

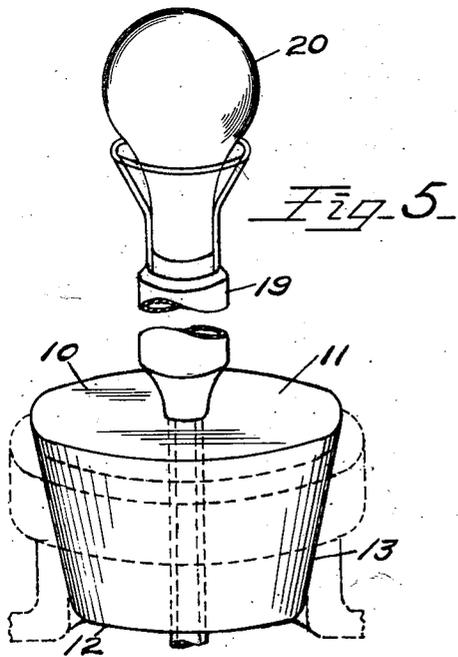
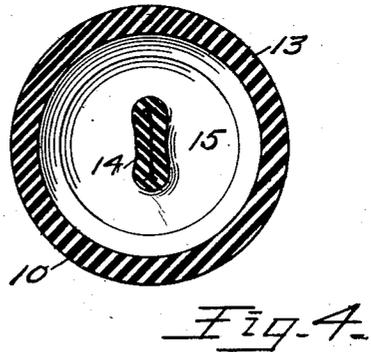
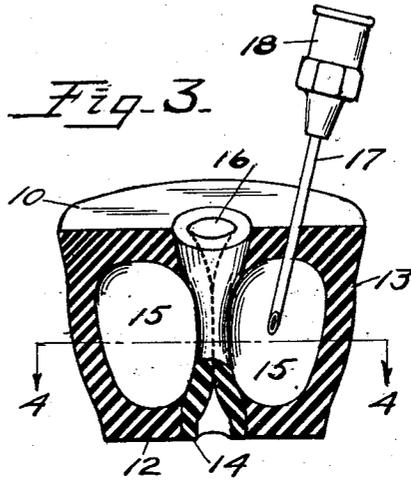
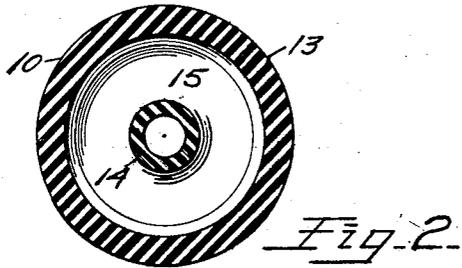
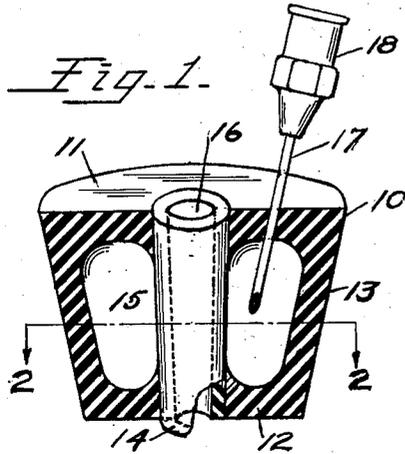
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C. V. MORGAN

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STOPPER

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2,115,035

STOPPER

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7 Claims. (Cl. 215-47)

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This invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

5 This invention relates generally to stoppers, but more particularly to a stopper provided with a normally closed passage therein, said passage permitting the admission of a tube into the interior of the container into which the stopper is fitted.

10 The stopper is adapted for insertion into the mouth of a bottle, flask, jug, can, inkwell or any other type of containers, but is especially adapted for use in connection with vessels used in chemical laboratories and hospitals.

15 One object of the invention is to provide a stopper having one or more holes, ducts or canals for the passage of fluids, either liquid or gaseous, into and out of the containers.

