

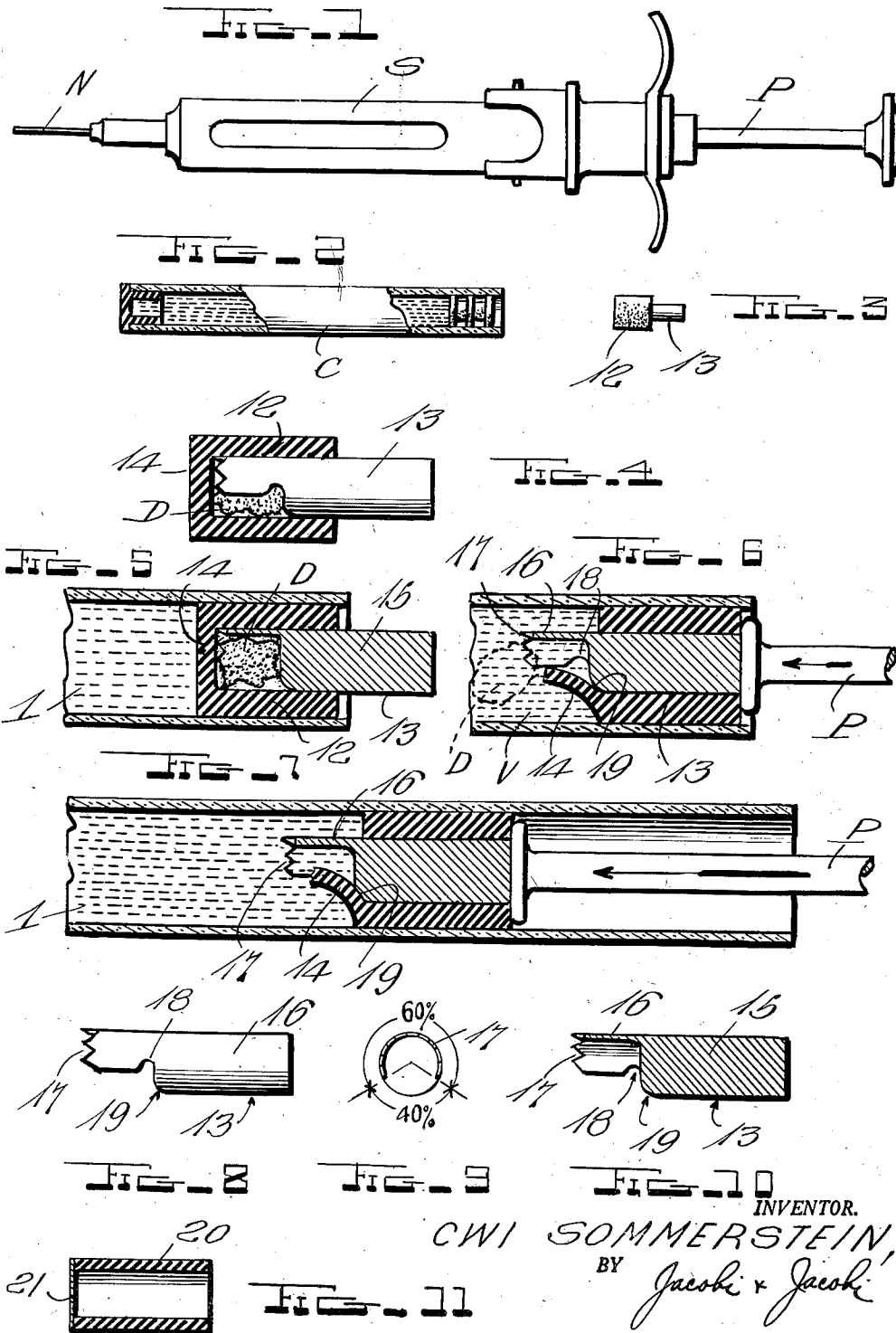
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AMPOULE

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AMPOULE

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This invention relates to new and useful improvements in ampules or cartridges for use in syringes of the hypodermic type, the principal object of the invention being to provide an ampule or cartridge with means for retaining a drug free of the vehicle or solvent until such time as it is desired to use the same.

