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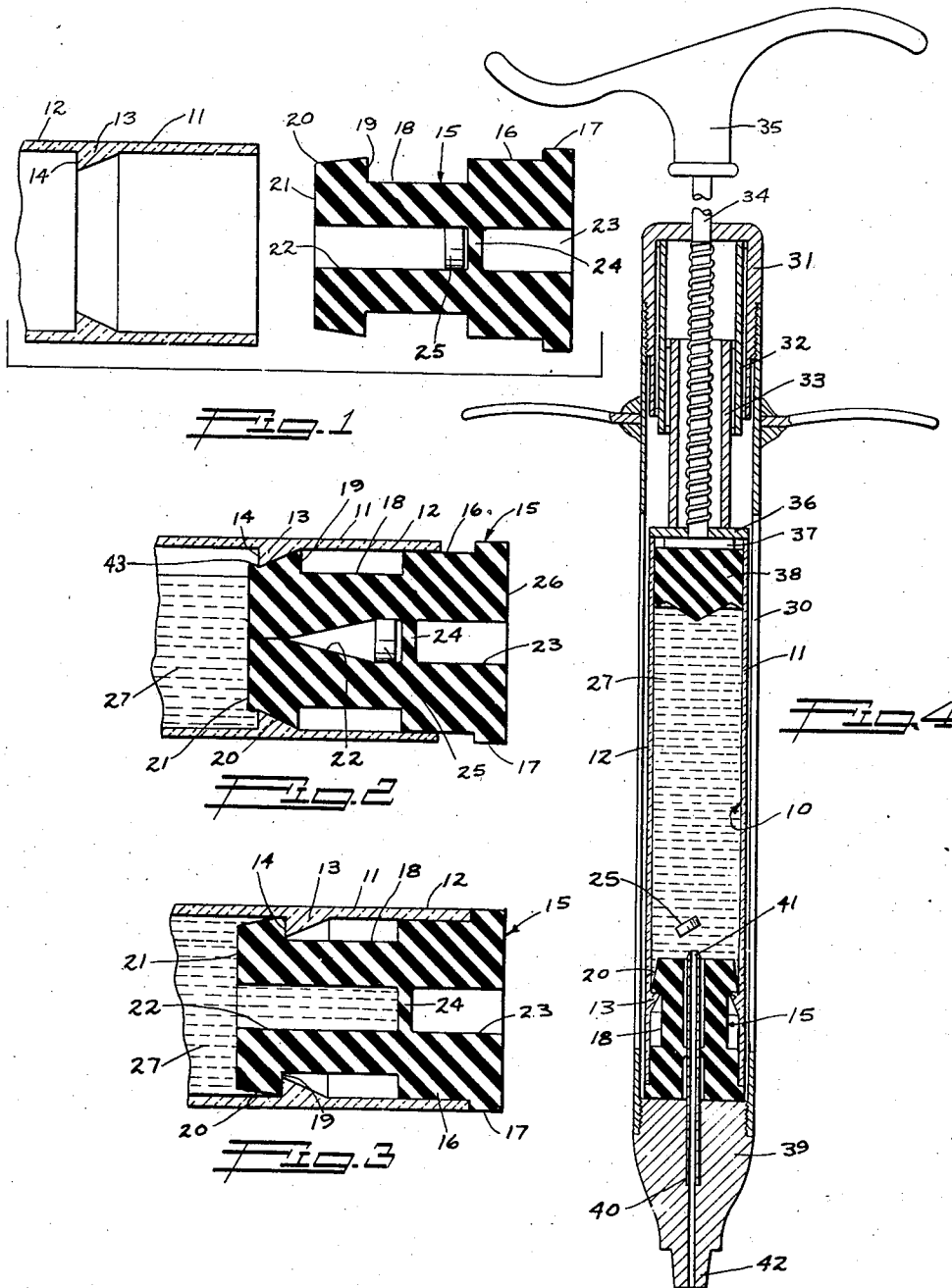
A. E. SMITH