20 Another object is to have these holes or canals so constructed as to permit the insertion and withdrawal of such other articles, apparatus, instruments or devices like syringes, medicine droppers, pipettes, burettes, tubing, thermometers; pens, et cetera.

25 Still another object is to provide a means of closing or compressing the passages or canals of the stopper, after the withdrawal of such items, by a pressure which is within the stopper and which is exerted upon the walls of said canals. This entails a means of creating and replenishing this internal pressure.

30 With these and other objects in view, the invention consists of a novel construction of a stopper, the parts of which to be hereinafter more fully described and specifically pointed out in the claims.

35 In describing the invention in detail, reference is had to the accompanying drawing forming a part of this specification, and wherein the numerals or references indicate corresponding parts throughout the several views, in which:

40 Fig. 1 is a perspective view of the stopper showing a vertical mid-cross-section of the portion surrounding the central tube, with the lower portion of the latter partially broken away, when no internal pressure is collapsing the tube, and when a needle of an inflating instrument is inserted into the interval cavity;

50 Fig. 2 is a horizontal mid-cross-section of the stopper taken on the line 2-2 of Fig. 1, showing the tube when no internal pressure is exerted upon the same;

55 Fig. 3 is a perspective view of the stopper showing a vertical mid-cross-section of the portion

surrounding the central tube and of the lower third of the tube; when internal pressure has collapsed the tube, the needle remaining inserted into the internal cavity;

Fig. 4 is a horizontal mid-cross-section of the stopper, taken on the line 4-4 of Fig. 3, showing the tube collapsed by internal pressure within the annular chamber surrounding the same;

Fig. 5 is a perspective view showing a syringe inserted into the stopper. A portion of the container into which the stopper is inserted is shown in dotted outline.

Briefly stated, the article which forms the subject matter of this invention consists of a hollow stopper formed preferably of rubber or other permeable elastic material provided with a canal or passage therethrough, and an annular chamber surrounding the tubular wall of said canal. The tubular wall of the canal is collapsed by the injection of a fluid into this internal cavity through a hollow needle, thereby forming a valve within the canal by compression of its tubular wall, the function of the valve depending upon, among other things, the length, diameter, thickness and elasticity of the rubber tube and the degree of pressure, viscosity and temperature of the injected fluid.

Referring to the drawing the numeral 10 indicates generally the enclosing walls of the rubber stopper, the top 11, bottom 12 and conical side wall 13 being continuous but not necessarily of one piece construction. It is obvious that the walls might be made up of a separate top, sides, and bottom, each or all being of varied number of pieces, size, shape, or material, but it is imperative that all walls are united together and to the tube 14 by such means and manner as to completely seal the stopper's internal cavity 15, so that it will retain the particular type of fluid that may be injected therein to produce the pressure.

40 For some purposes, parts or all of the top, sides or bottom might need to be made of cast, molded, or machined alloys of steel, aluminum, brass, or other metals, glass, bakelite or other varied compositions. The shape might be round, square, oblong, oval or other varied design. The size is immaterial. It may be desired to provide a wall with a threaded opening adapted for the reception of a small valve which might be inserted into the wall at some part of a large stopper so as to be adapted for the transfer of the fluid pressure by other means than the needle process.

The walls 10 should be thicker or otherwise reinforced at portions where bulging is to be prevented. The cavity 15 lying within the walls 10 of

the stopper surrounds the tube 14 of the passage or canal 18. The internal cavity is preferably symmetrical and annular as illustrated, but need not necessarily be so. The size is arbitrary but it should be as small as practical to allow walls 10 to be thick and strong, but the cavity should be large enough to hold sufficient fluid to collapse tube 14.

Air, oil or other suitable fluid is injected into cavity 15 through the tubular needle 17 which is attached through its shank 18 to a Luer syringe or other pumping or pressure device. The needle is then withdrawn from the rubber stopper, and the hole caused by the perforation is automatically sealed by virtue of the nature of the rubber wall 10. Withdrawal or replenishment may be similarly accomplished.