A further object of the invention resides in the provision of an element adapted to form a closure for the ampule which carries the drug free of the solvent or vehicle, said drug being introduced to said vehicle upon the puncturing of the closure when use is desired.

A still further object of the invention resides in the provision of a combined piston and secondary member, the latter containing a housing and cutter adapted for actuation by the plunger of a conventional hypodermic syringe.

Still another object resides in the provision of a secondary chamber or container having a puncturable or severable diaphragm, said container having a bore defined by surrounding walls of substantially uniform thickness.

A still further object of the invention resides in the provision of a combined cutter and housing adapted to partially enclose a drug within the bore or chamber of a sliding closure for the ampule.

Still another object of the invention resides in forming a cutter of a predetermined size and shape to enable the diaphragm of the secondary chamber to be punctured or partially severed upon the actuation of the plunger of the conventional hypodermic syringe.

A still further object resides in providing an ampule which is comparatively simple and durable in construction, inexpensive to manufacture and one which will be very efficient and useful in operation.

With these and numerous other objects in view, my invention consists in the novel features of construction, combination and arrangement of parts, as will be hereinafter referred to and more particularly pointed out in the specification and claims.

In the accompanying drawing, forming a part of this application,

Figure 1 is a side elevation of a syringe of conventional form and in connection with which my improved cartridge or ampule is adapted to be used;

Figure 2 is a side elevation, with parts broken away and parts in section, of a conventional cartridge or ampule customarily used in a syringe of the type shown in Figure 1, there being dis-

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closed at the ends of said cartridge or ampule the usual closures, including the piston-type closure at the right hand end thereof, the latter being adapted to be replaced by my improved closure-piston;

Figure 3 is a side elevation of my improved combined piston-closure and container;

Figure 4 is an enlarged longitudinal sectional view of my improved piston-closure and container in combination with my combined housing and cutter, showing the drug element in position therein;

Figure 5 is an enlarged fragmental longitudinal section through an ampule showing my improved piston-closure and container with the combined housing and cutter therein applied to the ampule;

Figure 6 is a view similar to Figure 5 showing the plunger of the syringe applied and the combined housing and cutter advanced to the position of puncturing or partially severing the diaphragm of the piston-closure, the drug element being shown in dotted lines in the vehicle or solution;

Figure 7 is a view similar to Figures 5 and 6, except that the combined container and piston as well as the combined housing and cutter is shown further advanced in the shell of the cartridge or ampule under action of the syringe plunger;

Figure 8 is a side elevation of the combined cutter and housing removed;

Figure 9 is an end elevational view of the cutter and housing shown in Figure 8, with particular emphasis being placed on the percentage of the circumference of the device covered by the cutter element;

Figure 10 is a longitudinal sectional view of the cutter and housing shown in Figure 8; and

Figure 11 is a sectional view through a combined piston and closure showing a slightly modified form of diaphragm thereon.

In describing the invention, I shall refer to the drawing in which similar reference characters designate corresponding parts throughout the several views, but it will be understood that this drawing is merely illustrative of my improvements and not definitive thereof except insofar as may be defined in the claimed subject matter.

It is a well known fact that certain drugs, such as penicillin and the like, should or must be used in a fresh state of solution, in order to be effective for the purposes desired. It is the primary object of my invention, as aforesaid, to provide

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a means whereby such drugs may be retained free or out of contact with a vehicle or solvent until it is desired to use the same. To this end, I have provided an improved ampule, or what may be said to be an improved piston-closure therefor adapted to contain the drug until such time as use is made thereof.

