

Jan. 10, 1967

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3,297,184

CAP FOR CULTURE TUBES

Filed Nov. 5, 1963

FIG. 1

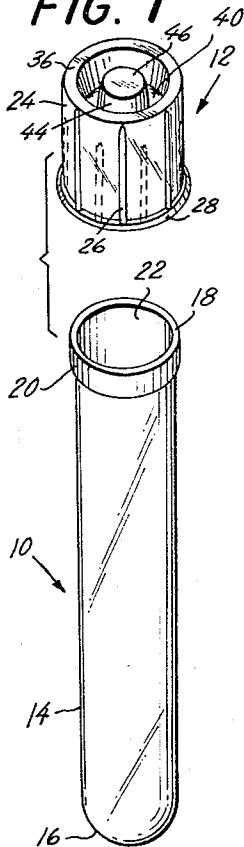


FIG. 2

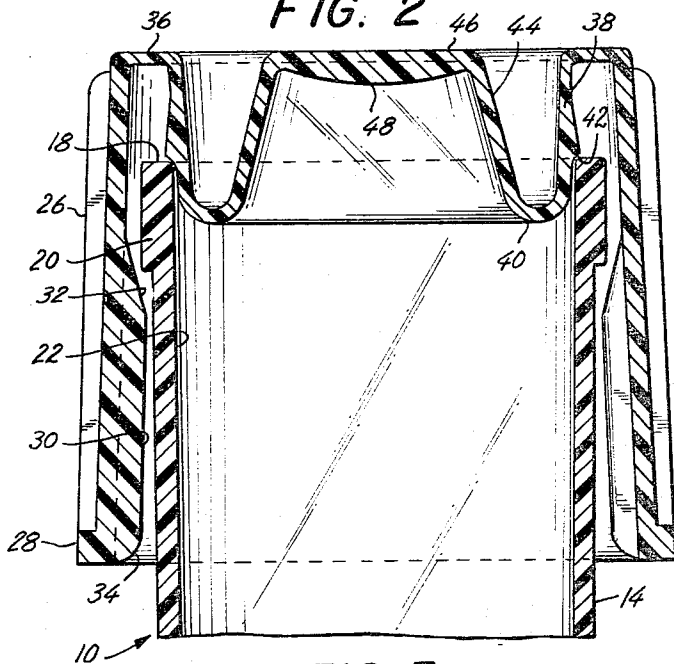


FIG. 3

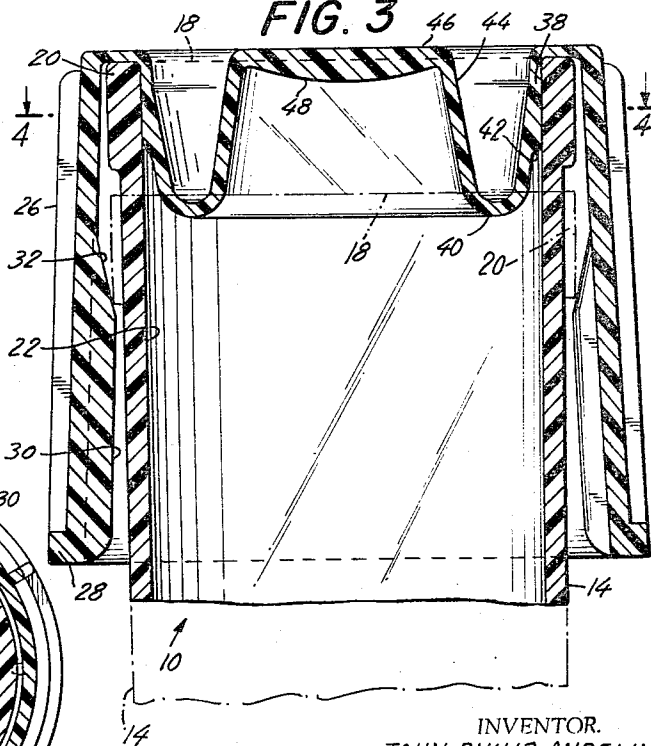
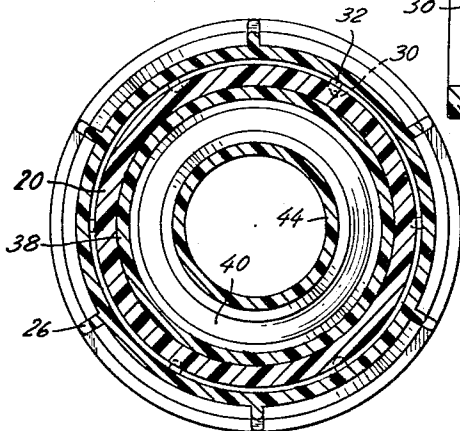


FIG. 4



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3,297,184

CAP FOR CULTURE TUBES

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Filed Nov. 5, 1963, Ser. No. 321,635

8 Claims. (Cl. 215—41)

This invention relates to improvements in caps for culture tubes capable of culturing microorganisms under aerobic or anaerobic conditions.

