Aug. 7, 1973 L. J. SEITZ ET AL 3,751,341

RECEPTABLE HAVING A DISTENDABLE SIDEWALL

Filed May 25, 1971

FIG. 1.

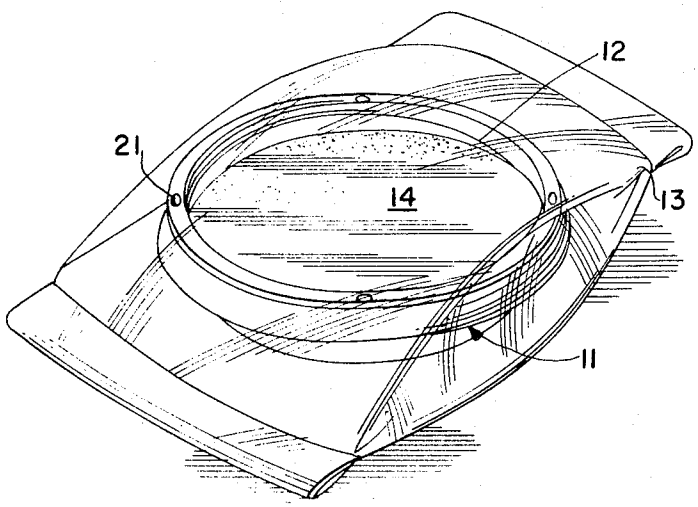


FIG. 2.

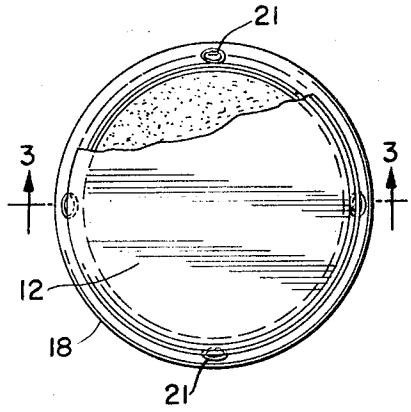


FIG. 4.

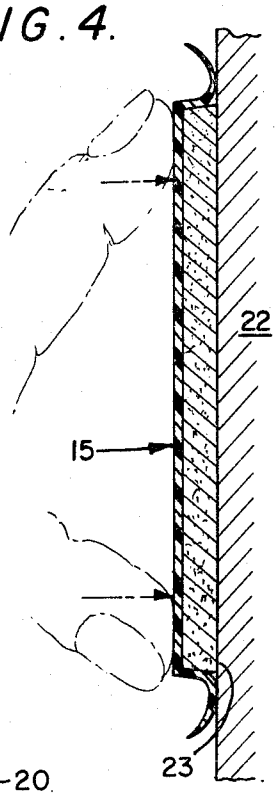


FIG. 3.

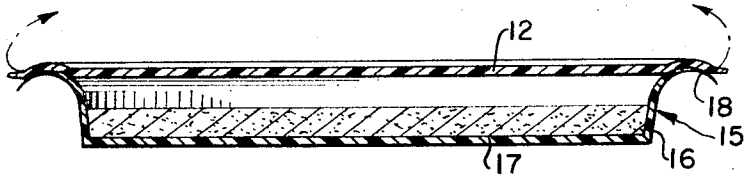
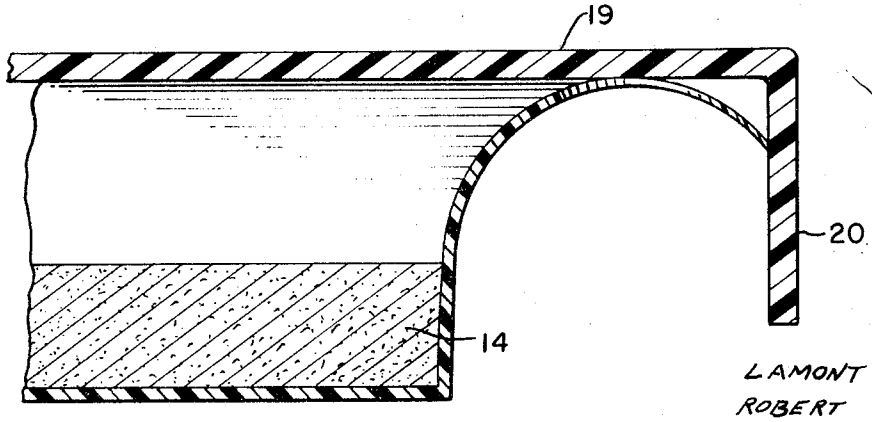


FIG. 5.