2,368,431

AMPOULE

Filed July 19, 1943

2 Sheets-Sheet 1



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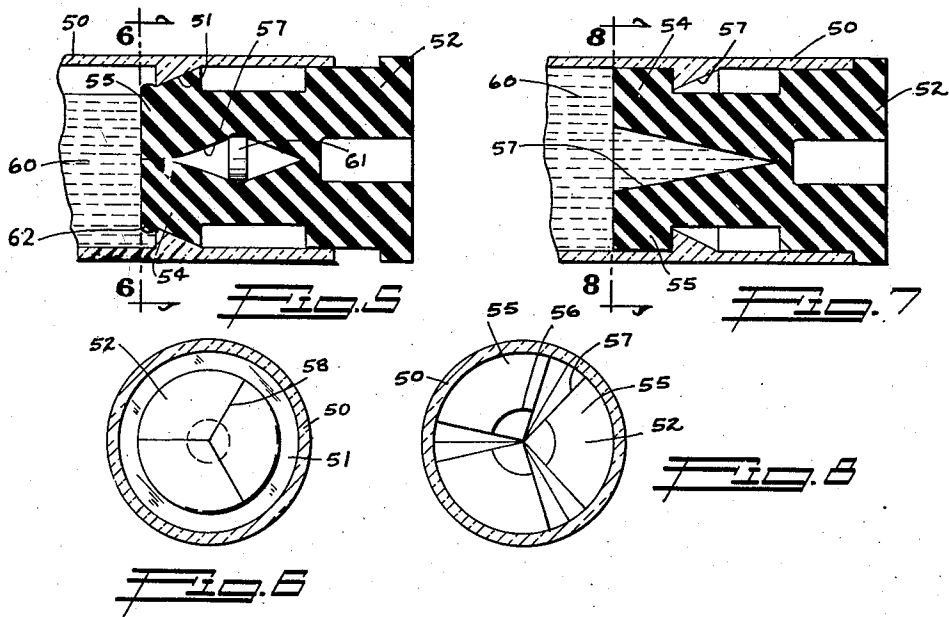
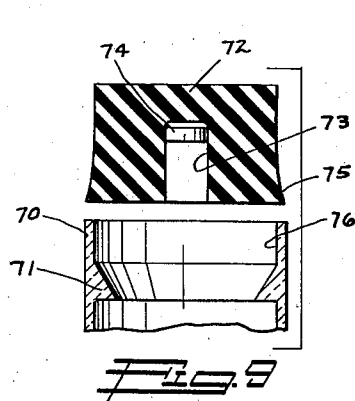
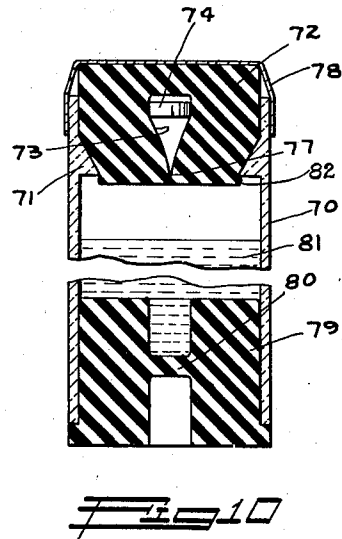
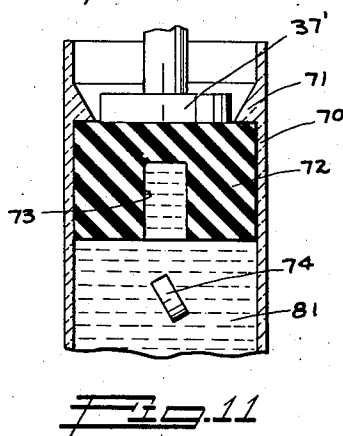
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2 Sheets-Sheet 2



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2,368,431

AMPOULE

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Application July 19, 1943, Serial No. 495,318

16 Claims. (Cl. 128-272)

This invention relates to an improvement in ampoules.

The general object of the invention is to provide an improved ampoule construction including a novel ampoule and a novel cork coacting with the novel ampoule and permitting a fresh solution to be readily prepared.

A more specific object of the invention is to provide a novel combined ampoule and cork with cooperating parts so arranged that a medicinal pellet, normally sealed in the cork may be readily discharged into a solvent in the ampoule.

A more specific object of the invention is to provide a novel ampoule.

Another object of the invention is to provide a novel cork for an ampoule.

A further object of the invention is to provide a cork having novel means incorporated therein whereby a medicinal preparation may be sealed in the cork when the latter is inserted in an ampoule.