As aforesaid, my improved ampule is adapted for use in connection with the conventional type of syringe which I have designated in the drawing by the letter S, said syringe containing a drug free vehicle or solvent I and being provided with the usual plunger P and the double ended needle N. The conventional ampule or cartridge C is provided at the outer or left hand end thereof with a puncturable closure, which is also conventional, and a closure piston, of conventional form, as shown in Figure 2, at the right hand or inner end thereof. It is this latter closure of piston-like formation that is adapted to be replaced by my improved device.

My combined container and piston, shown in Figure 3, and in other figures, comprises the piston 12 and a combined housing and cutter element designated by the numeral 13. This constitutes a unit which, as aforesaid, is adapted to replace the conventional piston-closure of the ampules ordinarily adapted for use in syringes of the type shown and aforementioned.

The combined container and piston 12 is preferably formed of suitable rubber or rubber composition or any other suitable material and is tubular in formation being open at its rear or right hand end and closed at the opposite end by a puncturable or partially severable diaphragm 14. The walls of this member 12 are of suitable thickness and substantially uniform in thickness throughout their length and area.

Fitted snugly into the tubular member 12 is a solid cylindrical element 13 which, as aforesaid, constitutes a combined cutter and housing. Thus, it will be seen that the inner peripheral wall of said combined container and piston 12 constitutes a guide for the combined cutter and housing 13. The solid cylindrical portion 15 thereof has an arcuate extension 16 formed thereon constituting a housing for the drug, designated in the drawing by the letter D. The combined cutter and housing 13 is, at least, one and one-half times as long as the element 12 and it may be made substantially twice the length of the latter. Thus, under normal conditions, prior to use, the element 13 will project beyond the inner end of the element 12, as best shown in Figures 3 and 4. It is merely essential that the cutter and its housing be long enough to eject the charge or drug D into the solvent or vehicle V when said element 13 is projected forwardly by the plunger P of the syringe.

The combined cutter and housing must be sufficiently large to properly receive the drug D, which, as shown in the drawing, is in crystal form, although it may be in any other form desired. It is preferred that the housing 16 of the member 13 extend circumferentially sixty per cent of the cylindrical housing, so that the remaining open portion of the housing shall constitute forty per cent of the circumference, as best illustrated in Figure 9 of the drawing. The ratio in degrees of the housing and its open side will be, under these conditions, 216° to 144°, respectively. While the exact sizes specified represent the preferred ratio, they are not to be considered precisely essential as specified, since it is merely necessary that the housing be large

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enough to receive the measured or weighed charge of drug D and, likewise, it is essential that the same be of a size to enable the cutter to sever a major portion of the diaphragm 14 and to provide for the ejection of the drug into the vehicle when the plunger P effectively actuates the combined piston-closure-container.

In order to effectively puncture or partially sever the diaphragm 14, the peripheral front edge of the extension 16 forming the wall of the housing is notched, cut out or serrated sharply, as shown at 17. The effectiveness of this cutter end of the device is clearly shown in Figures 6 and 7 of the drawing. To aid in the proper puncturing or partial severing of the diaphragm 14, the wall of the housing at the junction thereof with the cylindrical portion 15 is notched or cut out, as shown at 18, and the cylindrical portion 15 is rounded, as shown at 19. This will enable the diaphragm 14 to be properly punctured without tearing the material or causing any abrasive effects.

The element 13 may be made of any suitable material, such as aluminum, aluminum alloy, stainless steel or any other suitable metal or alloy thereof. There are, however, two essentials required of the metal, namely, it must lend itself to the production of an efficient cutting edge and it must not lend itself to detrimental corrosion, in view of the presence of the drug charge D.

The used cartridges or ampules are usually discarded, but it is apparent that the stainless steel or other metal elements may be salvaged, sterilized and reused.

The combined container and piston constituting the element 12 is preferably made integral by molding the material. This element 12 lends itself, of course, to various modifications, of which I have shown one in Figure 11.

