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LABORATORY EQUIPMENT

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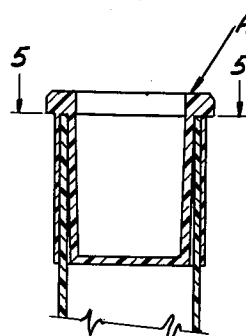
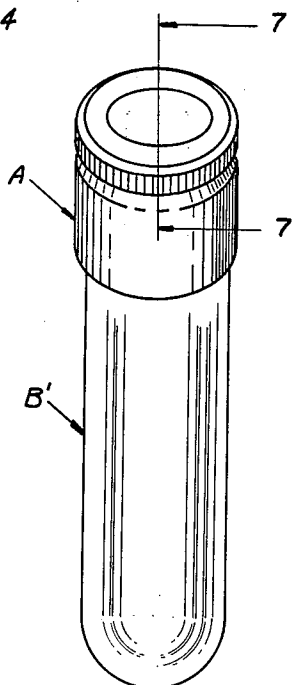
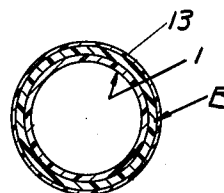
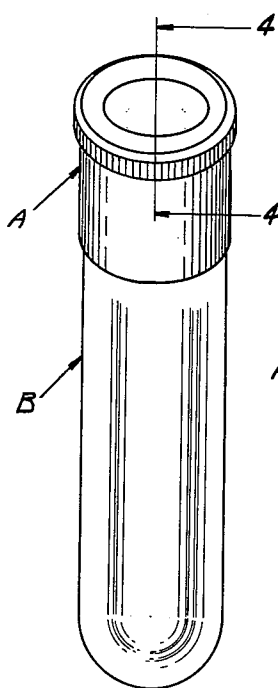
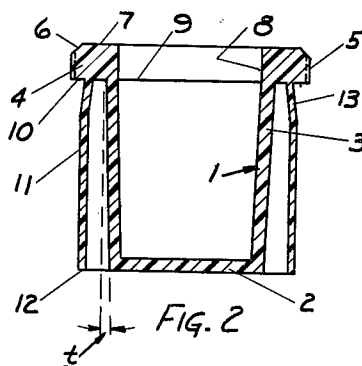
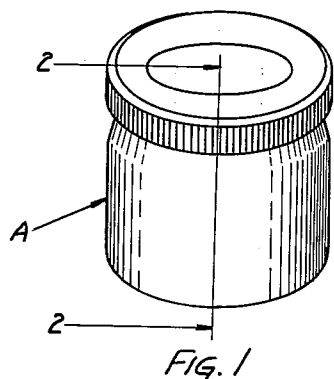
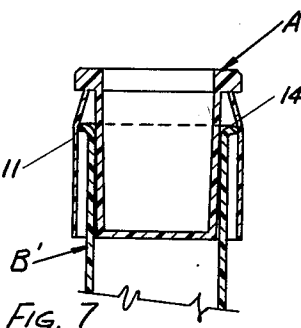


FIG. 3

FIG. 6



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1

3,005,564

LABORATORY EQUIPMENT

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This invention relates in general to certain new and useful improvements in laboratory equipment and, more particularly, to a new and unique closure for laboratory glassware, such as test tubes, spectrophotometer tubes, nephelometer tubes, and the like.

In analytical laboratories, such as those which are found in hospitals, medical clinics, industrial plants, and the like, various types of laboratory glassware are routinely used for analytical procedures. For instance, several different types of glass tubes, generally resembling test tubes in shape, are used in spectrophotometers for containing liquid samples which are being subjected to spectrophotometric analysis. In other types of analytical procedures where the end result is obtained by color comparison, tubes of somewhat similar shape and design are employed in colorimeters, nephelometers, and similar apparatus. In fact, there is quite a wide range and variety of this type of laboratory glassware which is currently in use in scientific laboratories of all sorts.

One of the problems which is encountered in the use of such laboratory glassware relates to the stoppers or closures therefor. At the present time, it is conventional practice to use a solid rubber stopper which is forced down into the open or mouth end of the glass tube or vessel. If the stopper is not forced into place firmly it often slips out unauthorizably, resulting in spillage or contamination of the sample. On the other hand, when the stopper is pressed too tightly in place, the upper end of the tube is occasionally broken. In addition to this, the upper portion of the glassware adjacent to the stoppered end very often will strike against some hard object, such as a table top or other piece of glassware, and the impact will crack or break the upper end of the tube, particularly if it is under some degree of tension as a result of stoppering.