Other objects and the advantages of my invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is an extended sectional view showing a portion of an ampoule and a stopper embodying the features of my invention;

Fig. 2 is a fragmentary, central, sectional view showing the stopper assembled in the ampoule for shipment;

Fig. 3 is a view similar to Fig. 2 showing the stopper pushed into the ampoule and the fresh solution prepared;

Fig. 4 is a central, sectional view through a syringe showing my improved ampoule therein;

Fig. 5 is a fragmentary, central, sectional view showing a modified construction;

Fig. 6 is a section taken on line 6-6, Fig. 5;

Fig. 7 is a view similar to Fig. 6 showing the cork fully inserted in the ampoule;

Fig. 8 is a view taken on line 8-8, Fig. 7;

Fig. 9 is an extended, fragmentary, sectional view showing a further modification;

Fig. 10 is a fragmentary view showing the further modification with the cork inserted in the ampoule, and

Fig. 11 is a fragmentary, sectional view showing the cork pushed into the ampoule so that the medicinal pellet is discharged.

Referring to the drawings by reference characters, I have shown my invention as embodied in an ampoule construction which is indicated generally at 10. My construction includes an ampoule 11 which may be made of suitable material

such as plastic. This ampoule has a body 12 which is shown as cylindrical inside and out except for a portion 13 near one end of the ampoule. This portion 13 is frusto-conical and converges inwardly. The portion 13 terminates at its inner end in a planar shoulder 14 which is perpendicular to the axis of the ampoule.

My improved stopper is indicated generally at 15 and includes a cylindrical end portion 16 having a terminal flange 17 thereon. Inwardly of the portion 16 the stopper includes a reduced cylindrical portion 18 and beyond this the stopper is of enlarged diameter, providing a shoulder 19 which is planar and perpendicular to the axis of the stopper. Beyond the shoulder 19 the outer wall 20 of the stopper is frusto-conical in shape. The slope of the portion 20 is preferably less abrupt than that of the portion 13 on the ampoule which is engaged by the portion 20, as will be later described. The inner end of the stopper is provided with a central recess 22 at one end and with a recess 23 at the other end. A thin integral diaphragm 24 separates the portions 22 and 23. The stopper is preferably made of rubber, synthetic rubber, or other suitable material.

In use, a medicinal tablet 25 is inserted in the recess 22 and the stopper is then moved into the end of the ampoule to the position shown in Fig. 2. In this position the portion 20 of the stopper engages the frusto-conical portion 13 on the ampoule and the inner end of the stopper is compressed and squeezed together so that the inner end of the cavity 22 is sealed as shown in Fig. 2. My improved construction is particularly adapted for use in the preparation of fresh solutions such as solutions of anaesthetizing material employed by surgeons, dental surgeons, and others, to produce local anaesthesia. In the preparation of these solutions a suitable vehicle such as distilled water is placed in a container and a drug in pellet, powder or other form is brought into contact with the vehicle just prior to the time of the injection so that the solution is fresh, thereby insuring its potency and the elimination of post-operative difficulties.

In using my improved ampoule construction the operator takes the ampoule, which reaches him in the condition shown in Fig. 2, and he may then push upon the end 26 of the ampoule, thus moving the portion 20 beyond the portion 13 so that the planar wall 19 is just level with or beyond the planar portion 14 on the planar portion 13. This allows the front end of the stopper to expand so that the cavity 22 is again

opened due to the resiliency of the material and the drug 25 then passes into solution in the vehicle 27 in the main portion of the ampoule.

It will be noted that the portion 20 is longer than the portion 13 so that the inner end of the portion 20 projects beyond the shoulder 14 when the parts are in the position shown in Fig. 2 and as a result the extreme inner end of the stopper expands as at 43 and extends over the shoulder and thus forms a lock which tends to prevent outward movement of the stopper from the ampoule. This locking feature is of considerable importance as it prevents loosening of the stopper during shipment and prior to use.

My improved ampoule construction is adapted for use in numerous types of syringes. In Fig. 4 I have shown one type with which it may be used. In this illustration the syringe includes a body 30 having a rear member 31 removably threaded thereon. The rear member 31 includes telescoping segments 32 and 33 within which a plunger 34 moves. The plunger 34 passes through the end member 31 and has a finger engaging end portion 35 thereon. The inner end of the segment 33 has a head member 36 thereon. This head member 36 engages the inner end of the ampoule 11 while the plunger at its lower end has a head 37 thereon which engages piston cork 38 which is slidable within the ampoule.

At its forward end the syringe 30 has a front member 39 thereon in which a tube 40 is inserted. This tube has an open inner end 41 which is shown as slightly sharpened.