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RECEPTACLE HAVING A DISTENDABLE SIDEWALL

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U.S. Cl. 195—139 10 Claims

ABSTRACT OF THE DISCLOSURE

A round receptacle is disclosed having a distendable sidewall wherein a gelled culture medium is located in the bottom of the receptacle. The receptacle is an improved sterility tester and/or microorganism detector for surfaces, and more particularly for direct contact with surfaces which are relatively flat.

BACKGROUND OF THE INVENTION

A serious problem is encountered in hospitals and other institutions, in determining whether a particular surface is sterile or in some cases to determine the nature and count of microorganisms on said surface. This is often a problem with bed sheets, surgical masks, surfaces in an operating room, or surfaces on the body of a patient. In the past, the practice most widely used involved extensive preparation of materials, and the steps involved in performing a sterility test required considerable effort, time and manipulation. For instance, for performing a sterility test on a single, flat, nonporous area, the procedure generally accepted as being the most accurate is normally referred to as the swab-dilution-plating technique. Materials required for this procedure include sterile cotton-tipped applicators packaged in test tubes or other sterile individual containers, plastic templates, each about 4 sq. in. and aseptically packaged, dilution blanks each containing a few ml. of a suitable sterile non-toxic diluent in sterile test tubes, serologic pipettes, each of about one ml. capacity, and Petri dishes, each containing a suitable sterile agar medium. The test is performed by placing aseptically the template over the area to be tested; dipping aseptically a cotton-tipped applicator into a dilution blank of diluent; removing the applicator and swabbing the 4 sq. in. area within the confines of the template; placing the swab back into the dilution blank and returning the same to the laboratory where the blank is diluted serially in 10-fold dilutions to 1–100,000 or higher final dilutions. One ml. aliquots of the dilutions from 0 to the highest final dilution are pipetted aseptically to respective sterile, empty, marked Petri dishes. Then 10 ml. of sterile agar in test tubes are melted, cooled and added to each Petri dish containing the one ml. of the respective dilution of the test sample. The contents are allowed to solidify and then incubated from 18 to 24 hours in an incubator at 37° C. After the incubation, the number and types of microorganisms are reported as the number and types of organisms per a given area, viz, organisms and types per square inch of suface tested. Obviously, this procedure involves a great deal of labor and equipment and it enhances the possibility of foreign contamination.

Considerable progress away from the above described techniques was made with the advent of the type of sterility testing device disclosed in U.S. Pat. No. 3,337,416 to Forgacs. This device is essentially a surface contact plate.

However, the Forgacs device requires a flexible fabric insert with a tab which necessitates a secondary assembly step, thereby resulting in a higher cost than that which is most desired. A gelled culture medium is retained on the insert in the Forgacs device. In operation, the device requires removal of the insert with the gel from the container for contacting the surface to be tested, followed by its replacement in the container for incubation.

Another improved device for microorganism detecting is illustrated in U.S. Pat. No. 3,203,870 to Andelin. However, the Andelin device is difficult to pour since the dish must be completely filled with the gelled medium so that the gel surface projects above the level of the upstanding sidewalls.

Still another variation of the surface contact type of device employs a flexible bottom whereby slight depression of the bottom forces the gel plug outward toward the test surface to be contacted. Said device has the disadvantage in that only the center portion of the gel surface tends to make contact with the test surface and, occasionally, the entire gel plug is inadvertently pushed out of the container.

