

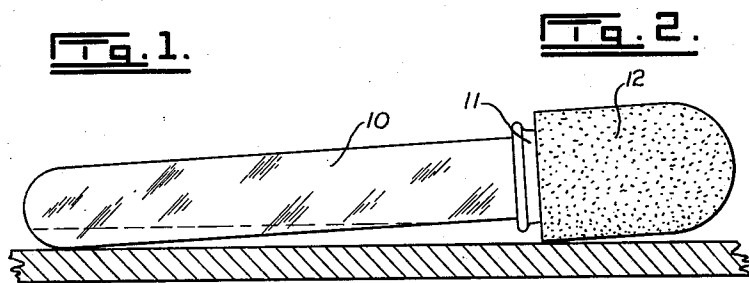
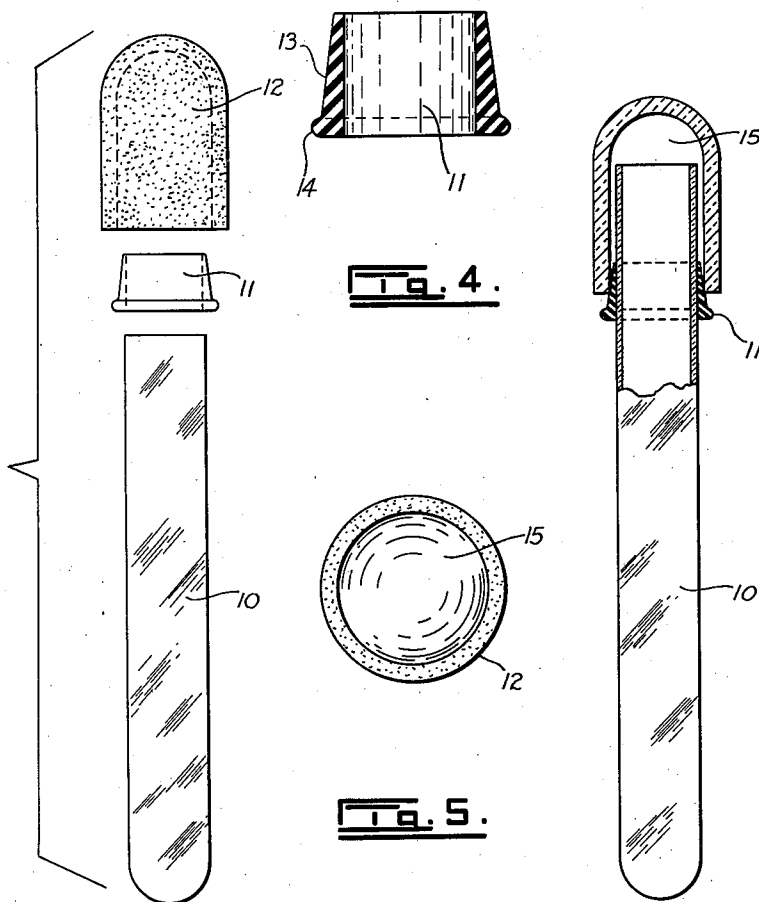
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CLOSURE FOR TEST TUBES OR THE LIKE

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CLOSURE FOR TEST TUBES OR THE LIKE

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5 Claims. (Cl. 23—292)

This invention relates to an improved closure for test tubes, flasks or other similar containers used in laboratory work.

An object of the present invention is the provision of a closure particularly for test tubes used in bacteriology and biology.

Another object is the provision of a closure for test tubes used in bacteriology to replace the cotton wool plugs now universally used.

A further object is the provision of a test tube closure that will permit the free circulation of air into the tube and, at the same time, will prevent the entrance of bacteria and dust therein.

A further object is the provision of a test tube closure that may be sterilized without ill effect in dry heat or under steam pressure.

Yet another object is the provision of a test tube closure that may be used with any suitable standard test tube without altering its construction.

A still further object is the provision of a test tube closure that may be manufactured at a very small cost.