Another and closely related problem in connection with closures or stoppers for laboratory glassware results from the wide variety of different sizes employed for such glassware. Since solid rubber stoppers must fit snugly and yet cannot be inserted with excessive force, it is necessary to have a different sized stopper for each different sized tube or vessel, with the result that the average laboratory must contain quite a stock of stoppers in a large range of sizes. It is not only costly to maintain such a stock of stoppers, but it also occasions considerable loss of valuable time, inconvenience and annoyance to sort through the various sized stoppers and pick out the right size each time one is required. Similarly, it is also time-consuming, after the stoppers have been used and washed, to sort them out and again return them, each to its proper storage bin, storage compartment, or container.

It is, therefore, the primary object of the present invention to provide a closure or stopper for laboratory glassware which is uniquely constructed so as to fit snugly and securely within the open or mouth end of a piece of laboratory glassware and form a tight, secure closure therefor without exerting undue bursting pressure or rim pressure upon the upper end of the glassware.

It is another object of the present invention to provide a closure or stopper of the type stated which will readily accommodate itself to variations of internal diametral size of the mouth of the piece of glassware into which it is inserted.

2

It is also an object of the present invention to provide a closure or stopper of the type stated which will protect the upper end of the piece of glassware into which it is inserted and prevent breakage thereof due to accidental impact with other objects.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing (one sheet)—

FIG. 1 is a perspective view of a stopper or closure constructed in accordance with and embodying the present invention;

FIG. 2 is a vertical sectional view taken along line 2-2 of FIG. 1;

FIG. 3 is a perspective view of a laboratory tube stoppered with a closure constructed in accordance with the present invention;

FIG. 4 is a fragmentary sectional view taken along line 4-4 of FIG. 3;

FIG. 5 is a transverse sectional view taken along line 5-5 of FIG. 4;

FIG. 6 is a perspective view of a different type of laboratory glass tube stoppered with a closure constructed in accordance with the present invention; and

FIG. 7 is a fragmentary sectional view taken along line 7-7 of FIG. 6.

Referring now in more detail and by reference characters to the drawing, which illustrates a preferred embodiment of the present invention, A designates a closure or stopper which is molded as an integral or one-piece unit from a suitable rubber-like synthetic resin or so-called "plastic material" such as polyethylene and comprises a central somewhat cup-shaped element 1 having a flat bottom member 2 and a somewhat frusto-conical side wall 3 extending upwardly therefrom at an outwardly diverging angle of taper t . It has been found in connection with the present invention that this angle of taper should not be less than 5° nor more than 10° for reasons which will be presently more fully discussed. At its upper end, the side wall 3 merges integrally into a relatively heavy annular collar 4 which is provided around its outer face 5 with a rough pattern, such as, for example, a vertical series of serrations which serve to facilitate gripping the stopper A with the fingers. The upper margin of the collar 4 is preferably, though not necessarily, beveled as at 6 so that the grip-forming serrations or pattern on the annular face 5 will not intersect the flat top face 7 of the stopper A. It will also be noted by reference to FIG. 2 that the interior annular face 8 of the collar 4 is cylindrical and merges with the interior face of the side wall 3 along a circular line of demarcation 9 which is coplanar with the downwardly presented under face 10 of the collar 4.

Formed integrally with, and extending downwardly from, the under face 10 of the collar 4 is a skirt member 11 which terminates at its lower end in a transverse margin 12 which is coplanar with the under face of the bottom member 2. For a substantial distance upwardly from the bottom margin 12, the skirt member 11 is substantially cylindrical and then tapers inwardly at an angle of taper which is several degrees greater than the angle of taper t , thus forming an inwardly tapering integral band 13 which, in vertical height, is approximately one-fifth the height of the cylindrical portion of the skirt member 11.

In use, the stopper A can be conveniently and easily fitted into the open or mouth end of a glass tube B and the tapered central cup-shaped element 1 will seat itself snugly and conformably into the interior thereof. As a result of the hollow interior of the cup-like element 1 and

the angle of taper t , it is possible, with a single size of stopper A, to accommodate a fairly wide range of different glass tubes. The angle of taper t within the range above specified is substantially greater than the conventional angle of taper employed on solid rubber stoppers and corks. Consequently, with solid rubber stoppers, it is necessary to utilize something of the order of thirty to forty different sizes in order to accommodate various types of laboratory glassware commonly in use. With the stopper A of the present invention, it is possible to accommodate this same range with only seven different stopper sizes. Moreover, the angle of the taper t and the fact that the cup-like element 1 is hollow makes it possible to achieve a much more secure effective closure within the mouth end of the glass tube B or other similar piece of laboratory glassware without imposing excessive bursting or so-called "rim pressure" on the glass. Finally, the skirt element 11 will envelope the upper portion of the glass tube B and protect it against chipping and breaking as a result of accidental impact or shock.