SUMMARY OF THE INVENTION

The device of the present invention, which is an improvement over the foregoing surface contact devices, takes the general shape of a Petri dish, being cylindrical with an upwardly extending peripheral wall. The dish is adapted to contain a gelled culture medium such as agar. The upwardly extending wall terminates in a radially directed upper portion which preferably is thinner as it reaches the end. The radially directed portion, therefore, presents an annular rim. The material of the dish is plastic so that it may be easily fabricated into the descending thickness. As a result of the thinning wall and flexible nature of the plastic, the wall can be distended radially when the open portion of the dish is pressed against a flat surface to be tested. The upper surface of the gel in the dish is brought to confrontation with the mentioned flat surface as a result of the distension so that microorganisms on the flat surface may be picked up by the surface of the agar. Suitable removable covering means is provided to protect the agar surface both before and after use of the dish in contacting the test surface.

DETAILED DESCRIPTION OF THE INVENTION

In the following, like reference numerals refer to like parts throughout the drawings wherein:

FIG. 1 is a perspective view of an embodiment of the receptacle of the present invention suitably packaged.

FIG. 2 is a top plan view with part of the cover broken away.

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2.

FIG. 4 depicts use of the invention.

FIG. 5 is an enlarged cross-sectional view of a portion of another embodiment of the present invention.

Turning to the drawings, reference numeral **11** refers, generally, to the receptable of the present invention. In FIG. 1 the receptacle **11** with a cover **12** in place is enclosed in a protective plastic bag **13**. The bag is preferably sterilized and sealed to prevent the admission of air, moisture, dirt and other contaminating materials. The receptacle contains a gelled culture medium **14** such as hardened agar.

From FIG. 3 it can be seen that the receptacle consists of two parts, a lower part **15** and a cover **12**. The lower part **15** has a shallow (e.g., ¼–1 inch depth) cylindrical configuration with an upwardly extending sidewall **16** and a disc shaped bottom **17**. The sidewall has an arcuate portion **18** which can comprise a rolled rim. The wall becomes thinner in the direction of its leading edge. The lower part **15** is constructed of plastic in a manner so that the sidewall **16** is flexible at its upper portion and increases in flexibility as it becomes thinner.

Suitable plastics for fabricating the receptacle are, for example, polystyrene, polyethylene, polypropylene, polyvinylchloride, cellulose acetate and methacryate polymers. The receptacle can be readily thermoformed or injection molded from these plastics to a degree of flexibility sufficient to permit distension of the upper portion of the sidewall when manually pressed against the surface to be tested, whereby the upper surface of the gel is brought into confrontation with said test surface.

As can be seen from FIG. 2, the arcuate portion **18** presents an annular appearance from the top. The arcuate portion has a plurality of apertures **21** spaced equidistant thereabout. The apertures will become distorted when the arcuate portion **18** of the sidewall **16** is distended and can serve to relieve hoop stress of the rolled rim. Also, the apertures are useful to receive downwardly depending lugs on the cover **12**. In this way the thin cover **12** is less likely to slip off the lower part **15**. The edge of cover **12** has an annular arcuate edge portion adapted to be complementary with the arcuate portion **18** of the sidewall **16**.

FIG. 5 depicts another embodiment in cover **19** structure. The cover **19** has a diameter greater than the largest diameter of the lower part **15**. It also possesses a downwardly depending skirt **20**. The cover may be of the type normally employed in covering a Petri dish so that from a manufacturing point of view only the lower part requires new fabricating facilities.

Prior to use, a quantity of molten sterile agar or other gelling medium is poured into the lower part **15**, much in the same manner as in connection with handling Petri dishes. The upper surface of the agar in the lower part preferably is at a level such that the agar volume is equivalent to about one-third to one-half of the capacity of the lower part **15**.

A cover is then placed over or on the lower part. The assembled receptacle is then packaged in a transparent envelope such as a polyethylene bag, for instance. The use of the bag may not be necessary when a large cover 19 is used so that the receptacle of the present invention may be handled as covered Petri dishes. When the device is to be utilized, the cover is removed and the lower part is positioned against a flat surface such as a wall **22**, as in FIG. 4. It will be seen there from that the open portion of lower part **15** is facing the wall **22**. By pressing at the bottom **17** of the lower part **15**, the sidewall **16** is distended along the arcuate portion **18** thereof so that the surface **23** of the agar makes contact with the wall, thereby picking up any microorganisms that may be present on the wall.When the pressure on the bottom is released, the lower part assumes its normal configuration. The cover is then repositioned and the receptacle is incubated employing conventional procedures therefor. The microorganism growth can be calculated from standards already known.

