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2,371,774

PHARMACEUTICAL DISPENSING DEVICE

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Fig. 1.

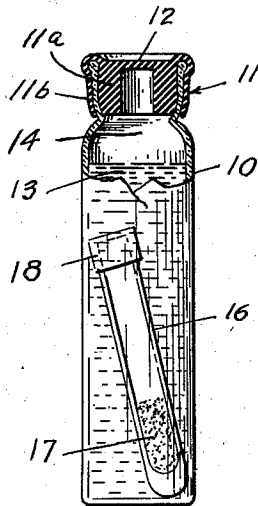


Fig. 2.

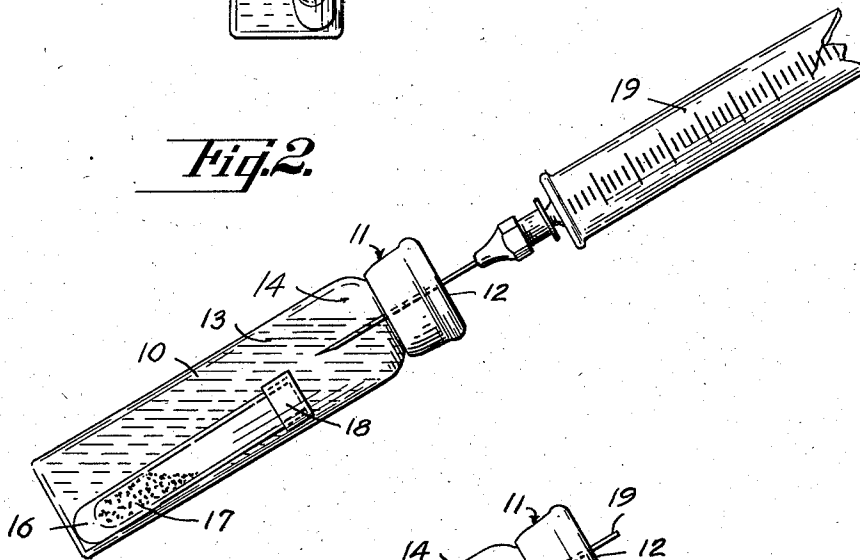
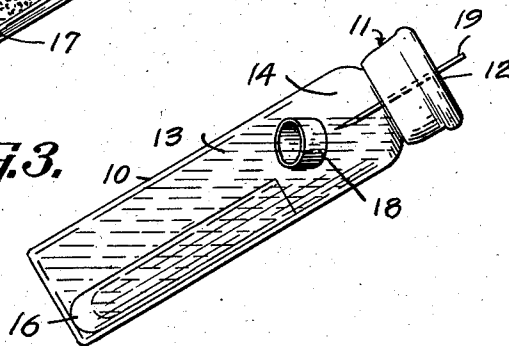


Fig. 3.



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PHARMACEUTICAL DISPENSING DEVICE

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5 Claims. (Cl. 128—272)

This invention relates generally to devices for the marketing and dispensing of pharmaceutical preparations, particularly where it is desired to employ the preparation in a hypodermic syringe.

Many pharmaceutical preparations of the type employed in hypodermic syringes require the intermingling of two or more ingredients immediately before the preparation is injected. In addition it is essential that the final solution or mixture be sterile, which necessitates use of sterile ingredients and a sterile mixing container, if heat sterilization immediately before injection is to be avoided. For example in the dispensing of such drugs as pentothal, morphine, codeine, barbiturates, and the like, the drug itself is supplied in powdered form and must be kept dry before its use. In the past the dispensing of such drugs to form a suitable sterile solution for injection involved intermixing a measured quantity of the dry drug with distilled water in a sterile container, to form a suitable amount of the sterile solution for injection. In an endeavor to facilitate the preparation of the sterile solution certain of these drugs are being supplied by the manufacturers in kits each containing a sealed ampule of the drug, together with a sealed sterile ampule containing distilled water. At the time the preparation is dispensed from the kit the glass seals of the two ampules are broken, and by use of a hypodermic syringe the distilled water is transferred to the ampule containing the drug, and intermixed to form the desired solution. While the use of such kits avoids the necessity of separately supplying sterile distilled water and a sterile mixing container, considerable time is required to break the glass seals, and in addition there is always the possibility of contaminating the solution. In particular this dispensing method is not well adapted for emergency field applications, where opportunities for maintaining customary cleanliness may be lacking and where it may be important to prepare the solution in the shortest possible time.

