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TEST TUBE CLOSURE

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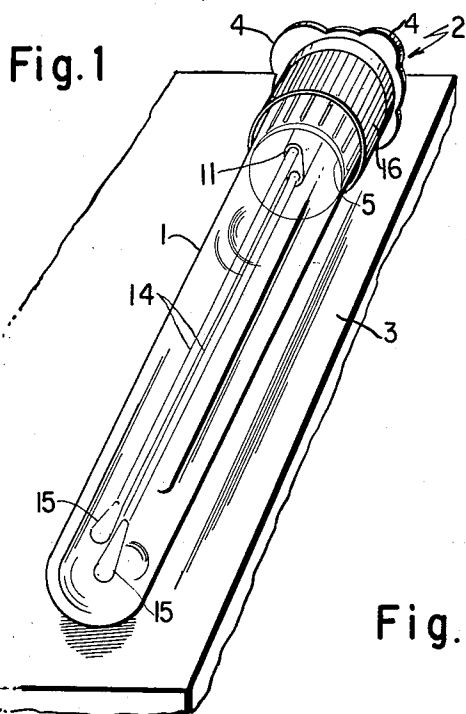


Fig. 1

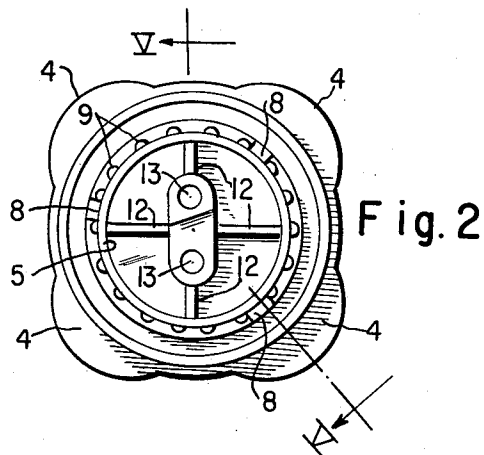


Fig. 2

Fig. 3

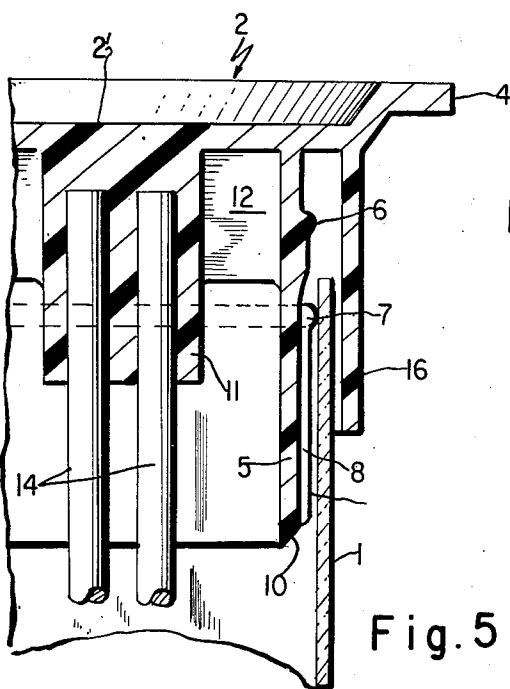
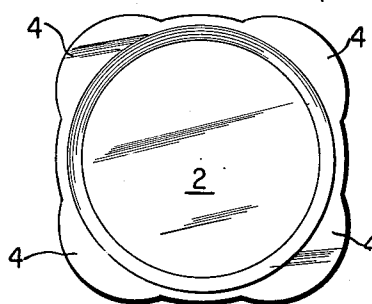
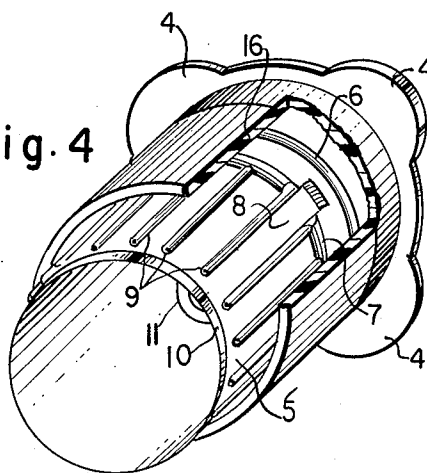


Fig. 4

Fig. 5



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TEST TUBE CLOSURE

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6 Claims. (Cl. 215-47)

This invention relates to a test tube closure, and particularly a closure for a culture container, having for an object the provision of such a closure which comprises a top and a pair of depending skirts, the inner one of which is designed and adapted to fit within a plain cylindrical tube and is so formed that, when partly inserted therein, the assembly or unit may be evacuated of air and filled with a sterilizing gas, while the farther insertion causes the closure completely to seal the tube; the other and outer skirt, which is for manual operation, being spaced from the inner one so as to fit freely about the exterior of the tube and thus avoid preventing the ingress of gas when the tube is being sterilized. The inner skirt is longer than the outer one in order to accommodate the formations necessary for the above mentioned functions, while the length of the outer skirt is merely sufficient for convenient handling when inserting the closure to its partial and complete sealing positions and when removing the closure for repeated use of the assembly or unit.