When a sterilized bag is employed, a cover may in fact not be needed as long as the bag has sufficient self-sustaining properties so that a portion thereof does not fall to the surface of the agar in the lower part of the receptacle.

One of the advantages of the present invention merits mention at this point although others will be readily apparent. While the principal use of sterility or bacteriological identification with the present device is in a hospital, that is not the only use of the invention. Frequently a doctor calling on a patient at his home or in the case of office calls may wish to make tests of selected areas. These are more apt to be tests in which the identification of the microorganism is of importance, but occasionally they are also sterility tests. The physician can keep a supply of receptacles of the present invention in his office and take a few with him in his doctor's bag and can make the tests and then send the receptacles to a suitable laboratory for examination, for example, at the nearest hospital. This convenience, even for the individual physician, is of importance and, of course, the enhanced reliability of the tests is just as important whether the test is made by an individual physican or is made in conjunction with a surgical team of a hospital.

Although particular reference has been made hereinbefore to use of the claimed invention in hospitals and by physicians, it will be understood that the invention is not limited thereto but is similiarly applicable for use in food laboratories, dairies, meat packing houses and other such institutions having a need to determine sterility and/or the nature and count of microorganisms.

While the invention has been described in detail with respect to particular embodiments in which the receptacle is distendable along the arcuate and thinner portion of the sidewall, it will be appreciated that the objects of the invention can also be achieved by providing convolutions in said sidewall which will distend or yield under stress and allow the gelled medium to contact the surface as the receptacle is pressed against a flat surface.

In another embodiment of the invention, a plurality of upwardly extending and distendable finger-like projections or tabs can be positioned on the rim of the sidewall. These tabs can be equidistantly spaced apart in the manner shown for apertures **21** in FIG. 2.

In still another embodiment, a removable plastic ring can be placed around the outer circumference of the lower part of the receptacle for supporting a thin, flexible sidewall. The ring can be removed when contact with the test surface is desired to be made and then replaced for support prior to incubation of the receptacle.

In yet another embodiment, the sidewall can be notched, scored, or otherwise constructed to distend or break away under stress to allow the culture medium to contact the test surface.

It should also be noted that although agar has been particularly described to illustrate the gelled nutrient medium, solid culture media for microorganisms other than agar can be employed in the receptacle of this invention, for instance, agarose, gelatin, carrageenin, modified cellulose such as described in U.S. Pat. 3,360,440, cross-linked polyacrylamide as disclosed in U.S. Pat. 3,046,021, irradiated polyethylene and the like natural and synthetic gelling substances.

While there have been shown and described particular embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention and, therefore, it is aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

We claim:

1. A test device for determining the presence of microorganisms on a relatively flat surface by direct contact therewith comprising a shallow cylindrical receptacle, said receptacle having a bottom and an upwardly extending cylindrical sidewall terminating in a leading edge, said receptacle including a quantity of gel medium the upper surface of which is substantially below said sidewall, said sidewall having a degree of flexibility to permit distension of its upper portion when manually pressed against said relatively flat surface whereby said upper surface of said medium is brought into contact with said relatively flat surface due to the flexibility of the upper sidewall.

2. The device of claim **1** wherein said sidewall has an arcuate radially extending portion at the upper portion thereof.

3. The device of claim 2 wherein the receptacle is distendable along said arcuate portion.

4. The device of claim 2 wherein said sidewall tapers in thickness from at least the beginning portion of the arcuate portion towards the said leading edge.

5. The device of claim 4 wherein at least the arcuate portion of the sidewall is constructed of plastic.

6. The device of claim 5 wherein said arcuate portion has a plurality of apertures.

7. The device of claim 6 wherein the receptacle has a cover.

8. The device of claim 7 wherein the cover has a plurality of depending lugs adapted to fit into said apertures.

9. The device of claim 4 wherein the arcuate portion is resilient.

10. The device of claim 1 wherein said sidewall is convoluted.

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