It is an object of the present invention to provide a pharmaceutical dispensing device which will avoid the difficulties pointed out above, and which will facilitate quick preparation of a sterile solution or mixture for application in a hypodermic syringe, with no possibility of contamination.

Another object of the invention is to provide a device particularly adapted for dispensing drugs which must be kept in dry powdered form before being used, as for example drugs such as

pentothal, morphine, codeine, barbiturates, and the like.

Additional objects of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Figure 1 is a side elevational view partly in cross section, illustrating a device in accordance with the present invention.

Figure 2 is a side elevational view of the same device shown in Figure 1, indicating the manner in which a hypodermic syringe is applied.

Figure 3 is a view like Figure 2, showing how the closure for the inner capsule is removed.

The present invention involves generally the use of two bottles, one within the other, and containing two or more ingredients which are to be intermingled to prepare a mixture or solution for injection. With drugs such as pentothal, morphine, codeine, barbiturates and the like, the outer container is charged with a suitable quantity of sterile distilled water, and the inner container or cartridge contains the sterile drug in dry powdered form. The outer bottle has its mouth sealed with a cap including a wall adapted to be punctured by the needle of a hypodermic syringe. The inner cartridge is sealed by a cap or closure which is removable by expansion of gas within the cartridge, responsive to reduction of pressure within the outer bottle. This reduction of pressure is carried out when the needle of a hypodermic syringe is thrust through the cap of the outer bottle, and part of the liquid withdrawn.

Referring to the specific form of the invention illustrated in the drawing, the invention in this instance consists of a glass bottle 10, which is sealed by the cap 11. This cap is preferably made of suitable resilient material like natural or synthetic rubber, and is shown provided with an inner stopper like portion 11a and an outer skirt or lip 11b embracing the mouth of the bottle. Portion 11a is recessed to afford the pliable wall 12 which is adapted to be pierced or punctured by the needle of a standard hypodermic syringe. The liquid 13 within this bottle may be distilled water, and preferably the bottle is incompletely filled to provide the air or gas space 14.

Within the outer bottle 10 there is a smaller inner bottle or cartridge 16, which is shown containing a charge 17 of drug in dry powdered form. The open end of the inner bottle 16 is closed by the cap 18, and it is desirable to likewise make this cap of suitable resilient material, such as natural or synthetic rubber. Closure 18

should fit over the end of the bottle 16 sufficiently snugly to provide a good liquid tight seal. However it should be free to slip from the end of the bottle by longitudinal movement, so that it can be dislodged by pressure within the inner bottle 16 substantially greater than the pressure in the outer bottle 10. I have found that this requirement can be readily met particularly where the mouth of the bottle engaged by the closure 18 is cylindrical and free of a bead or lip such as might tend to lock the closure in place. The remaining space within bottle 16 not occupied by the powder, contains air or other gas. For reasons to be presently explained it is desirable that the volume of the space within bottle 16, not occupied by the powder, be generally similar in size to the gas or air space 14 within the larger bottle 10.

In the assembling of the device the measured quantity of the drug is first placed within the bottle 16 and after cap 18 has been applied, this bottle is placed within the larger bottle 10. Then a measured quantity of distilled water is introduced into the bottle 10 and the cap 11 applied. Upon applying this cap a pressure is formed in space 14 substantially greater than atmospheric, because of the plunger action of cap portion 11a. In a typical instance this results in a pressure within bottle 10 which, at normal temperature, is from 10 to 30% or more in excess of atmospheric. Such a pressure serves to press cap 18 against the bottle or cartridge 16, thus affording added assurance of a proper seal. The complete assembly is then sterilized, as by immersion in boiling water, after which it is packaged in a conventional manner and supplied to the trade.

