

June 14, 1955

N. W. DREY
SHIPPING CONTAINERS
Filed March 10, 1949

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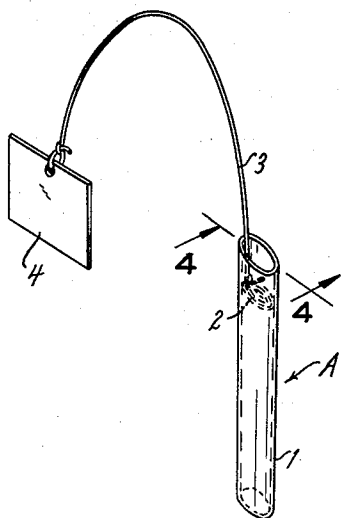


FIG. 1.

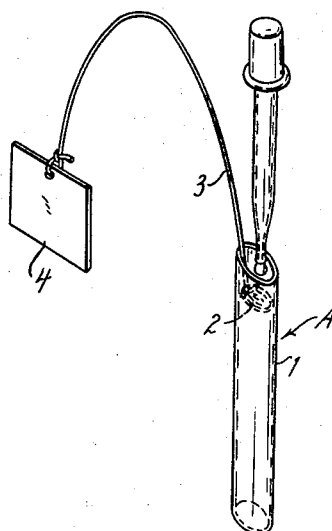


FIG. 2.

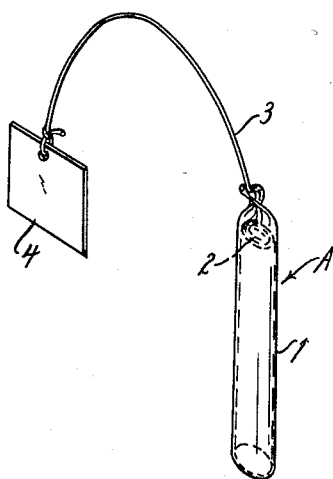


FIG. 3.

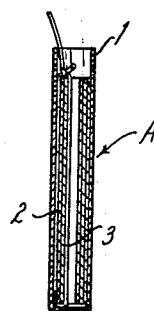


FIG. 4.

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SHIPPING CONTAINERS

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Application March 10, 1949, Serial No. 80,761

1 Claim. (Cl. 206—46)

This invention relates in general to new and useful improvements in shipping containers for transmittal of liquid specimens to laboratories for the qualitative and quantitative determination of material contained therein.

In the everyday practice of medicine there is the constant need to analyze biological materials for diagnostic and therapeutic purposes. Such analyses vary from routine determination of urine sugar, urine albumin, blood sugar, and the like, to serological tests for determining the presence of immunological and pathological bodies. In many circumstances, where the patient is removed from laboratory facilities, the transmittal of a sample of the biologic material to a laboratory presents very serious problems for which no satisfactory solution has been achieved heretofore. Such circumstances arise primarily where a patient is too sick to be moved, or where, with less acute conditions, distant travel might work an economic hardship, or in the case of individuals suffering from a chronic ailment such as diabetes mellitus wherein urine specimens must be shipped with great frequency so that the sugar content thereof be constantly checked in order to maintain a properly calculated diet.

In various industrial procedures a like need occurs wherein the chemical constituency of solutions, such as used in electroetching and electroplating, must be maintained at necessary levels. Small concerns which cannot afford to have their own laboratories are thus deprived of the benefits of scientific controls.

Thus, it is the primary object of the present invention to provide a shipping container which is compact, unbreakable, easily transportable, and which may be sent by air or first class mail without incurring any excessive charges.

It is a further object of the present invention to provide a shipping container wherein the specimen will be maintained for indefinite periods of time without deterioration or decomposition.

It is a further object of the present invention to provide a shipping container which does not interfere with the analysis of materials contained in the specimen.

It is a further object of the present invention to provide a shipping container wherein the specimen to be conveyed may be analyzed by standard, well recognized procedures.

It is an additional object of the present invention to provide a shipping container which is so economical in manufacture that it may be disposed of after a single usage.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claim.

