Prior hereto, the most widely used container for collecting and storing capillary blood has been the standard capillary tube. However, collection of blood specimens in capillary tubes requires a degree of technical proficiency on the part of medical personnel if air pockets are to be avoided. Further, capillary tubes are relatively fragile and subject to easy breakage. For storage of relatively large quantities of capillary blood, on the order for example of 500 microliters, several capillary tubes must be used. In addition, blood stored in capillary tubes is often difficult to remove since the blood will often clot and clog the capillary even when the blood is treated with an anti-coagulant.

Although the need for an improved container for collecting and storing capillary blood has been obvious, there have been few attempts to satisfy this need (see for example U.S. Pat. No. 3,623,475). The container of my invention fulfills this need and provides an improved storage container designed specifically for the collection, storage and safe handling of capillary blood specimens.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of a container of the invention showing the closure removed from the body of the container.

FIG. 2 is an enlarged fragmentary section of the container of the invention showing the closure in place.

FIG. 3 is a cross-sectional view of a container constructed according to the invention and having preferred embodiments.

FIG. 4 is an overhead view of the container shown in FIG. 3 with the closure in an open position.

SUMMARY OF THE INVENTION

The invention comprises a container for collecting and storing capillary blood specimens, which comprises a straight tubular body having a fixed closure adjacent to a first end; a movable closure at a second end; and at least one inwardly directed rib circumscribing the interior surface of said body at a position adjacent to said second end; said tubular body defining a bore of substantially uniform diameter which measures at least 7.5 mm. and has a volume of between about 200 microliters to about 1000 microliters when closed at said second end; said closure comprising a tapered tubular body, fixedly closed at its narrowest end; open at its broadest end and having a flange radially disposed therearound.

DETAILED DESCRIPTION OF THE INVENTION

The containers of the invention are conveniently fabricated by conventional methods, employing conventional materials which are inert to blood or reagents conventionally mixed with blood specimens for diagnostic purposes. The term inert as used herein means that the material does not react with or in any way adversely affect the blood specimen to be stored therein. Examples of inert materials are glass and plastics such as polyethylene, polypropylene, polystyrene, polymethacrylate and the like. Polyethylene is a preferred material for fabricating the containers of the invention since polyethylene has electrostatic properties which assist in retaining anti-coagulant additives such as heparin, which are commonly employed as anti-coagulants for the stroage of capillary blood specimens.

The tubular containers of the invention are constructed so as to have a minimum inside bore diameter of about 7.5 mm. Smaller diameter bores are generally undesirable in that blood specimens may not travel to the lower end of the tube, thereby preventing an accurate estimation of the volume of blood collected. The tubular containers of the invention are constructed so as to have a volume capacity of between 200 microliters to about 1000 microliters. Thus the tubular container may be constructed with any length and diameter consistent with this requirement.

The improved containers of the invention will now be further described and exemplified by reference to the various specific embodiments set forth in the drawings.

FIG. 1 is a cross-sectional side elevation of an embodiment of the invention. The container depicted comprises a straight body portion **10** having a fixed closure **12** adjacent to a first end, and an open end **25.** The walls and ends of the tubular body define a bore **12** which has a minimum diameter of about 7.5 mm. Circumscribing the interior surface of the body **10** at a position adjacent to open end **25** are inwardly directed ribs **15**a and **15**b respectively. The function of ribs **15***a* and **15***b* are to provide a sealing surface against closure **28** when said closure is in place with opening **25.** This sealing feature is particularly important for safeguarding capillary blood specimens from exposure to the atmosphere, which may contain contaminants affecting diagnostic procedures to be subsequently carried out with the blood specimen. At least one rib **15** is required, but any multiple number may be employed, consistent with the size of the container stopper. In general, two ribs **15** are preferred. It will be observed from FIG. **1** that the closure **28** is a tapered tubular body having a narrow end **26.** The outer circumference of end **26** is slightly less than the inner circumference of opening **25** for easy insertion into the opening. The upper or broader end **27** of closure **28** is opening **30** and has an outside circumference exceeding the inside circumference of opening **25** thus providing a stop upon insertion of closure **28** into opening **25.** Radially disposed around end **27** at opening **30** of closure **28** there is flange **29.** Flange **29** provides a convenient grasping surface for the ready removal of closure **28** from opening **25.** FIG. **1** also shows a concave closed end **12** of tube **10,** this is a preferred embodiment which provides a recess **22** between end **12** and body **10.** This recess provides a small cup area which permits the ready removal of the complete blood specimen by withdrawal with a syringe. Also shown in FIG. **1** is a lip

member 20 circumscribing opening 25. Lip 20 provides an additional sealing area when closure 28 has been inserted to its full length in opening 25. Flange 18 shown circumscribing opening 25 is another preferred embodiment and provides a surface for retaining the containers of the invention in a centrifuge for centrifugation when that is desired.

Referring now to FIG. 2 there are seen details of closure 28 when emplaced in a sealing position within opening 25. As can be seen, the thin resilient wall 17 is forced inward by ribs 15*a* and 15*b* and provide a tight seal between closure 28 and tubular body wall 10.

FIG. 3 illustrates a number of preferred embodiments in the containers of the invention. As seen here, closure 28 is attached by tab 50 to the body of tube 10 and more specifically at flange 18. The attachment of closure 18 to the body of the container provides a means of assuring that the closures are always readily available. FIG. 3 also shows a preferred embodiment in a cup shaped fixed closure 40 which is located slightly within the body of tube 10. The cup shaped fixed bottom closure makes the removal of blood specimens by a syringe more convenient and complete. That portion 45 of tube 10 which extends beyond the fixed closure 40 is a base skirt which provides a stable means for standing the container of the invention on a flat surface and is a preferred embodiment of the invention.

FIG. 4 is an overall top view of the container shown in FIG. 3 but with closure 28 in an open position and illustrates the integral connection 50 between closure 28 and flange 18.

FIG. 5 illustrates the use of a container of the invention in collecting capillary blood from the finger of a human. After lancing the subject's finger in the usual manner and wiping away the first few drops of blood as is conventionally done, the container of the invention is held beneath the epidermal wound and the finger massaged to produce blood. The desired quantity of blood is then allowed to drip by gravity into the container. If the blood is to be kept in the fluid state, an anti-coagulant such as heparin, sodium oxalate or the like may be added to the container prior to collecting blood therein.

In a similar manner capillary blood may be collected for storage from other sources of capillary blood such as for example from the ear lobe of a mammal, the heel or toe of humans and from the tail of a mouse or rat.

What is claimed is:

1. A container for collecting and storing capillary blood specimens, which comprises:
   a straight tubular body having a fixed closure adjacent to a first end;
   a movable closure at a second end;
   and at least one inwardly directed rib circumscribing the interior surface of said body at a position adjacent to said second end;
   said tubular body defining a bore of substantially uniform diameter which measures at least 7.5 mm. and has a volume of between 200 microliters to about 1000 microliters when closed at said second end;
   said closure comprising a tapered tubular body fixedly closed at its narrowest end, open at its broadest end and having a flange radially disposed therearound, the side wall of said closure tubular body and rib cooperating in effecting a seal whereby to safeguard the contents of said container from exposure to the atmosphere.

2. A container according to claim 1 constructed of polyethylene.

3. A container according to claim 1 wherein said straight tubular body has a flange radially disposed around the exterior of said second end.

4. A container according to claim 1 wherein there are two inwardly directed ribs.

5. A container according to claim 1 wherein said closure is attached to said straight tubular body.

6. A container according to claim 1 wherein said fixed closure forms a cup wholly within said straight tubular body.

* * * * *