Another object is the provision of such a dual skirted closure that is fitted functionally to cooperate with a cylindrical tube which is devoid of any structural configuration for coaction with the closure, and thus is equally adapted for use with tubes having either unthickened or beaded open ends.

Another object is the provision of such a closure that is formed with a flat top of considerable area to permit standing the same on one end with the usual swab sticks that are attached to the top extending upwardly without danger of contamination while preparing the patient for the taking of a culture specimen.

Another object is to provide the top with a projecting edge that is shaped to prevent rolling of the assembly or unit when placed on its side.

A further object is to provide certain improvements in the form, construction and arrangement of the features or functional elements of the closure whereby the above recited objects, and others inherent in the invention, may be efficiently attained.

A practical embodiment of the invention is shown in the accompanying drawing, wherein

FIG. 1 represents a perspective view of the complete assembly or unit;

FIG. 2 represents, on an enlarged scale, a view looking toward the bottom or open end of the closure;

FIG. 3 represents a similar view looking toward the top of the closure;

FIG. 4 represents, on the same scale, a broken perspective view of the closure alone; and

FIG. 5 represents, on a still larger scale, a sectional view taken on the line V-V of FIG. 2, looking in the direction of the arrows.

In brief summary, this invention contemplates a cylindrical, dual skirted cap, of which the inner skirt is intended to be inserted within the open end of a test tube, and is formed with a pair of circumferential longitudinally spaced beads that are adapted closely to coact with the inner surface of the tube for holding the cap in two positions in one of which there is partial closure of the tube and in the other of which there is complete closure or sealing. The inner bead is interrupted by a longitudinally disposed groove that serves to open communication between the inner body of the tube and the outer bead, while the latter is continuous and serves tightly to seal the tube

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when in contact with the inner surface thereof. Thus the cap may first be inserted to such an extent that the interrupted bead is within the tube while the continuous bead is without. In this first position the tube may be evacuated of air and filled with a sterilizing gas due to the presence of the longitudinal groove. Thereafter, the cap may be farther inserted into the tube to its sealing position in which the outer continuous bead closely contacts the inside of the tube while the inner surface of the top of the cap presses upon the edge of the open end of the tube. The top of the cap is enlarged in area to permit standing on end and its corners project to inhibit rolling when the assembly or unit is on its side. The tube is composed of a transparent plastic, e.g. polystyrene, to allow visual inspection of its contents, while the cap is composed of any suitable plastic that has a slight elastic quality to enable the outer skirt to ride over any enlargement that may exist at the open end of the tube, and is preferably opaque. Within the inner skirt and fixed thereto is a head piece provided with one or more sockets for receiving the end or ends of one or more swab sticks and holding the same in place with their swabbed end or ends in the tube.

Referring now to the drawing, the tube, which is of the usual test tube shape, i.e. with the closed end rounded, is denoted by 1, and the cap as a whole is marked 2. In FIG. 1, the assembled tube and cap are shown as resting on a flat surface 3, such as a table, to illustrate the non-rolling characteristic above mentioned.

The cap has a relatively enlarged top constituted by a surrounding flange with laterally projecting corners indicated by 4, 4, 4, 4, which eliminate any rolling when the assembly or unit is on its side, as previously described; while the center of the top is depressed, as well shown in FIG. 5, in order to promote sealing contact with the tube edge when the cap is in closed position.

A cylindrical inner skirt 5 is formed integrally with and projects downwardly from the cap top 2, and has a pair of circumferential beads on its outer surface which are longitudinally spaced, the outer bead 6 being continuous while the inner one 7 is interrupted or broken by a longitudinal groove 8, the lower end of which is at the inner edge of this skirt and the upper end of which terminates short of the bead 6. The purpose and function of this groove is to open communication between the interior of the tube 1 and the space between the beads 6 and 7, which latter are of such size as very snugly to contact the inner surface of the tube 1.