In the accompanying drawing (one sheet):

Figure 1 is a perspective view of a shipping container constructed in accordance with and embodying the present invention;

Figure 2 is a perspective view showing material being deposited in the container by a dropper;

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Figure 3 is a perspective view of the container with the upper end twisted into closed condition;

Figure 4 is a transverse sectional view along line 4—4 of Figure 1.

Referring now in more detail and by reference characters to the drawing which illustrate a preferred embodiment of the present invention, A designates a shipping container comprising a cover member 1, which may be of any convenient design, although shown as tubular in the drawing, and which may be fabricated of various materials such as cellulose acetate, moisture proof cellophane, ethyl cellulose film, polyethylene film, metallic foil, and vinyl film. Freely disposed within the cover member 1 is an absorbent member 2 which may be fabricated of rolled filter paper, woven glass cloth, alpha cellulose wadding, or fiber glass having a phenolic resin binder. The cover member 1 is sealed at its bottom end and the upper end is adapted for ready closing as by twisting or sealing after the liquid specimen has been applied to the member 2 as will presently be described. A string or tape 3 may be suitably secured to or about the absorbent member 2 and led outwardly at its free end through the upper end of the cover member 1 to provide a simple means of removing the absorbent member 2 without contamination. A tag 4 for recordation of identifying data may be secured to the end of the string 3.

In broadest outline the use of the shipping container A is as follows: a measured quantity of the specimen material is dropped onto the member 2, through the open upper end of the cover 1, for absorption thereby. The upper end of said cover member 1 is then suitably closed and the container A is put into a normal mailing envelope for forwarding to a laboratory. There the member 2 is removed from the cover member 1 and deposited in a suitable analytical flask or vessel for digestion or extraction in accordance with conventional laboratory procedure. The resultant solution or extract may then be subjected to any standard scheme of chemical analysis required to ascertain some selected or particular chemical, biological or serological characteristic of the sample. For most biological work it is requisite to impregnate the absorbent member 2 with a suitable preservative agent.

As examples of the almost limitless usages of the shipping container A, hereunder are set forth, in details, various specific applications.

Biochemical determination tests

In the diagnosis and treatment of diabetes mellitus, urine must be analyzed qualitatively and quantitatively for sugar. Currently, bottles and the like are used to contain the urine specimen to be tested. In larger cities many drug stores provide such bottles which after receiving the specimen are periodically collected from the drug store by the city health department. But even with this service the actual providing of such a specimen evidently necessitates great inconvenience on the part of the individual. Additionally, unless the specimen is tested within a very short time, any trace of sugar will be lost through fermentation by enzymatic action. For diabetic individuals living in remote areas the problem presented in supplying specimens is indeed great since numerous specimens must be sent almost daily, wherefore, in time elapsed between the sending and arriving of the specimens at the laboratories, it is most likely that the sugar has been converted by enzymatic action. Thus in the use of the present invention for urine sugar analysis, a patient is provided with a suitable number of the shipping containers A, the absorbent member 2 having first been treated with a suitable preservative, such as a 2½%—4% solution of sodium fluoride (NaF), or mercuric chloride, merthiolate, or any other organic mercurial, which has been permitted to dry thereon. The patient, preferably by means of a calibrated

eye-dropper, puts 8 to 10 drops of urine, which are equivalent to one-half ($\frac{1}{2}$) cc., upon the absorbent member 2 and closes the upper end of the cover member 1 which is then placed within a mailing envelope and forwarded to a laboratory. The specimen thus provided is inert to any atmospheric changes and will maintain its chemical constituency for an indefinite period of time without danger of enzymatic or bacterial action. If, for any reason, the cover 1 should be lost or inadvertently destroyed the absorbent member 2 with the specimen absorbed thereon may still be mailed, if the specimen has been permitted to dry at room temperature. Any dirt, soot, or the like, which may get on the absorbent member 2 will not interfere with accurate analysis. At the laboratory the absorbent member 2 is removed from the member 1 and placed in a conventional type test tube. The urine specimen contained therein may be tested for sugar quantitatively and qualitatively without extraction by any well known standard procedure such as Somogyi's method. This method consists of treating the absorbent 2 with 5 cc. of 10% sodium carbonate (Na_2CO_3) solution, which will give, if sugar is present, the usual color reaction with the intensity thereof determinative of the quantity of sugar present. Other standardized tests may also be used such as treatment with Fehling's solution, Benedict's solution, or other alkaline copper reagents. As an example of these tests, 5 cc. of Benedict's solution is poured on the specimen-containing absorbent 2 which has been placed in a test tube, and is then permitted to soak at room temperature for extracting the specimen. The extract is then poured into a suitable container and heated to give the usual color reaction. The results of tests, wherein the shipping container A was utilized, compared precisely with those obtained from controlled tests wherein the urine was collected in substantial quantity in normal containers and tested directly therefrom.