A wide variety of techniques have been proposed and adopted for cell as well as tissue culture. By the use of a growth-stimulating medium and transfer, cultures may be propagated for many generations. It may very well be required that the medium be renewed at frequent intervals without disturbing the cell or tissue culture. Over the years ordinary test tubes have been utilized for growing large numbers of cultures particularly in view of the attendant convenience. These tubes are used for the maintenance of tissues and for virus and biochemical assays as well as other applications. These tubes may either be rotated or kept stationary in racks depending upon the particular technique being employed. The tubes as a rule have the advantage of being relatively inexpensive and easily handled in large quantities when preparing large numbers of cultures. The tubes are quite frequently provided with caps and supplied in packages and under sterile conditions. In use, the tubes are utilized for the culturing of aerobes or anaerobes as the case may be, the utilization of the cap being dependent upon the particular technique employed.

It is a primary object of this invention to provide a culture tube with a cap facilitating the culturing of cells, tissues and microorganisms under either aerobic or anaerobic conditions depending upon the dictates of the technique being employed.

Another object is to provide a cap structure of this type with means for indicating the location of the cap relative to the tube and consequently a clear definition of the juncture between aerobic and anaerobic culturing of the contents of the tube.

A further object is to provide a cap of this type which when placed in a completely sealed position on the mouth of the tube, the possibility of rupture or fracture of the tube at this end is substantially completely eliminated.

Briefly stated, the cap fabricated in accordance with this invention is provided with internal ribs extending from the lower edge partway to the top which are adapted to engage the upper lip of the tube to retain the cap in an elevated position particularly suited for the culturing of aerobic microorganisms. The cap is also provided with a central plug portion which is adapted to tightly engage the tube when the cap is fully applied to consequently seal the tube. The plug portion is formed with a central upwardly extending projection which increases the resiliency of the plug to facilitate its application to the tube and at the same time minimize the tendency of the tube to fracture at its open end. The cap is formed with a central zone which is adapted to receive the lip of the upper open end of the tube and accordingly create an area of "play" clearly defining the location of the cap relative to the tube particularly the juncture between a completely sealed position and the position at which aerobic culturing is facilitated. Either this "play" or loose fit does not affect the maintenance of the cap on the tube and advantageously permits breathing in response to ambient conditions.

Other objects and advantages will become apparent from the following detailed description which is to be taken in conjunction with the accompanying drawing

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illustrating a somewhat preferred embodiment of the invention and in which:

FIG. 1 is an exploded perspective view of a culturing tube and cap therefor incorporating the teachings of this invention;

FIG. 2 is an enlarged and fragmentary elevational view in section of the cap mounted on the tube at the stated intermediate junction at which play between the cap and tube is present;

FIG. 3 is a similar view showing the cap fully applied on the end of the tube to create a hermetic seal therebetween, with the dotted line representation showing the relative disposition of cap and tube for facilitating aerobic culturing of the tube contents; and

FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 3.

In the drawings a culturing tube 10 is adapted to have applied thereto a cap 12 incorporating the teachings of this invention. Referring initially to the tube 10 it will be appreciated that a somewhat conventional construction is illustrated in which a cylindrical side wall 14 is closed at one end 16 and open at the other end 18. The open end 18 is defined by a circumferentially extending lip 20 and facilitates the introduction of cultures and growth stimulating media into the tube interior 22.

Referring now to the cap 12, it will be observed that it is substantially frusto-conical in configuration and includes the outwardly tapered conical side wall 24. This side wall is formed with spaced parallel exterior ribs 26 which terminate at their base in a circumferentially extending exterior flange 28 and supply the side wall with an added degree of rigidity. The side wall 24 is formed with inwardly extending projections or ribs 30 which do not extend for the entire length of the side wall but only a part of the way with the upper end thereof terminating in a beveled edge 32. The lower end of the internal ribbing 30 is formed with an arcuate face 34 to facilitate the association of the cap 12 on the tube 10.

The relative dimensioning of the cap 12 particularly the ribbing 30 and the upper lip 20 of the tube 10 is such that the lip is adapted to engage the ribbing 30 intermediate its ends as shown by way of dotted lines in FIG. 3 so as to permit the retention of the cap on the tube in an elevated position. Under these circumstances, the ambient atmosphere is adapted to be exposed to the interior 22 of the tube and, consequently, the tube contents.

