Aug. 4, 1959 W. J. NUNGESTER 2,897,992

CLOSURE AND SPRING CLIP ASSEMBLY ADAPTED FOR USE WITH A TEST TUBE AND THE LIKE

Filed May 27, 1957

FIG. 1.

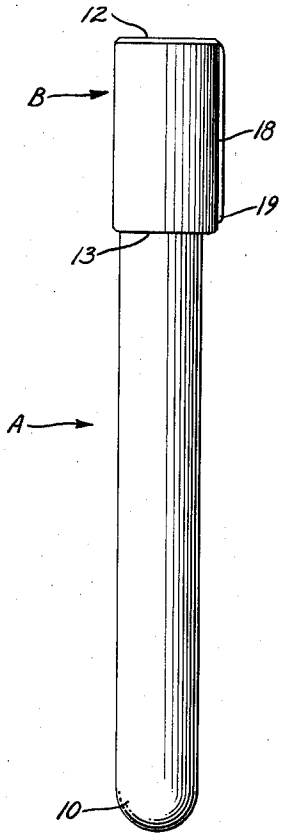


FIG. 2

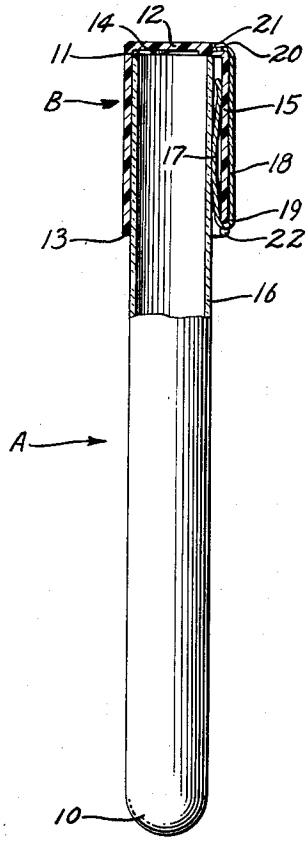


FIG. 3.

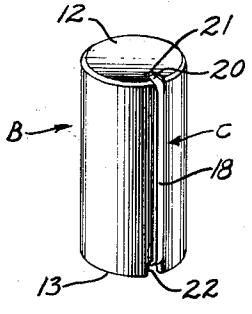


FIG. 4

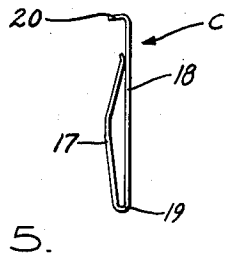
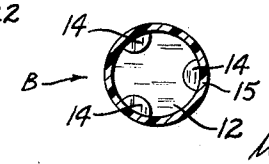


FIG. 5.



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United States Patent Office 2,897,992 Patented Aug. 4, 1959

2,897,992

CLOSURE AND SPRING CLIP ASSEMBLY ADAPTED FOR USE WITH A TEST TUBE AND THE LIKE

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Application May 27, 1957, Serial No. 661,726

11 Claims. (Cl. 215—38)

This invention relates generally to a closure and spring clip assembly adapted for use with a test tube and the like.

One of the essential objects of the invention is to provide an assembly of the type mentioned comprising a closure adapted to be sleeved upon the open end of a test tube, and means for holding said closure against displacement when sleeved upon the test tube, including spring means straddling a wall of said closure and adapted to frictionally engage the outer surface of the test tube.

Another object is to provide a closure of the type mentioned that is formed by a compression molding operation and is capable of withstanding high temperatures and of resisting breakage while being handled and in use, as well as deterioration.

Another object is to provide a closure formed from a phenolic resin of the high impact type and of any desired color, or capable of being impregnated with any coloring substance, so that closures of various colors may be provided for identification purposes, for example when used in pharmaceutical laboratories.

Another object is to provide a closure of sufficient length to provide ample finger or gripping area so that the fingers will not come in contact with the test tube.

Another object is to provide a closure with means, preferably in the form of a spring metal clip, engageable with a test tube and the like to effectively hold the closure in closed position upon the open end of the test tube.

Another object is to provide a clip of the type mentioned that is preferably formed from tempered stainless steel so that it will not rust or corrode and that is capable of retaining its spring tension, without losing any of its properties, after being subjected repeatedly to high temperatures.

