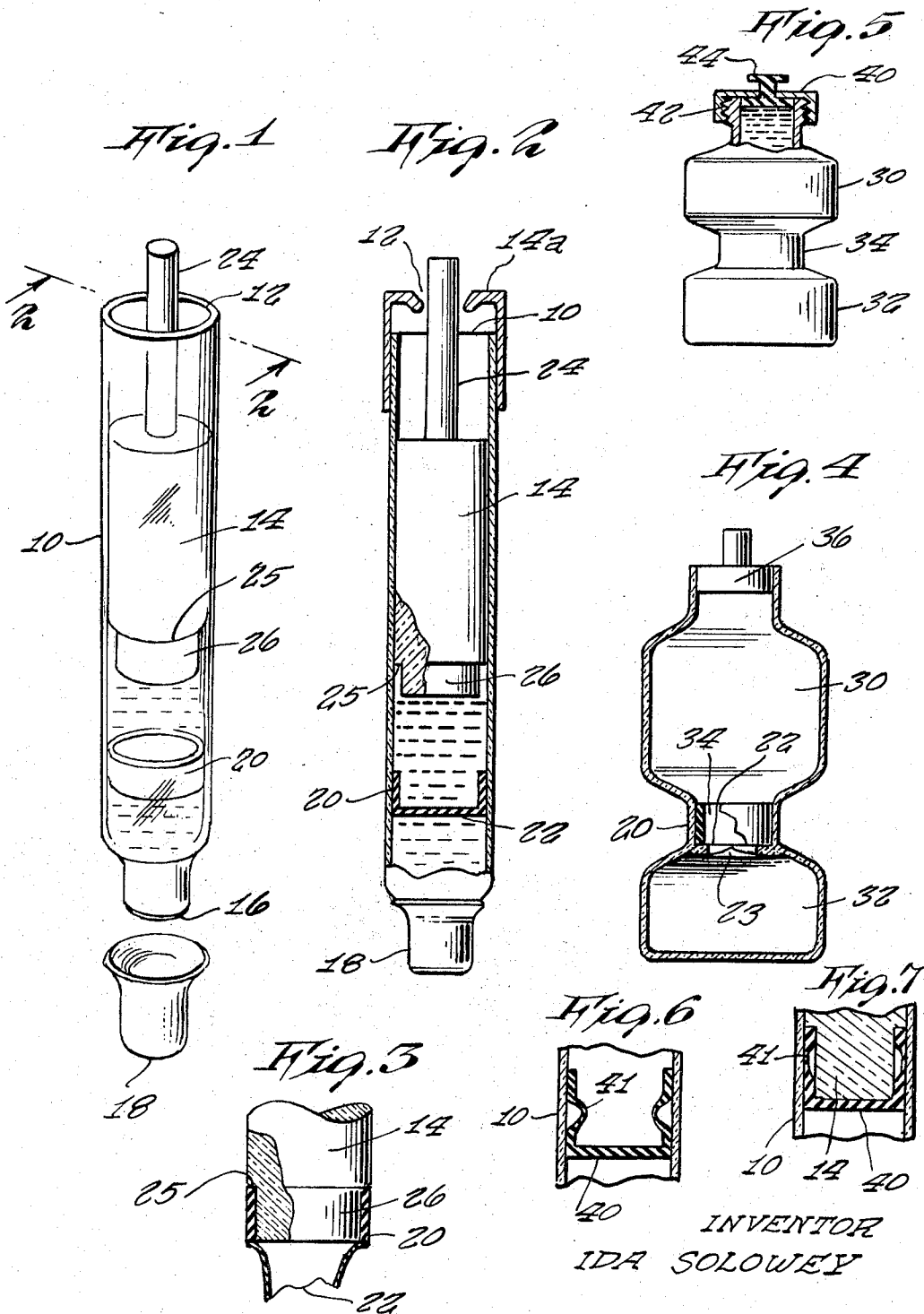


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 COMPARTMENTED MEDICAL CONTAINER HAVING A RUPTURABLE
 DIAPHRAGM BETWEEN COMPARTMENTS
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1 Claim. (Cl. 128—272)

My invention is directed toward a hypodermic syringe which can contain two or more medicinal ingredients which are mixed only at the time of injection and in addition relates to bottles or vials containing two or more medicinal ingredients which are held isolated from each other until mixing is desired.

It is an object of my invention to provide a new and improved syringe of the character indicated.

Another object is to provide a new and improved medicinal vial of the character indicated.

Still another object is to provide a new and improved medicinal bottle of the character indicated.