The needle 17 could just as well be inserted into the cavity 15 at any other point in the wall 10 other than the top 11, or even through the canal 16 and tube 14 into cavity 15.

Tube 14 bounds the canal or passageway 16 through the stopper. It may or may not originally have been a separate piece of rubber tubing, but regardless of the method of construction, it becomes an integral part of the stopper as a whole.

It theoretically, if not actually, bounds the canal from one end to the other. At the junction of the tube 14 to the top 11 and bottom 12 of the walls 10 there should be thickening or re-inforcement to prevent the eversion of the tube 14 through the canal 16 when internal pressure is applied.

Tube 14 may be of varied size, shape or material. In length it should be short enough to permit, through its canal 16, the insertion and operation of the apparatus or device for which it was intended, such as a glass plungerless syringe 19 having a rubber bulb 20. The tube 14 should be thick enough to withstand wear without tearing easily.

Theoretically, it appears that tube 14 should be round and have its canal 16 round for the reasons that most apparatus have rounded ends and because tubes with circular passages collapse evenly without undue puckering, thus permitting maximum approximation of the canal surfaces to the apparatus and to each other when pressure is increased within the cavity 11. Other shapes may prove more practical however.

Tube 14 as illustrated, is formed of rubber of high elasticity and tensile strength, and minimum adhesive qualities so as to withstand the insertion and withdrawal of apparatus. Other flexible and elastic compositions may be more suitable in some stoppers, particularly if rubber is too adhesive to special apparatus or too much affected by the chemical agents used.

With reference to Fig. 3 it will be noted that not only are the walls of the tubular canal 16 collapsed by the pressure of the fluid within the annular chamber, but the lateral circular wall of the stopper is extended so that the stopper is more tightly retained within the container into which it is placed.

Having described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A hollow annularly shaped stopper provided with a longitudinal tubular canal having a collapsible wall.
2. A hollow annularly shaped stopper formed of permeable elastic material provided with a central longitudinal canal having a collapsible wall adapted to form a valve.
3. A hollow annularly shaped stopper formed of permeable elastic material provided with a central longitudinal canal forming a unitary structure with said stopper, said canal having a collapsible wall adapted to form a closable passage there-through.
4. A hollow stopper formed of permeable elastic material adapted to form a closure for a container, a canal having a tubular collapsible wall passing longitudinally through said stopper and forming an annular inflatable chamber therein.
5. A hollow stopper adapted to form a closure for a container, said stopper formed of permeable elastic material adapted for the insertion of the needle of a hypodermic syringe, and of automatically closing the opening made by said needle upon withdrawal of the same, a central longitudinal tubular canal having a collapsible wall, passing through said stopper adapted to receive a tubular member for filling or withdrawing fluid from said container, said canal forming an annular inflatable chamber within said hollow stopper adapted to receive a fluid under pressure through said hypodermic syringe to collapse said canal on withdrawal of said tubular member.
6. A hollow stopper adapted to form a closure for a container, said stopper formed of permeable elastic material adapted for the insertion of a tubular needle of an inflating instrument, and of automatically closing the opening made by said needle upon withdrawal of the same, a central longitudinal tubular canal having a collapsible wall, passing through said stopper adapted to receive a tubular member for filling or withdrawing fluid from said container, said canal forming an annular inflatable chamber within said hollow stopper adapted to retain a fluid under pressure injected through said inflating instrument to extend the surface of said stopper adjacent said container and to close the passage through said canal on withdrawal of said tubular member.
7. A hollow stopper adapted to form a closure for a container, said stopper formed of permeable elastic material adapted for the insertion of the needle of a hypodermic syringe, and of automatically closing the opening made by said needle upon withdrawal of the same, a central longitudinal tubular canal having a collapsible wall, passing through said stopper adapted to receive a tubular member for filling or withdrawing fluid from said container, said canal forming an annular inflatable chamber within said hollow stopper adapted to receive a fluid under pressure through said hypodermic syringe to collapse said canal on withdrawal of said tubular member.

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