Another object is to provide a clip that will accept automatically the normal variations of test tube diameters prevalent with the dimensional tolerances established by the test tube manufacturers when making test tubes, and that therefore will compensate for any irregularities in the diameters of the test tubes to which a closure equipped with such a spring clip is applied.

Another object is to provide a clip that is readily attached to and removed from the closure, whereby the clip is easily replaceable by the user if worn out, or damaged or lost while in use, and whereby the closure may be used with or without such clip, as desired.

Another object is to provide a closure and spring assembly that is simple in construction, economical to manufacture, and efficient while in use.

Other objects, advantages and novel details of construction of this invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings wherein:

Figure 1 is an elevational view of a closure and clip assembly embodying my invention applied to the open end of a test tube;

Figure 2 is a fragmentary longitudinal sectional view through the construction shown in Figure 1;

Figure 3 is a perspective view of the closure and clip;

Figure 4 is an elevational view of the clip;

Figure 5 is a cross-sectional view through the closure.

Referring now to the drawing, A is a cylindrical test tube, B is a cylindrical closure therefor, and C is a spring metal clip detachably carried by the closure and engageable with the test tube to hold the closure in closed position on the test tube.

As shown, the test tube A is formed of glass and has a closed lower end **10** and an open upper end **11**.

The closure B is preferably formed from a phenolic resin of the high impact type and has a closed upper end **12** and an open lower end **13**. Within the closure B and integral therewith at the juncture of the closed end **12** and the side walls thereof are three centrifugally spaced substantially flat substantially semi-circular pads **14** that are engageable with the open end **11** of the test tube when the closure B is sleeved thereon to fully closed position. These pads **14** space the closed end **12** of the closure from the open end **11** of the test tube and provide therebetween air breather passages.

The clip C is preferably formed from a relatively narrow strip of tempered stainless steel and is substantially U-shaped in configuration. Preferably, this clip straddles a side wall **15** of the closure and is engageable with a side wall **16** of the test tube A to retain the closure B in closed position upon the test tube. As shown, the clip C has a bowed inner leg portion **17**, a substantially straight outer leg portion **18**, and an intermediate open return bent connecting portion **19**. The bowed inner leg portion **17** extends longitudinally of the inner surface of the side wall **15** of the closure B and is frictionally engageable with the outer surface of the side wall **16** of the test tube A. The substantially straight outer leg portion **18** is disposed in substantially surface to surface relation with the outer surface of the side wall **15** of the closure and has at its free end an inturned or laterally projecting portion **20** that is received in and detachably interlocked with a notch or recess **21** in the exterior or outer face of the closed end **12** of the closure. The intermediate open return bent connecting portion **19** is received in and detachably interlocked with a notch or recess **22** in an edge of the closure B at the open end thereof.

One of the features of the present construction is the ease by which the clip C may be quickly assembled with or removed from the closure B. For example, when assembling the clip C with the closure B, the clip is initially placed in straddling relation upon the wall **15** of the closure, and then is slid lengthwise of said wall until the open return bent or folded connecting portion **19** is received within and detachably interlocked with the notch or recess **22**. Then the laterally bent end portion **20** of the outer leg **18** of the clip is received within and detachably interlocked with the notch or recess **21** in the closed end of the closure. In this position the clip C is effectively held in assembled relation with the closure, and the bowed inner leg portion **17** of the clip is in operative position to frictionally engage the outer surface of the test tube when the closure B is sleeved upon the open end of the test tube.

When it is desired to remove the clip C from the closure B, all that is necessary is to first disengage the laterally bent end portion **20** from the notch or recess **21** and then slide the clip lengthwise of the wall **15** of the closure toward the open end **13** thereof, and then remove the clip entirely from the closure.

In the present instance, the closure B is formed by a compression molding operation so that such closure is capable of withstanding high temperatures and of resisting breakage while being handled and in use, as well as

deterioration. Preferably, the phenolic resin of the high impact type contains either cotton or asbestos linters.

In the process of manufacturing the closure, the phenolic resin, preferably in powdered form (Trade #B.M.G. 2011), is placed within a mold and then is subjected to approximately 3000 lbs. per square inch pressure and to approximately 360° F. temperature. The mold containing such resin is maintained for a predetermined period of time (approximately two minutes) at approximately the temperature mentioned, by the use of electric heating coils within the mold.