All of the foregoing and still further objects and advantages of my invention will now be explained with reference both to this specification and to the drawings wherein:

FIGURE 1 is a perspective view of my syringe;

FIGURE 2 is a cross sectional view of a modification thereof;

FIGURE 3 is a detail view of a portion of the syringe after an injection has been given;

FIGURE 4 is a cross sectional view of another modification;

FIGURE 5 is a cross sectional view of my bottle;

FIGURES 6 and 7 are partial sectional views of a further modification.

Referring now to FIGURE 1, there is shown a hypodermic syringe having a barrel 10 with an open end 12 which accommodates a plunger 14. Barrel 10 has a tip 16 at the other end arranged for hypodermic needle attachment. Tip 16 has the conventional small orifice through which the medicine ejected from the barrel flows into the needle, and when not in use the tip is sealed by cap 18.

In use, the portion of the barrel adjacent tip 16 is filled with a first medicinal ingredient either in powder form (to which liquid is added) or in liquid form. A hollow rubber cylinder 20 having a diaphragm of very thin rubber 22 is then press fitted snugly into the barrel until the diaphragm just touches the top of the liquid level of the first ingredient. The portion of the barrel adjacent the other side of the diaphragm and extending toward the open end is then filled with a second ingredient. The plunger is inserted to rest on top of the second or top layer ingredient. As the operator presses the plunger arm 24, the head 26 of the plunger (which is contoured to conform to the inside of cylinder 20) moves downward into the second ingredient, and the pressure causes a ruptured diaphragm 22 and permits the two ingredients to mix. Thereafter, the head 26 and shoulder 25 engages the cylinder and the head and the cylinder move downward together toward the tip ejecting the mixture thru the syringe.

To prevent the plunger 14 from slipping out, a stop 14a can be provided at the open end 12, as seen in FIGURE 2.

FIGURE 4 shows a vial having an upper chamber 30 containing one ingredient, a lower chamber 32 having a second ingredient, a hollow section 34 open at both ends interconnecting these chambers. A rubber cylinder 20 having a diaphragm 22 is fitted in section 34. When a rubber plunger 36 in the top of the chamber 30 is de-

pressed, the diaphragm is ruptured and the ingredients are mixed. A conventional syringe can then be filled in conventional manner by inserting the hypodermic needle through plunger 36 into the chamber. A sharp ridge 23 is provided under diaphragm 22 to help puncture the diaphragm.

FIGURE 5 shows an arrangement similar to FIGURE 4, except that the top of chamber 30 carries a screw-on cover 40 having a hole 42 through which a portion of a plunger 44 extends. In this case, the plunger cannot go through the cover and the plunger is reciprocated through the cover 40 to generate pressure on the diaphragm. The diaphragm 22 of the above said devices can be fabricated from any suitable thin flexible material.

In FIGURES 6 and 7 a diaphragm 40 is used which is cup shaped but includes a relatively thin flexible band 41 which is normally spaced from barrel 10. When the plunger 14 is depressed towards the diaphragm the band 41 expands radially into sealing engagement with barrel 10 because of the increase in pressure. Thus the diaphragm cup will cling more firmly to the barrel and the fluid pressure will build up more rapidly to cause a more effective rupturing of the diaphragm.

It is to be noted that the engagement between the plunger and diaphragm and their combined further movement causes a simultaneous ejecting pressure and further mixing of the ingredients.

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

A medical mixing container having upper and lower chambers sealingly separated by a thin rupturable diaphragm transversely mounted sealingly and longitudinally movable within the container, said diaphragm being in the form of an expandable cylinder having a circumferential barrel and a transverse bottom, said barrel having a portion normally spaced from the container and having an upper shoulder, in combination with a plunger longitudinally movable within one of said chambers and being contoured to fit snugly within the said chambers, including ingredients which are mixed when the diaphragm is ruptured, said plunger having surfaces adapted to sealingly engage the barrel, bottom and shoulder of the diaphragm, whereby axial movement of the plunger will first cause the barrel to expand towards the container, whereby complete engagement with the wall being then effected when the plunger has entered the cylinder to contact the barrel and snap the said portion against the container, whereby the diaphragm bottom is ruptured during the axial movement of the plunger, further movement of the plunger causing the plunger surfaces to sealingly engage the diaphragm thereby moving the diaphragm axially, including means mounted on the end of the container opposite the plunger adapted to receive a hypodermic needle and wherein the plunger extends through an open end of the container having a perforated closure wherein said closure functions as a stop to prevent complete removal of the plunger from the container.

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