Cotton wool plugs for test tubes were first used in bacteriology about 1850 and while other sides of bacteriology have progressed since then, the cotton wool plug has not changed and is still in universal use. The cotton wool plug catches and holds dust and affords a ground for the protection and growth of moulds from the air. Any dust or bacteria in the plug is carried to the inside of the test tube when the plug is inserted therein. When cotton wool plugs are used, loose fragments of wool fly about and are likely to infect people coming into contact with them or to contaminate the cultures. Loose fragments of wool often destroy stock solutions, such as bacterial emulsions for vaccines, after many weeks of preparation. Only exceptionally painstaking workers will make these cotton wool plugs uniformly and satisfactorily. Sometimes it is necessary, due to some unforeseen difficulties, to set a plug down but this cannot be done with the cotton wool plug without the danger or even certainty of contaminating the media or culture. Another disadvantage of the wool plug is that it absorbs moisture during steam sterilization of the materials and vessels with which it is used resulting in hundreds of tubes of media being spoiled each year in every laboratory due to moisture entering the tubes. In these cases, the cultures fail through unrecognized alteration by dilution of the media in the tubes by condensed steam.

Attempts have been made to provide a substi-

tute for cotton wool plugs but these have failed. The chief attempt was made by providing a test tube having a groove adapted to receive a ring of cotton wool over which a cap was fitted. The cotton wool was necessary to permit the free circulation of oxygen into the tube. In this case, it would be practically impossible to hold the cotton wool in place when the cap was being fitted on to the tube. The cotton wool would unavoidably be moved out of place every time the cap was removed and replaced, a process which happens frequently in the life of the culture. The alternate wetting and drying incident to sterilization, would make the cotton wool either pervious to bacteria (the universal cotton wool plug has sufficient bulk to absorb excess moisture) or it would become water logged and impervious to air and so would be unsuitable for bacteria requiring free oxygen. An outstanding drawback to the above described method is that it could not be used with a standard test tube. It would be necessary to make special test tubes for the purpose having grooves formed therein. The tubes would be costly and difficult to clean out because of the groove. They would be liable to be broken in the frequent boilings necessary for sterilization and would offer an undesirable elevation which would be likely to catch the inoculating loop carrying infected material from the culture to make smears or to inoculate fresh cultures.

The utility of these attempts to provide a substitute for cotton wool plugs is clearly recognized by the fact that the cotton wool plug is still used the world over despite the many disadvantages incurred by its use.

The present invention consists essentially of a tubular cushion or collar formed of a resilient material, such as rubber or the like, adapted to be positioned on a test tube, and a cap formed of porous material such as, for example, unglazed porcelain, pottery or other suitable similar material, said cap being adapted to fit over the end of the test tube and the cushion, as more clearly illustrated in the accompanying drawing, in which

Figure 1 is an elevational view of a test tube, the cushion and the cap before assembly,

Figure 2 is a vertical sectional view through the cushion and the cap mounted in position on a test tube,

Figure 3 is an elevational view of a test tube in sloped position with the cushion and cap in position,

Figure 4 is an enlarged vertical section taken through the cushion, and

Figure 5 is an end elevation of the cap.

Referring more particularly to the drawing, 10 is an ordinary test tube, 11 is a tubular cushion or collar formed of a suitable resilient material, such as rubber or the like, adapted to be positioned on the tube, and 12 is a cap formed of a suitable porous material, such as, for example, unglazed porcelain, pottery or similar material.

The cushion or collar 11 consists of a tubular sleeve 13 adapted to fit snugly over a test tube and having a shoulder 14 at the lower end thereof. The outer surface of the sleeve 13 tapers inwardly from the shoulder 14 towards the upper end of the sleeve or, in other words, the outer diameter of the sleeve diminishes from the lower end thereof towards its upper end. The inside diameter of the sleeve remains constant throughout its length.

The porous cap 12, hollowed out, as at 15, is adapted to fit over the upper end of the test tube. The inside diameter of the cap is greater than the diameter of the test tube and slightly greater than the diameter of the upper end of the sleeve 13 but it is slightly less than the diameter of the sleeve immediately above the shoulder 14. With this construction, the sleeve 13 acts as a cushion for the cap and, at the same time, it retains the cap in position on the test tube. When the cap is pressed downwardly over the sleeve 13, the tapered outer surface of said sleeve acts as a wedge which acts firmly to hold the cap in position. The shape, size and porosity of the caps may be standardized as desired. When in position, the porous cap will permit the free circulation of air or gases into the tube and will prevent bacteria and dust from entering therein. This cap affords a support by means of which the tubes may be rested at an angle (see Fig. 3) while sloped media therein solidifies.