Actually the resin molded closure B is less expensive to manufacture than a closure made of aluminum or steel, and is not affected detrimentally by the high heat ranges to which it is subjected while in use. Also, such resin molded closure B may be any color desired for identification purposes. In fact, the resin itself may be any desired color, or the resin may be impregnated with any coloring substance as desired, so that closures of various colors may be produced. This is especially advantageous when the closures B are used in pharmaceutical laboratories.

Likewise the clip C is capable of maintaining its spring tension, without losing any of its properties, after being subjected repeatedly to high temperatures. Inasmuch as it is made of tempered stainless steel, such clip C will not rust or corrode. Due to its spring characteristics the clip C will also accept automatically the normal variations of test tube diameters prevalent with the dimensional tolerances established by the test tube manufacturers when making test tubes, and thus such clip C will compensate for any irregularities in the diameter of the test tube to which the closure B is applied and will effectively hold the closure in closed position on the test tube regardless of such irregularities. In this connection, it will be appreciated that the closure B equipped with the clip C may be readily applied to the open end **11** of the test tube by merely sleeving the closure B upon the test tube. As the closure B slides lengthwise of the test tube to closed position the bowed portion **17** of the clip will frictionally engage the adjacent outer surface of the test tube and accordingly will effectively hold the closure in any position to which it is adjusted on the test tube. When adjusted to fully closed position on the test tube the pads **14** within the closure will engage the open end **11** of the test tube and thereby will space the closed end **12** of the closure B from the open end **11** of the test tube A, and accordingly will provide therebetween air breather passages.

What I claim as my invention is:

1. A closure and spring clip assembly adapted for use with a test tube and the like, comprising a closure adapted to be sleeved upon the open end of a test tube, and means for holding said closure against displacement when sleeved upon the test tube, including a spring clip straddling and extending longitudinally of a side wall of said closure, the inner leg of said clip having a longitudinally bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of said test tube, and the outer leg of said clip having an inturned portion detachably engaging a recess in said closure and retaining said clip in assembled relation with said closure.

2. In combination, a cylindrical closure formed from plastic material and adapted to be sleeved upon the open end of a cylindrical test tube, said closure being closed at one end and open at the other, the exterior of said closed end having a recess therein, an edge of the open end of said closure having a recess therein, and means for holding said closure against displacement when sleeved upon the test tube, including a separate substantially U-shaped spring clip of tempered stainless steel removably straddling and extending longitudinally of a side wall of said cylindrical closure, the inner leg of said clip having a longitudinally bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of one side wall of said test tube, the outer leg of said clip extending lengthwise of the outer surface of a side wall of said cylindrical closure, the intermediate open return bent portion of said clip being received in the recess in the edge of the open end of said closure to prevent accidental movement of said clip circumferentially of said cylindrical closure, and said outer leg having at its free end an inturned portion received in the recess in the exterior of the closed end of said closure to retain said clip in assembled relation with said closure and thereby to prevent accidental withdrawal of said return bent portion from said recess in said edge of the closure.

3. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical test tube, said closure being closed at one end and open at the other, the exterior of said closed end having a recess therein, an edge of the open end of said closure having a recess therein, and means for holding said closure against displacement when sleeved upon the test tube, including a separate substantially U-shaped spring clip removably straddling and extending longitudinally of a side wall of said cylindrical closure, the inner leg of said clip having a bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of one side wall of said test tube, the outer leg of said clip extending lengthwise of the outer surface of a side wall of said cylindrical closure, the intermediate open return bent portion of said clip being received in the recess in the edge of the open end of said closure to prevent accidental movement of said clip circumferentially of said cylindrical closure, and said outer leg having at its free end an inturned portion received in the recess in the exterior of the closed end of said closure to retain said clip in assembled relation with said closure and thereby to prevent accidental withdrawal of said return bent portion from said recess in said edge of the closure.

4. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical test tube, said closure being closed at one end and open at the other, the exterior of said closed end having a recess therein, and means for holding said closure against displacement when sleeved upon the test tube, including a separate substantially U-shaped spring clip removably straddling and extending longitudinally of a side wall of said cylindrical closure, the inner leg of said clip having a bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of one side wall of said test tube, the outer leg of said clip extending lengthwise of the outer surface of a side wall of said closure and having at its free end an inturned portion received in the recess in the exterior of the closed end of said closure to retain said clip in assembled relation with said closure.

5. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical test tube, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon the test tube, including a separate substantially U-shaped spring clip removably straddling and extending longitudinally of a side wall of said cylindrical closure, the inner leg of said clip having a bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of one side wall of said test tube, the outer leg of said clip extending lengthwise of the outer surface of a side wall of said cylindrical closure and having at its free end an inturned portion engaging the exterior of the closed end of said closure to retain said clip in assembled relation with said closure.

6. In combination, a closure adapted to be sleeved upon the open end of a container, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon the container, including a separate substantially U-shaped spring clip removably straddling and extending longitudinally of a side wall of said closure, the inner leg of said clip having a bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of one side

wall of said container, the outer leg of said clip extending lengthwise of the outer surface of a side wall of said closure and having at its free end an inturned portion engaging the closed end of said closure to retain said clip in assembled relation with said closure.

7. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical container, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon the container, including a separate substantially U-shaped spring clip removably straddling and extending longitudinally of a side wall of said cylindrical closure, the inner leg of said clip having a bowed portion adapted to extend lengthwise of and frictionally engage the outer surface of one side wall of said container, the outer leg of said clip extending lengthwise of the outer surface of a side wall of said closure and having means engaging the closed end of said closure to retain said clip in assembled relation with said closure.

8. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical receptacle, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon said receptacle, including a clip detachably connected to said closure, said clip being adapted to be quickly assembled with and quickly removed from said closure, said clip having inner and outer leg portions respectively upon the inner and outer surfaces of one side wall of said cylindrical closure, said inner leg portion having a part adapted to frictionally engage the outer surface of one side wall of said receptacle, a connection between said inner and outer leg portions detachably interlocked with an edge of said closure at the open end thereof, and means at the free end of said outer leg portion detachably interlocked with the exterior of the closed end of said closure and retaining said inner and outer leg portions and the connection therebetween against accidental displacement.

9. In combination, a cylindrical closure formed from plastic material and adapted to be sleeved upon the open end of a cylindrical receptacle, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon said receptacle, including a clip formed from a strip of tempered stainless steel and detachably connected to said closure, said clip being adapted to be quickly assembled with and quickly removed from said closure, said clip having inner and outer leg portions respectively upon and extending lengthwise of the inner and outer surfaces of one side wall of said cylindrical closure, said inner leg portion having a longitudinally extending bowed part adapted to frictionally engage the outer surface of one side wall of said receptacle, a connection between said inner and outer leg portions engaging an edge of said closure at the open end thereof, and means at the free end of said outer leg portion engaging the exterior of the closed end of said closure and retaining said inner and outer leg portions and the connection therebetween against accidental displacement.

10. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical receptacle, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon said receptacle, including a clip detachably connected to said closure, said clip being adapted to be quickly assembled with and quickly removed from said closure, said clip having substantially parallel inner and outer leg portions, a portion connecting said leg portions, and a portion projecting laterally from said outer leg portion and disposed at substantially right angles thereto, said outer leg portion extending lengthwise of an outer surface of said closure, said connecting portion extending transversely of an edge of said closure at the open end thereof, said inner leg portion extending lengthwise of an inner surface of said closure and having a part adapted to frictionally engage an outer surface of said receptacle, and said laterally projecting portion extending over the exterior of the closed end of said closure and retaining said inner and outer leg portions and said connecting portion against accidental displacement.

11. In combination, a cylindrical closure adapted to be sleeved upon the open end of a cylindrical receptacle, said closure being closed at one end and open at the other, and means for holding said closure against displacement when sleeved upon said receptacle, including a clip detachably connected to said closure, said clip being adapted to be quickly assembled with and quickly removed from said closure, said clip having substantially parallel inner and outer leg portions, means connecting said leg portions, and means projecting laterally from said outer leg portion, said outer leg portion being upon an outer surface of said closure, said connecting means being detachably interlocked with an edge of said closure at the open end thereof, said inner leg portion being upon an inner surface of said closure and having a part adapted to frictionally engage an outer surface of said receptacle, and said laterally projecting means being upon the exterior of the closed end of said closure and retaining said inner and outer leg portions and said connecting means against accidental displacement.

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