After the ampoule is in the condition shown in Fig. 3, the operator may place it in the barrel 30, press the rear member 31 thereon and push the ampoule forward in the barrel by inserting the rear member 31. This will cause the end 41 on the tube 40 to pierce the diaphragm 24, thus opening communication between the tube 40 and the interior of the ampoule. A suitable hypodermic needle may be placed on the forward end 42 of the member 39. After the parts are in this position the operator depresses finger member 35 thus moving the plunger and piston cork thereby discharging the contents of the ampoule.

Instead of pushing the cork 15 into the ampoule from the position in Fig. 2 to the position in Fig. 3 before the ampoule is put into the syringe the operator may, if he desires, place the ampoule, when the parts are in the position in Fig. 2, in the barrel and may then push the entire ampoule cork forwardly thus forcing the cork 15 into the ampoule and also piercing the diaphragm 34.

In Figs. 5 to 8, inclusive, I show a modification of my invention wherein the ampoule 50 is similar to the ampoule 11 previously described and includes a frusto-conical portion 51. The stopper 52 is similar to the stopper 15 except that the skirt 54 at the inner end of the stopper is arranged in a plurality of segments, shown as three in number and designated 55. These segments are cut away at the center at 56 and the segments have planar radial walls 57. The construction is such that when the stopper is arranged in the ampoule in the position shown at 55 the segments 57 will come in contact as shown at 58, Fig. 6, and at the same time the outer end of the cavity 60 in the end of the ampoule will be closed so that a pellet 61 arranged in the cavity 60 will be out of contact with the vehicle in the ampoule 50.

The operation of the construction shown in

Figs. 5 to 8 is the same as that described previously.

In Figs. 9, 10 and 11 I show a further modification of my invention wherein the ampoule 70 is provided with a frusto-conical member 71 similar to the frusto-conical members previously described. A stopper, indicated at 72, has a central cavity 73 in which a pellet 74 is arranged. The stopper 72 flares slightly at its lower end as at 75 with the diameter of this flared portion slightly greater than the internal diameter 76 of the ampoule 70. The stopper 72 is moved into the ampoule after the pellet 74 is inserted until the parts are in the position shown in Fig. 10 in which position the cavity 72 will be sealed at 77. A plastic or gelatinous seal 78 may then be arranged about the ampoule to hold the stopper 72 in place. The front end of the ampoule is provided with a stopper 79 which has a diaphragm 80 therein adapted to be punctured by a member such as the tube 40 previously described.

In the operation of the modification the stopper 72 is pushed into the ampoule as by the plunger 37' until the cavity 73 is open and the pellet 74 passes into the liquid 81 in the ampoule. The stopper 72 in this type serves as a piston cork and further movement of this stopper 72 will cause the contents of the ampoule to be discharged as will be readily understood.

In the modifications the stopper 52 has a locking portion 62 similar to the portion 43 and the stopper 72 has a locking portion 82 similar to the portion 43. These locking portions serve to hold the stoppers in place prior to use.

From the foregoing description it will be apparent that I have invented a novel ampoule construction which can be economically manufactured, readily loaded and readily used.

Having thus described my invention, I claim:

1. An ampoule comprising a hollow member having an inwardly converging portion adjacent to one end, and a stopper, said stopper being made of resilient material and including an inwardly opening cavity at the inner end, said stopper including an inner end portion engaging the converging portion on the ampoule, the normal maximum diameter of the stopper inner end portion being greater than the minimum diameter of the converging portion of the ampoule whereby the stopper is compressed and the inner end of the cavity is closed.

2. An ampoule comprising a hollow member having an inwardly converging portion, and a stopper, said stopper being made of resilient material and arranged in the ampoule, said stopper including a reduced intermediate portion and an inwardly converging portion beyond the intermediate portion, said stopper having a cavity therein, said cavity being open at its outer end, said stopper converging portion engaging the converging portion on the ampoule, the normal maximum diameter of the stopper converging portion being greater than the minimum diameter of the converging portion of the ampoule adjacent the shoulder, whereby the stopper is compressed by the engagement of the converging portions.

3. An ampoule comprising a hollow, elongated, cylindrical member having an inwardly converging portion, and a stopper made of resilient material and including a reduced portion, said stopper including an inwardly converging portion beyond the reduced portion, said stopper having a cavity therein, said cavity being normally open at its outer end, said stopper converging portion en-

gaging and extending beyond the converging portion on the ampoule, the normal maximum diameter of the stopper converging portion being greater than the minimum diameter of the converging portion of the ampoule adjacent the shoulder whereby the stopper is compressed by the engagement of the converging portions and the inner end of the cavity is closed, the inner end of the converging portion forming a bead and thereby providing a seal.