The above described cap with the tubular cushion fulfills the following essentials of a closure for test tubes containing bacterial cultures:—

- (a) It will withstand high temperatures of dry heat. (The cushion need not be exposed to this.)
- (b) It will resist sterilization under steam pressure.
- (c) It will not absorb moisture during steam sterilization and it will not allow moisture to enter the test tube.
- (d) It allows free circulation of air or gases into the tube.
- (e) It prevents the entrance of bacteria and dust into the tube.
- (f) It can readily be held between the fingers while transfers are being made from one tube to another.
- (g) It can be manufactured at a small cost.
- (h) It is extremely durable.

This closure has the following advantages over the cotton wool plug:

- (a) It will not readily catch and hold dust.
- (b) Any dust or bacteria that might settle on it will be carried to the outside of the tube instead of the inside thereof, as in the case of the cotton wool plug.
- (c) There are no loose fragments of wool to fly loose thus eliminating the danger of infecting people or contaminating the cultures.
- (d) The cap affords a support to rest test tubes at an angle while sloped media therein solidifies.

(e) The cap may readily be standardized to the exact size, shape and porosity.

(f) The cap may be set down during use without the danger of contaminating the media or culture.

(g) It does not afford an undesirable receptacle for the protection and growth of moulds from the air, as does the cotton wool plug.

(h) Eliminates the necessity of flaming the plug.

(i) It eliminates the fire hazard of the highly inflammable cotton wool plug.

(j) It will not stick in the tube when media has been dropped near the rim thereof, which media usually solidifies.

(k) It is not spoiled by alternate wetting and drying.

(l) It can be used innumerable times while the cotton wool plug may be used only once.

The following is an example of a method of sterilizing and using the above mentioned closure:

The cushions, preferably formed of rubber, are stored in a 4% formalin solution and the caps kept in a metal box and sterilized from time to time in a hot air sterilizer. The test tubes are sterilized by fractional sterilization, washed and dried out. In use, the caps are placed on the test tubes without the cushions and put into test tube baskets to be sterilized in a dry air sterilizer. After removing the caps, the media is filtered into the tubes, in the usual manner, and the cushions slipped thereon, preferably from the bottom upwardly. The caps are replaced and the whole sterilized in an autoclave. The procedure in using these closures is very simple and they may be easily handled.

While the cap 12 has been described as being formed of porous material, it will be understood that it may be formed of non-porous material for use in cases when it is desirable to exclude air from the test tube. Another variation of this invention is that the inner surface of the cap 12 may be tapered towards the bottom thereof in place of tapering the outer surface of the cushion 11.

From the above, it will readily be seen that a closure for test tubes or the like has been provided to replace the universally used cotton wool plug, said closure being suitable for the purpose without the many disadvantages of the cotton wool plug.

Various modifications may be made in this invention without departing from the spirit thereof or the scope of the claims, and therefore the exact forms shown are to be taken as illustrative only and not in a limiting sense, and it is desired that only such limitations shall be placed thereon as are disclosed in the prior art or are set forth in the accompanying claims.

What I claim as my invention is:

1. In combination with a test tube, a closure therefor comprising a cushion positioned on the tube adjacent the top thereof and a cap removably fitted over the top of the tube and the cushion, said cap being formed of porous porcelain material, whereby air is permitted to circulate in the tube and bacteria and dust are precluded therefrom.

2. In combination with a test tube, a closure therefor comprising a resilient cushion positioned on the tube adjacent the top thereof and a cap removably fitted over the top of the tube and the cushion, said cap being formed of porous

porcelain material, whereby air is permitted to circulate in the tube and bacteria and dust are precluded therefrom.

3. In combination with a test tube, a closure therefor comprising a resilient, tubular cushion 5 positioned on the tube adjacent the top thereof, and a cap removably fitted over the top of the tube and the cushion, said cap being formed of porous porcelain material, whereby air is permitted to circulate in the tube and bacteria and 10 dust are precluded therefrom.

4. In combination with a test tube, a closure therefor comprising a tapered tubular cushion positioned on the tube adjacent the top thereof, 15 and a cap removably fitted over the top of the tube and the tapered portion of the cushion, said cap being formed of unglazed porous porcelain

material, whereby air is permitted to circulate in the tube and bacteria and dust are precluded therefrom.

5. In combination with a test tube, a closure therefor comprising a tubular cushion positioned on the tube adjacent the top thereof, the outer diameter of said cushion diminishing from the lower end towards the top thereof, and a cap formed of porous porcelain material removably fitted over the top of the tube and the cushion, the inside diameter of the cap being greater than the diameter of the upper end of the cushion and less than the diameter of the lower end thereof, whereby air is permitted to circulate in the tube and bacteria and dust are precluded therefrom.

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