Certain types of glass tubes which require an unusually tight seal can be pushed all the way up into the doubly tapered recess between the upper portion of the side wall 3 and the annular band portion 13 of the skirt member 11 substantially as shown in FIG. 4.

The stopper A may also be used equally well with glass tubes such as the tube B' shown in FIG. 6, which has an upwardly and outwardly flared fire-polished rim 14 which stretches the skirt member 11 and seats itself tightly therein somewhat in the manner shown in FIG. 7.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the laboratory equipment may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A closure for laboratory glassware such as test-tubes, sample tubes, and the like, which have substantially cylindrical necks terminating in a substantially circular mouth; said closure comprising a tapered plug-like element adapted for insertion into said mouth and being integrally provided at its larger end with a diametrically enlarged collar, the angle of taper of the plug-like element being from 5° to 10° with respect to the longitudinal axis thereof, said collar having a depending skirt which encircles the plug-like element and is provided with an inwardly presented cylindrical face disposed in annularly spaced relation to the plug, said skirt being connected at its upper end to the collar by an axially inwardly tapering band, said band having a vertical height substantially shorter than the height of said skirt.

2. A closure for laboratory glassware such as test-tubes, sample tubes, and the like, which have substantially cylindrical necks terminating in a substantially circular mouth; said closure comprising a tapered plug-like element adapted for insertion into said mouth and being integrally provided at its larger end with a diametrically enlarged collar having a depending integral skirt which encircles the plug-like element and is provided with an inwardly presented cylindrical face disposed in annularly spaced relation to the plug, the lower margin of the skirt being substantially coplanar with the lower margin of the plug, said skirt being connected at its upper end to the collar by an axially inwardly tapering band, said band having a vertical height substantially shorter than the height of said skirt.

3. A closure for laboratory glassware such as test-tubes, sample tubes, and the like, which have substantially cylindrical necks terminating in a substantially circular mouth; said closure comprising a tapered hollow plug-like element adapted for insertion into said mouth and being integrally provided at its larger end with a diametrically enlarged collar, the angle of taper of the plug-like element being from 5° to 10° with respect to the longitudinal axis thereof, said collar having a depending skirt which encircles the plug-like element and is provided with an inwardly presented cylindrical face disposed in annularly spaced relation to the plug, said skirt furthermore being connected at its upper end to the collar by an axially short inwardly tapered section, said tapered section having a vertical height substantially shorter than the height of the cylindrical face of said collar.

4. A closure for laboratory glassware such as test-tubes, sample tubes, and the like, which have substantially cylindrical necks terminating in a substantially circular mouth; said closure comprising a tapered hollow plug-like element having a flat bottom wall adapted for insertion into said mouth and being integrally provided at its larger end with a diametrically enlarged collar, the angle of taper of the plug-like element being from 5° to 10° with respect to the longitudinal axis thereof, said collar having a depending skirt which encircles the plug-like element in annularly spaced relation thereto, said skirt being connected at its upper end to the collar by an axially inwardly tapering band, said band having a vertical height substantially shorter than the height of said skirt.

5. A closure for laboratory glassware such as test-tubes, sample tubes, and the like, which have substantially cylindrical necks terminating in a substantially circular mouth; said closure comprising a tapered plug-like element adapted for insertion into said mouth and being integrally provided at its larger end with a diametrically enlarged collar having a depending skirt which encircles the plug-like element and is provided with an inwardly presented cylindrical face disposed in annularly spaced relation to the plug and is connected to the underside of the collar by an inwardly tapering section which is substantially shorter than the axial length with respect to the axial length of the remainder of the skirt.

6. A closure for laboratory glassware such as test-tubes, sample tubes, and the like, which have substantially cylindrical necks terminating in a substantially circular mouth; said closure comprising a plug-like element adapted for insertion into said mouth, said plug-like element having a downwardly diverging angle of taper of 5° to 10° with respect to the longitudinal axis thereof, said element further being integrally provided with a diametrically enlarged collar at its larger end, said collar having a depending skirt which encircles the plug-like element and is provided with an inwardly presented cylindrical face disposed in annularly spaced relation to the plug, said skirt being connected at its upper end to the collar by an axially inwardly tapering band, said band having a vertical height substantially shorter than the height of said skirt.

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