The upper end of the cap is provided with a plug portion which facilitates sealing of the upper end 18 of the tube 10. In this connection the upper end of the cap side wall 24 terminates in a radially inwardly extending flat sector 36 the interior surface of which is adapted to rest on the upper end 18 of the tube 10 as shown clearly in FIG. 3. The inner edge of the substantially flat sector 36 extends into a circumferentially extending cylindrical wall 38 which in turn extends into the substantially arcuate vent portion 40. The juncture between this vent portion 40 and the wall 38 is provided with an outwardly flared lip 42 which is adapted to rest directly on the upper end 18 of the tube 10 when the cap 12 is in its intermediary "play" position relative to tube 10 as shown in FIG. 2. In this connection the lower end of the lip 20 is adapted to engage the tapered edge 32 at the upper end of the internal ribbing 30 at the other extreme position of the permissible "play."

The curved vent 40 extends into a substantially conical wall 44 the top end of which includes a substantially flat finger engaging portion 46 substantially coplanar with the flat portion 36. The central portion of the inner surface of the central portion 46 is thickened as at 48 to provide increased strength to accommodate the finger pressures that are applied in maneuvering the cap 12 to its sealed position on the tube 10. In this regard the pressure is

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applied directly to the central portion 46. Under these circumstances the flared lip 42 will in effect cam against the upper end 18 on the tube and because of the inherent flexibility and resiliency of the material from which the cap 12 is fabricated the wall 38 will shift radially inwardly with its exterior face providing a hermetic seal with the interior surfaces of the upper end 18 of the tube 10 as shown clearly in FIG. 3.

Thus, it should be apparent to those skilled in the art that an important and significant contribution is made by the cap of this invention. Biological samples may be effectively preserved and transported, particularly when associating the cap 12 on the tube 10 in the sealed position as depicted by the solid lines of FIG. 3. Aerobes and anaerobes may be effectively cultured in the tube 10 by merely associating the cap 12 in proper position on the tube as represented by the dotted lines of FIG. 3 on the one hand and on the other by the solid lines in this figure. The juncture between the sealed position and the elevated position for aerobic culturing is well defined by indicator means provided by the "play" of the lip 20 existing between the flared lip 42 and tapered end 32 of the internal ribbing 30.

Thus the numerous aforementioned objects and advantages among others are most effectively attained. Although a single somewhat preferred embodiment of the invention has been disclosed and described in detail herein it should be understood that this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

I claim:

1. A cap for culture tubes comprising an upper plug portion and a downwardly extending side wall, sealing means on said cap for sealing the top of the tubes, and gripping means including elongated and vertically extending ribbing on said cap for maintaining said cap in an elevated position with respect to the top of the tubes, whereby passages are adapted to be defined when the cap is in the elevated position between the ribbing and the interior of the cap side wall and exterior of the tube upper end to permit passage of a gaseous medium through the passages so that aerobic and anaerobic conditions are adapted to be selectively attained for culturing purposes, said cap being so constructed and arranged so as to provide a stop means intermediate said sealing means and said gripping means for permitting the sensing of attainment of the cap sealing and elevated positions on the top of the tubes.

2. The invention in accordance with claim 1 wherein the ribbing extends inwardly of the side wall and adapted to engage the exterior of the top of the tubes in elevated position with respect to the tube upper end.

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3. The invention in accordance with claim 2 wherein the plug portion includes a downwardly extending sealing wall spaced inwardly of said side wall for engaging with the interior of the top of the tubes and seal the contents of the tubes.

4. The invention in accordance with claim 3 wherein the plug portion includes flexible means associated with said sealing wall for permitting the sealing wall to shift in a substantially radial direction to assume its sealing relationship with the top of the tubes.

5. The invention in accordance with claim 4 wherein the stop means is defined at the top by a flared lip projecting substantially radially outwardly from the sealing wall and at the bottom by a downwardly and inwardly tapered upper end of the internal ribbing of the side wall.

6. The invention in accordance with claim 5 wherein the plug portion includes a central finger engaging portion against which pressure is applied to seal the cap on the tube.

7. The invention in accordance with claim 5 wherein the side wall includes external projections which cooperate in rigidifying the side wall.

8. A capped culturing tube comprising in combination: a tube having an open end and a bottom closed end, a cap on the top of the tube, said cap having an upper portion and a downwardly extending side wall, sealing means on said cap for sealing the top of the tubes, and gripping means on said cap for maintaining said cap in an elevated position with respect to the top of the tubes whereby passages are adapted to be defined when the cap is in the elevated position by the surface of the cap including the gripping means and the tube upper end to permit passage of a gaseous medium through the passages so that aerobic and anaerobic conditions are adapted to be selectively attained for culturing purposes, said cap being so constructed and arranged so as to provide a stop means intermediate said sealing means and said gripping means for permitting the sensing of attainment of the cap sealing and elevated positions on the top of the tubes.

References Cited by the Examiner

UNITED STATES PATENTS

2,304,532	12/1942	Boxley	215—56	X
2,953,272	9/1960	Mumford	215—56	
2,987,206	6/1961	Grussen	215—41	X
3,113,693	12/1963	Stull	220—60	
3,116,846	1/1964	Salminen	215—41	
3,186,573	6/1965	Salminen	215—52	

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