Urine specimens collected in the manner above stated may also be as readily used for determination of albumin by the standard, or so-called heat-coagulation, test. The urine is extracted from the absorbent member 2 at room temperature by treating the absorbent member 2 with 5 cc. of a weak solution, in the order of 1%, of sodium hydroxide (NaOH). The urine-containing solution is then poured off and filtered. The filtrate is acidified with 3% acetic acid, and heated until near boiling, slightly above 70°C ., to give the usual turbidity reaction from which the amount of albumin present may be determined.

Blood sugar tests may be made from blood so collected and conveyed by the shipping containers A. It is preferable for this usage that filter paper be used for the absorbent member 2 and it is requisite that the cover member 1 be aluminum or other type metallic foil. The absorbent member 2 is impregnated with a suitable preservative, such as 2½% to 4% sodium fluoride (NaF) solution. Blood in the quantity of .1 cc. is dropped through the upper end of the cover member 1 onto the absorbent member 2, said upper end is then closed and the container A forwarded to a laboratory. Blood so collected is inert under all atmospheric conditions for an indefinite period of time. If the blood has been permitted to dry on the absorbent member 2, said member 2 may, if necessary, be sent without being encased in the cover member 1. Any dirt, or grit which might inadvertently adhere to the blood-containing absorbent member 2 will in no way interfere with the sugar analysis. At the laboratory, the absorbent member 2 is removed from the cover member 1 and treated with a measured amount of standard sodium hydroxide (NaOH) or barium hydroxide (BaOH) solution for extraction of the blood therefrom. When the extraction is complete, as may be determined by removal of all traces of the blood from the absorbent member 2, the blood-containing solution is treated with a measured quantity of zinc sulphate (ZnSO_4) to provide a precipitation which is filtered off and the filtrate is ready to be quantitatively tested for sugar by any standard procedure such

as Somogyi's micro method. It is to be particularly noted that the precise amounts of the measured quantities of hydroxide solution and zinc sulphate as utilized in the extraction of the blood are determined by normal clinical methods.

Serological tests

The shipping container A may also be utilized for the transference of blood specimens which are to be analyzed for determination of pathological and immunological bodies. For such usage it is preferable that the absorbent member 2 be fabricated of filter paper or glass wool. It has been determined that filter paper of 90 mm. diameter, properly folded, and a mass of fiber glass having a phenolic resin binder weighing .1 gram will absorb equal amounts of blood. The absorbent member 2 should be impregnated with a suitable preservative agent, such as sodium fluoride solution, merthiolate, and the like. Blood in the quantity of one (1) ml. is dropped onto the absorbent member 2 through the open end of the cover member 1, which is then suitably closed for transference to a laboratory. Blood so contained will keep for extended periods of time without deterioration and thus be useful for accurate testing despite any attendant delays in reaching the laboratory. There, a quantity of .85% salt solution equal to the amount of blood deposited, is dropped onto the absorbent member 2 while it is still in the cover member 1, and the blood is thereby extracted. The blood-containing extract is then poured from the shipping container A by squeezing the container A to press the fluid from the absorbent member 2. The blood so reconstituted is centrifuged in order to obtain clear sera-containing solution by removing the red cells and any particles, such as fibers, of the absorbent member 2. This sera-containing solution may then be tested by any standardized method for determining the presence therein of pathological or immunological bodies, such as, by way of example, for diagnosis of syphilitic infection by the precipitation method of Kahn, the newly developed VDRL slide agglutination tests (the letters VDRL referring to Venereal Disease Research Laboratory) or the complement fixation test of Kolmer. The qualitative and quantitative results of these tests using the sera-containing solution corresponded accurately with the results of the same tests when undiluted blood was utilized. Standard agglutination tests as used in the diagnosis of typhoid fever, undulant fever, and the like, as well as pregnancy determination tests are further examples of procedures which may be successfully performed with the sera-containing solution.