When it is desired to dispense the contents of such a package, the outer end face of the cap 11 is first sterilized, as by wetting it with alcohol, and then the needle of a hypodermic syringe 19 is thrust through the wall 12, substantially as shown in Figure 2. This immediately establishes communication between the interior of the outer bottle 10 and the charging chamber of the syringe. The plunger of the syringe is then retracted to cause water or air from the bottle 10 to enter the syringe chamber, which in turn causes a substantial reduction in pressure within the bottle 10. Immediately upon this reduction in pressure taking place, a substantial differential pressure is created between the interior of the cartridge 16 and the interior of the bottle 10, and this causes expansion of gas within the cartridge 16 to dislodge the cap 18. Figure 3 shows the cap 18 having been dislodged, with the result that distilled water enters the cartridge 16, thus enabling an intermingling of the two ingredients, to form the desired solution for injection.

I have experienced no difficulty in effecting positive dislodgment of the inner cap 18, when the pressure within the outer bottle is reduced in the manner previously described. However in the event cap 18 should not dislodge itself, the point of the syringe needle can be caused to penetrate the cap 18, in the same manner as cap 11 was penetrated, and then pressure greater than that within space 14 can be produced in the inner cartridge 16, by displacing water or air from the chamber of the syringe.

It will be evident that the device described above makes it possible to prepare the desired solution for injection without possibility of contamination, and without the necessity of breaking glass seals, or attempting to transfer liquids from one container to another. The operation described for the use of my device takes a mini-

mum amount of time, and the device is well suited for field conditions where time may be an important factor, and where it might otherwise be difficult if not impossible to prepare a sterile solution.

Previous reference has been made to the fact that the air or gas space within the cartridge 16 is comparable to the space 14 within the outer bottle 10. This is for the purpose of making the assembly immune from atmospheric changes in temperature or pressure. Should the assembly be placed in a rarified atmosphere, such as might occur when the assembly is transported by plane, considerable pressure will be retained by the cap 11 within the outer bottle 10 sufficient to maintain the cap 18 intact. When subjected to low temperatures, the pressure within both the outer and inner bottles is reduced by comparable amounts, and likewise the pressures are increased by comparable amounts when the assembly is heated to relatively high temperatures. Thus my device is able to withstand all pressure and temperature variations to which it may be subjected, to insure its proper condition at the time of use.

I claim:

1. A pharmaceutical dispensing device comprising a bottle serving to contain liquid, a cap serving to seal the bottle and including a wall adapted to be punctured by the needle of a hypodermic syringe, a cartridge disposed within the bottle, the cartridge serving to contain an ingredient for ultimate intermingling with the liquid and also having a substantial inner space occupied by gas, and a closure normally sealing the cartridge and removable by expansion of gas within the cartridge, responsive to reduction of pressure within the bottle.

2. A pharmaceutical dispensing device comprising a bottle serving to contain liquid, a cap serving to seal the bottle and including a wall adapted to be punctured by the needle of a hypodermic syringe, a cartridge disposed within the bottle, the cartridge serving to contain an ingredient for ultimate intermingling with the liquid and also having a substantial inner space occupied by gas, the bottle also having an inner space occupied by gas, said latter space being generally of the same volume as the volume of the space within the cartridge, and a closure normally sealing the cartridge and removable by expansion of gas within the cartridge responsive to reduction of pressure within the bottle.

3. A pharmaceutical dispensing device as in claim 2, in which the pressure in the bottle is normally substantially greater than the pressure in the cartridge.

4. A pharmaceutical dispensing device comprising a sterilized sealed assembly including a bottle serving to contain distilled water, a cap serving to seal the mouth of the bottle and including a pliable wall formed of resilient material and adapted to be punctured by the needle of a hypodermic syringe, a smaller cartridge within the bottle, the latter cartridge serving to contain a quantity of drug in powdered form for ultimate solution with the water, the remaining space within the cartridge being occupied by gas, and a closure normally sealing the mouth of the cartridge and removable by expansion of gas within the cartridge, whereby the cartridge closure is removed automatically in response to puncturing the cap of the bottle with a hypodermic needle followed by withdrawing a portion of the liquid to thereby reduce the pressure within the bottle.

5. A pharmaceutical dispensing device com-

prising a bottle serving to contain liquid, closure means serving to seal the bottle and including a wall adapted to be punctured by the needle of a hypodermic syringe, a cartridge disposed within the bottle, the cartridge serving to contain an ingredient for ultimate intermingling with the liquid and also having a substantial inner space

5 occupied by gas, and closure means normally sealing the cartridge and removable with respect to the cartridge by production of pressure conditions such that gas pressure within the cartridge is substantially greater than gas pressure within the bottle.

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