A circumferential series of longitudinally arranged ridges, two of which are marked 9, promote surface contact of this inner skirt 5 with the tube 1 and also strengthen the skirt, while the inner edge of the skirt is beveled, as indicated at 10, to facilitate entry of the skirt into the tube.

Within the inner skirt is a centrally disposed head piece 11 that is fixed in place by four radial wings 12, 12, 12, 12, which are preferably integral with the skirt; and in this head piece are formed a pair of sockets 13, 13, designed to receive the ends of swab sticks denoted by 14, 14, which, as is customary, are intended to have suitable swabs, marked 15, 15, placed on their free ends for the taking of cultures or specimens from the patient.

The outer skirt of the cap is denoted by 16. It is shorter than the inner skirt, as clearly shown in the drawing, and is adapted loosely to fit the outside of the tube 1, freely sliding over the edge of the tube and leaving a slight space between it and the latter to permit the inflow of gas to the groove 8 when the tube is being sterilized. The exterior of the skirt 16 may be milled as indicated in FIGS. 1 and 4, to aid in the manipulation of the cap.

In preparation for use, the assembled tube and cap, with the latter inserted only partially and the continuous bead

6 outside the tube, as shown in FIG. 5, are placed in a container of cellophane, Mylar, paper or their equivalents, alone or in combination, which is then sealed. This package is enclosed in a chemical retort and subjected to a relatively high vacuum (e.g., 29 inches) to evacuate most of the air, both from the package and from the tube (through the groove 8). A sterilizing gas, such, for instance, as ethylene oxide, is now introduced into the retort, under pressure, the gas penetrating the cellophane container and sterilizing its interior as well as the interior of the tube to which it passes through the groove 8. Thereafter, the package is removed from the retort and will remain in its sterilized condition for storage or shipment until required for use. It should be added that this condition results from the fact that atmospheric air is not under any pressure tending to force it into the package, while sufficient sterilizing gas will remain in the package even if it is compressed somewhat in handling. This procedure is well understood and is described, for instance, in United States Patent No. 3,004,681, issued October 17, 1961.

When used, the assembled tube and cap are removed from the cellophane container, the cap carrying the swab sticks is pulled from the tube and stood upright on the flat top of the cap. The culture specimen is taken from the patient on one or more swabs, after which the sticks are reinserted into the tube and the cap is forced to its fully closed position with the bead 6 tightly contacting the inner surface of the tube and the underside of the cap pressing on the edge of the tube, thus completely sealing the latter in condition to be taken to a laboratory for examination and testing without danger of contamination.

The use of the tube may be repeated by the insertion of new swab sticks into the cap, and re-sterilization as above described, to which continued reuse the article is fully amenable.

As the handling and employment of this article have been explained in the foregoing description it is deemed superfluous to recite a substantial repetition, but it may be emphasized that this invention provides an inexpensive and fully satisfactory product for this important field of use.

It should also be understood that various changes may be made in the structure, material and precise arrangement of the several parts of the closure without departing from the spirit and scope of the invention, and hence, I do not intend the coverage of the patent to be limited to the details hereinabove described except as the same may be included in the claims or be required by disclosure of the prior art.

What I claim is:

1. A closure for a therapeutic test tube designed and adapted particularly as a culture container, said closure comprising a top and a pair of depending axially aligned skirts one within the other, the inner skirt being fitted for insertion within the tube and having two external circumferential longitudinally spaced beads adapted closely to contact the tube with a sealing fit, the longitudinally inner bead being interrupted while the longitudinally outer one is continuous, together with a longitudinally disposed groove in the exterior of the inner skirt that extends from the extremity thereof through the longitudinally inner bead but terminates short of the longitudinally outer bead.

2. A closure as defined in claim 1, which is adapted to be partially inserted into the tube with the longitudinally inner bead only in sealing contact therewith to permit evacuation of air from the tube and the filling of the latter with a sterilizing gas.

3. A closure as defined in claim 2, which is also adapted for farther insertion into the tube to complete the sealing thereof by the longitudinally outer bead and the top of the closure.

4. A closure as defined in claim 3, in which the outer skirt is slightly elastic to enable it to ride over any enlargement that may exist at the open end of the tube and is spaced sufficiently from the inner skirt loosely to fit the outside of the tube for permitting evacuation of air and ingress of sterilization gas when the closure is partially inserted in the tube.

5. A closure as defined in claim 4, which also includes a head piece fixed within the inner skirt and provided with at least one socket adapted removably to receive and hold a swab stick.

6. A closure as defined in claim 1, in which the top is larger in area than the cross section of the outer skirt and formed with a peripheral edge shaped to prevent rolling of the tube when laid horizontally.

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