

This invention relates to a device for the detection of microorganisms in a body fluid sample. More particularly, this invention relates to an assembly comprising a device containing at least one solid medium in combination with a connection for the device to a liquid medium culture bottle or container.

In the detection of microorganisms in body fluids, particularly bacteria in blood, there is a requirement that a sample of the fluid be used to inoculate a liquid nutrient medium. Subsequent to this, the liquid medium is, after incubation, in turn, used to inoculate one or more solid media to obtain colony growth of the organisms. Generally, devices have been provided in which both the liquid and the solid culture media are combined in the same container. This overcomes any problems involving exposure during transfer of these cultures in the liquid medium to the solid culture medium in another container. Representative of such devices is that described in U.S. Patent No. 3,589,983. Other patents directed to the subject matter of the invention include U.S. Patent No. 3,651,926; U.S. Patent No. 4,308,347; and U.S. Patent No. 4,678,753.



1/2 There are problems, however, with combined devices in that the constituents of the solid medium may be dissolved in the liquid medium. Thus, only solid media compatible with the liquid medium can be utilized. If the solid media constituents pass into the liquid medium, differentiations of the pathogens may no longer be possible.

EP-A 0 380 768 describes a multiplate subculture solid media device provided with a connection for internal flow communication with a liquid medium culture ~~model~~ bottle. The device includes an elongated body defining a solid growth medium chamber, one end of said elongated body is formed by a solid wall. A plurality of solid medium plates is positioned on the solid wall. The solid medium plates may be only accessed through the opening of the growth medium chamber and the observation facilities are only poor.

FR-A-2 381 103 describes a singleplate subculture solid media device provided with a connection for internal flow communication with a liquid culture medium bottle. However, the subculture solid media device is only a cap to be mounted parallel to the bottom of the liquid culture medium bottle, providing no solid growth medium chamber.

It is the object of the present invention to provide an assembly for culturing microorganisms having a solid growth medium chamber for a plurality of solid medium plates, wherein the solid medium plates are arranged to provide ready observation to the observer.

This object is solved according to the invention with an assembly as claimed in claim 1.

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The device of the present invention includes growth plates directly on the removable cap, the cap, in its fixed position, being angled from the vertical to provide ready observation to the observer. The cap may be removed to observe culture development directly. In view of the fact that the solid media is on the internal surface of the removable cap, no magnifying cover is used.

The device provides for proper exposure of the two media (solid and liquid) to the sample under investigation while at the same time providing complete noncovered access to the solid media during the growth period for taking samples or close examination.

With the device of the invention, once the microorganisms begin growth, they may be examined directly without any glass or plastic covering interfering with the examination. Alternatively, they may be examined in their entirety through the transparent covering forming the access entry to the device of the invention.

The internal cap surface is sub-divided to provide two or more solid media for culture growth.



The exposure is only intermittent, as required and desired, in order to provide the appropriate culture development during the incubation or colony growth period of the inoculated solid media present in the device of the invention. Because of the large cap which is transparent, the growth character may be examined throughout the incubation period either by the examination indirectly through the transparent cap, or in the embodiment having the media directly on the cap, by removal of the cap for direct examination and sampling of the various media plates supported on the device of the invention. Once the incubation period has taken place, the cap of the device may be removed so that the entire solid media with the cultured organisms present thereon may be exposed for examination by the laboratory technician.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings, and the appended claims.

Fig. 1 is a side elevational view partially in section and illustrating an embodiment of the device ^{being part} of the invention in which the solid media is positioned directly on the removable cap internal surface;

Fig. 2 is an enlarged external view of the cap for the embodiment or Fig. 1;

Fig. 3 is a sectional view taken along lines 3-3 of Fig. 2;

Fig. 4 is a side elevational view of the cap of Fig. 2, and showing the detailed serrations for handling application and removal of the cap;



Fig. 5 is an enlarged internal view of the cap for the embodiment of Fig. 1 and showing one form of solid media configuration, and

Fig. 6 is a sectional view taken along lines 6-6 of Fig. 5.