Inorganic quantitative tests

In the field of inorganic chemistry, the shipping containers A are highly useful for providing a ready means to transfer with minimum effort small quantities of material for testing to distant laboratories and thus have wide applicability in industry, such as, by way of example, in the quantitative determination of chemicals in electroplating and electroetching solutions. In tests of this character it has been found preferable to use filter paper for the absorbent member 2 and Saran film (vinylethylene chloride) or vinyl film for the cover member 1. The analysis of iron in a solution of iron chloride, as is frequently used in an etching bath for copper halftones, will serve to illustrate this application of the shipping container A. In this test, one (1) ml. of the iron chloride solution is deposited on the member 2, thereon the upper end of the cover member 1 is appropriately closed, for transference to a laboratory. Thereat, the absorbent member 2 is removed from the cover member 1, placed in a suitable beaker, and treated with 45 ml. of water and 5 ml. of hydrochloric acid (HCl) for extraction of the iron chloride. This extract-containing solution is then brought to a boil in which state it may be tested for total iron by standard procedures, such as the commonly used Zimmerman-Reinhardt method. The results ob-

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tained from a series of tests had a maximum variation of less than 2% from that obtained from tests made directly with iron chloride solution. From the foregoing, it is evident that it is within the scope of any laboratory technician to adapt the above set forth procedure for extracting specimens of other inorganic materials deposited on the absorbent member 2 for quantitative testing thereof, such as for nickel, chromium, and copper as used in solutions for plating, as for silver in silver nitrate solutions, and as for magnesium and calcium in water.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the shipping container may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

A mailable member for storing and transmitting urine specimens for analytical purposes comprising an elongated tubular, flexible, thin and impervious container of a thermoplastic resin sheeting, said container being closed at one end and normally open at the other end, said open end being adapted for closure, an absorbent member of rolled filter paper disposed in said container and substantially filling the interior thereof, one end of said filter paper roll terminating spacedly from the normally open end of said container so that the same may be readily closed for complete encasement of said filter paper roll, said filter paper roll being disposed for receiving and retaining under atmospheric conditions a quantity of a liquid urine specimen deposited on said filter paper roll through the normally open end of said container, a deposit of a bacteriostatic material upon said

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filter paper roll formed by subjecting same to a 2½ to 4% solution of sodium fluoride and permitting drying thereof whereby the particular specimen thereon is thus stabilized as to its original characteristics, an elongated, flexible, string-like member secured at one end to said filter paper roll and projecting outwardly through the normally open end of said container for a substantial distance, and a flat, card-like gripping and identification member for effecting removal of the filter paper roll from the container and for manipulating same during analytical procedure whereby contamination is prevented secured to the other or outer end of said string-like member, said gripping and identification member having provided on one face thereof a plurality of spaces for the inscription thereon of data concerning the particular specimen received and retained by the filter paper roll, said string-like member preventing flow of the specimen in a liquid state from the filter paper roll to the gripping and identification member.

References Cited in the file of this patent

UNITED STATES PATENTS

743,394	Mitchell	Nov. 3, 1903
965,276	Brooke	July 26, 1910
1,154,931	Miller	Sept. 28, 1915
1,343,579	Palmer	June 15, 1920
1,980,953	Kilmer	Nov. 13, 1934
2,301,710	Scudder	Nov. 10, 1942

FOREIGN PATENTS

406,850	Great Britain	Mar. 8, 1934
549,630	Great Britain	Nov. 30, 1942