4. An ampoule comprising a hollow cylindrical member having an inwardly converging portion adjacent to one end, said converging portion terminating inwardly in a shoulder and a stopper, said stopper being made of resilient material and including an outer end arranged in said one end portion of the ampoule, said stopper including a reduced intermediate portion and an inwardly converging portion beyond the intermediate portion, said stopper having a cavity therein, said cavity being normally open at its outer end and closed at its inner end, said stopper converging portion engaging the converging portion on the ampoule, the normal maximum diameter of the stopper converging portion being greater than the minimum diameter of the converging portion of the ampoule adjacent the shoulder whereby the stopper is compressed by the engagement of the converging portions and the inner end of the cavity is closed.

5. An ampoule comprising a hollow, elongated cylindrical member having a piston stopper in one end portion thereof, the other end portion of said ampoule having an inwardly converging portion, said converging portion terminating inwardly in a shoulder and a stopper, said stopper being made of resilient material and including a cylindrical end part fitting the other end portion of the ampoule, said stopper beyond the first cylindrical portion including a reduced portion, said stopper including an inwardly converging portion beyond the second cylindrical portion, said stopper having a cavity therein, said cavity being normally open at its outer end and closed at its inner end, said stopper converging portion engaging the converging portion on the ampoule, the normal maximum diameter of the stopper converging portion being greater than the minimum diameter of the converging portion of the ampoule adjacent the shoulder whereby the stopper is compressed by the engagement of the converging portions and the inner end of the cavity is closed.

6. An ampoule comprising a hollow, elongated, cylindrical member having an inwardly converging shoulder portion, said converging portion terminating inwardly in a shoulder and a stopper, said stopper being made of resilient material and including an end part fitting the ampoule, said stopper beyond the first cylindrical portion including a reduced portion, said stopper including an inwardly converging portion beyond the reduced portion, said stopper having a cavity therein, said cavity being normally open at its outer end and closed at its inner end, said stopper converging portion engaging the converging portion on the ampoule, whereby the stopper is compressed by the engagement of the complementary portions and the inner end of the cavity is closed, the stopper and ampoule being so proportioned that when the stopper converging portion is at least even with the ampoule shoulder the stopper will be free to expand to permit the stopper cavity to open, and a preparation arranged in said cavity.

7. An ampoule comprising a hollow, elongated, cylindrical member having a piston stopper in one

end portion thereof, the other end portion of said ampoule having an inwardly converging portion, said converging portion terminating inwardly in a plane shoulder which is perpendicular to the axis of the ampoule, and a stopper, said stopper being made of resilient material and including a cylindrical end part fitting the other end portion of the ampoule, said stopper beyond the first cylindrical portion including a reduced portion, said stopper including an inwardly converging portion beyond the second cylindrical portion, said stopper having a cavity therein, said cavity being normally open at its outer end and closed at its inner end by a diaphragm integral with the stopper, said stopper converging portion engaging the converging portion on the ampoule, the normal maximum diameter of the stopper converging portion being greater than the minimum diameter of the converging portion of the ampoule adjacent the shoulder whereby the stopper is compressed by the engagement of the converging portions and the inner end of the cavity is closed.

8. An ampoule comprising a hollow, elongated, cylindrical member having a frusto-conical, inwardly converging shoulder portion, said frusto-conical portion terminating inwardly in a plane shoulder which is perpendicular to the axis of the ampoule, and a stopper, said stopper being made of resilient material and including a cylindrical end part fitting the ampoule, said stopper, beyond the first cylindrical portion, including a reduced portion, said stopper including an inwardly converging frusto-conical portion beyond the reduced portion, said stopper having a cavity therein, said cavity being normally open at its outer end and closed at its inner end, said stopper frusto-conical portion engaging the frusto-conical portion on the ampoule, the normal maximum diameter of the frusto-conical stopper portion being such that the stopper is compressed by the engagement of the complementary portions and the inner end of the cavity is closed, said stopper frusto-conical portion terminating inwardly in a shoulder which is planar and perpendicular to the axis of the ampoule, the stopper and ampoule parts being so proportioned that when the stopper is moved inwardly so that the stopper shoulder is disposed at least even with the ampoule shoulder the frusto-conical portion on the stopper will be free to expand to permit the stopper cavity to open and a preparation arranged in said cavity.