In Fig. 1, an embodiment of cylindrical body generally designated 80 is shown defining a chamber 81 for solid media placement therein. Chamber 81 has a rear wall 83 and a front opening 82. Surrounding opening 82 are helical threads 84 for receiving the cap 90 shown in Figs. 8 to 12. Body 80 has an integral neck or extension 86 with internal threads for cooperating with threads ~~30~~ on ^aliquid culture media bottle ~~26~~. As can be seen in Fig. 1, the axis 85 of body 80 is at an angle 89 to the axis 87 of neck 86. Angle 89 may be about 19 degrees. At any rate angle 89 will be an acute angle.

As shown in Figs. 2 and 4, cap 90 has external serrations 92 for manipulating the application and removal thereof from the open end 82 of body 80. Referring to Fig. 3, a sectional view of cap 90 is shown having a ring structure 96 supported therein for receiving on the internal surface 97 thereof, solid culture media 98. Cap 90 includes internal threads 94 for cooperating with external threads 84 (Fig. 1). Annular seals 104 and 106 are positioned between the cooperating surfaces of cap 90 and internal media support ring 96 to prevent leakage of any liquid media during exposure of solid media 98 to liquid in bottle ~~26~~ during the inverting exposure procedure. Figs. 5 and 6 show the internal surface of cap 90 being divided into



two solid media plates 98 and 102 segregated by a divider 100.

Thus, as will be appreciated from the above description, there is provided in accordance with this invention, a device for culturing organisms wherein both solid and liquid culture media are required, with the device being particularly appropriate for examination of organisms during the incubation period of the device. That is, the device provides the complete alternatives of direct access or simply a thorough indirect examination.

Moreover, the assembly is comprised of multiple parts of thermoplastic materials which may be mass produced, as will be understood, from a variety of materials, including, for example, polyethylene, polypropylene and polycarbonate. Also, preferably the entire device is transparent to simplify observation.

~~While the form of the apparatus herein described constitutes preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims. For example, whereas, one form of arrangement is shown wherein the device of the invention is in tubular form,~~
It is to be understood that the basic unit of the invention may be square with a circular front face for incorporating integral screw threads for receiving the cap of the invention. The limitation is only that the device cap be easily removable so that the user will know when the cap may be removed for complete direct observation of the developed organisms.



CLAIMS

1. An assembly for culturing microorganisms, comprising
 - a) a liquid culture medium bottle;
 - b) said bottle having a closed end and an open end;
 - c) a neck on said bottle adjacent the open end;
 - d) external threads on said neck; and
 - e) a device for connection to said external threads, said device comprising
 - (1) an elongated body (80) defining a solid growth medium chamber (81);
 - (2) a solid wall (83) forming one end of said elongated body;
 - (3) an opening (82) forming the end of said elongated body opposite said solid wall;
 - (4) a transparent cap (90) for said open end;
 - (5) a plurality of solid medium plates (98, 102);
 - (6) cooperating connection means (84, 94) on said open end of said elongated body (80) and said transparent cap (90) for holding said cap in sealing engagement with said open end of said elongated body;
 - (7) an extension (86) extending integrally from said elongated body between said solid wall (83) and said open end thereof;



- (8) a bore extending through said extension (86) and in flow communication with said chamber (81);
- (9) internal screw threads (88) in said extension for connection to the external threads on the said neck of said liquid culture bottle,

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said solid medium plates (98, 102) are positioned on the internal surface of said transparent cap (90), and

the axis (85) of said elongated body (80) and the axis (87) of said extension (86) are positioned at an acute angle to each other.

- 2. The assembly of claim 1, wherein said cooperating connecting means (84, 94) are external screw threads on said open end of said elongated body (80) and internal screw threads on said cap (90).
- 3. The assembly of claim 1 or 2 wherein said elongated body (80) is cylindrical.

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