9. An ampoule comprising a hollow, elongated, cylindrical member having a piston stopper in one end thereof, the other end of said ampoule having a frusto-conical, inwardly converging shoulder portion, said frusto-conical portion terminating inwardly in a plane shoulder which is perpendicular to the axis of the ampoule, and a stopper, said stopper being made of resilient material and including an end flange and a cylindrical end part fitting the other end of the ampoule, said stopper, beyond the first cylindrical portion, including a second reduced cylindrical portion, said stopper including an inwardly converging frusto-conical portion beyond the second cylindrical portion, said stopper having a cavity therein, said cavity being normally open at its outer end and closed at its inner end by a diaphragm integral with the stopper, said stopper frusto-conical portion engaging the frusto-conical portion on the ampoule, the normal maximum diameter of the frusto-conical stopper portion being greater than the minimum diameter of the frusto-conical portion of the ampoule adjacent

the shoulder whereby the stopper is compressed by the engagement of the complementary portion and the inner end of the cavity is closed, said stopper frusto-conical portion terminating inwardly in a shoulder which is planar and perpendicular to the axis of the ampoule, the stopper and ampoule parts being so proportioned that when the flange on the stopper engages the end of the ampoule the stopper shoulder will be disposed at least even with the ampoule shoulder so that the frusto-conical portion on the stopper will be free to expand to permit the stopper cavity to open and a preparation arranged in said cavity.

10. An ampoule comprising a hollow, elongated, cylindrical member having a frusto-conical, inwardly converging shoulder portion, said frusto-conical portion terminating inwardly in a plane shoulder which is perpendicular to the axis of the ampoule, and a stopper, said stopper being made of resilient material and including a cylindrical end portion with an external flange thereon, said stopper beyond the first cylindrical portion including a plurality of segmental portions which taper downwardly, said segmental portions having spaced, planar, opposed, radial walls, the inner faces of said walls being normally spaced from each other to form a recess, each of said segmental portions having an external tapering flange on the inner end thereof.

11. An ampoule comprising a hollow, elongated, cylindrical member having a frusto-conical, inwardly converging shoulder portion, said frusto-conical portion terminating inwardly in a plane shoulder which is perpendicular to the axis of the ampoule, and a stopper, said stopper being made of resilient material and including a cylindrical outer end part, said stopper beyond the cylindrical part flaring outwardly, said stopper having a cavity therein, the outer end of said cavity being open, the inner end of said cavity extending beyond the flaring portion.

12. An ampoule stopper made of resilient material and including a cylindrical end portion, said stopper beyond the first cylindrical portion including a reduced portion, said stopper including an inwardly converging frusto-conical portion

beyond the reduced portion, said stopper having a recess extending inwardly from the front end, said recess being closed at its outer end by a diaphragm integral with the stopper, said stopper frusto-conical portion terminating inwardly in a shoulder.

13. An ampoule stopper made of resilient material and including a cylindrical end portion having an outwardly directed flange, said stopper beyond the first cylindrical portion including a second reduced cylindrical portion, said stopper including an inwardly converging frusto-conical portion beyond the second cylindrical portion, said stopper having a recess extending inwardly from each end, said recesses being closed at their inner ends by a diaphragm integral with the stopper, said stopper frusto-conical portion terminating inwardly in a shoulder which is planar and perpendicular to the axis of the stopper.

14. An ampoule stopper made of resilient material and including a cylindrical end portion, said stopper including a plurality of segmental portions, said segmental portions having spaced, opposed walls, the inner faces of said walls being normally spaced from each other to form a recess, each of said segmental portions having an external flange thereon.

15. An ampoule stopper made of resilient material and including a cylindrical end portion with an external flange thereon, said stopper beyond the first cylindrical portion including a plurality of segmental portions which taper downwardly, said segmental portions having spaced, planar, opposed, radial walls, the inner faces of said walls being normally spaced from each other to form a recess, each of said segmental portions having an external flange on the inner end thereof.

16. An ampoule stopper made of resilient material and including a cylindrical end part, said stopper beyond the first cylindrical portion flaring outwardly, said stopper having a cavity therein, the outer end of said cavity being open, the inner end of said cavity extending beyond the flaring portion.

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