In this modification shown in Figure 11, the combined piston and container may be made of composite materials, as desired, and in this view the same is represented by the numeral 20. This tubular cylinder may be made of rubber tubing cut to suitably measured lengths and each length or piece may be provided with a suitable diaphragm, as shown at 21, made of sheet material, such as rubber, plastic composition, metal or any other material suitable for the purpose and secured adhesively or otherwise to the end of the tubular member 20. If adhesives are used, same may be any one of various varieties, such as rubber, rubber composition, latex, acrylic, vinyl, or chlorophrene adhesives, or any other type available and satisfactory for the purpose.

When the elements 12 and 13 are assembled in the cartridge shell, the element 12 must frictionally retain itself within the shell to enable the advancement of the element 13 while puncturing or partially severing the diaphragm 14. The drug charge D is ejected into the vehicle V, as shown in Figure 6, and the rounded edge 19 of the cylindrical portion 15 maintains the partially severed diaphragm in open condition, while the notches 18 on the walls of the element 16 interlock with the adjacent uncut edge of the diaphragm to prevent damaging the latter.

From the foregoing description of the construction of my improved device, the application thereof to use and the operation of same will be readily understood, and it will be seen that I have provided a comparatively simple, inexpensive and efficient means for carrying out the various objects of the invention.

While I have particularly described the ele-

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ments best adapted to perform the functions set forth, it is apparent that various changes in form, proportion and in the minor details of construction may be resorted to, without departing from the spirit of sacrificing any of the principles of the invention providing that any such permissible changes to be effected fall within the purview of the claims in this application.

Having thus described my invention, what I claim is:

1. In an ampule replacement unit, said unit comprising a combined closure piston and container, said container having a severable diaphragm on one end thereof, in combination with a combined housing and diaphragm cutter located in said container, said housing being amply large enough to receive and contain at least a major portion of a drug charge therein, said cutter being in physical contact with a portion of said diaphragm, the peripheral wall of said container constituting a guide for said housing and cutter, and said combined housing and cutter being, at least, one and one-half times as long as the combined piston closure and container, said combined housing and cutter having on one of its ends a solid cylindrical portion constituting a guiding means therefor.

2. In an ampule replacement unit, said unit comprising a combined closure piston and container, said container having a severable diaphragm on one end thereof, in combination with a combined housing and diaphragm cutter located in said container, said housing being amply large enough to receive and contain at least a major portion of a drug charge therein, said cutter being in physical contact with a portion of said diaphragm, the peripheral wall of said container constituting a guide for said housing and cutter, and said combined housing and cutter comprising a major portion of a hollow cylinder having on one end thereof an arcuate serrated cutter whereby a major portion of said diaphragm may be severed by the advancement of said cutter.

3. In an ampule replacement unit, said unit

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comprising a combined closure piston and container, said container having a severable diaphragm on one end thereof, in combination with a combined housing and diaphragm cutter located in said container, said housing being amply large enough to receive and contain at least a major portion of a drug charge therein, said cutter being in physical contact with a portion of said diaphragm, the peripheral wall of said container constituting a guide for said housing and cutter, and said combined housing and cutter being provided with a solid cylindrical portion, said cylindrical portion having on one advanced edge thereof a rounded edge portion to deflect the partly severed diaphragm, said housing and cutter being located in opposed relation to the rounded edge portion, said combined housing and cutter having notches in each lateral edge thereof adjacent said solid cylindrical portion whereby each notch engages the unsevered portion of the diaphragm and thereby aids in maintaining said rounded edge portion against the diaphragm.

4. In an ampule replacement unit, the substructure comprising an article of manufacture, said article comprising a combined housing and cutter, said article having a solid cylindrical portion having on one advance end thereof a rounded edge portion and in opposed relation thereto a housing comprising the major portion of a hollow cylinder having notches in its lateral edges adjacent said solid cylindrical portion, the advance edge of said hollow cylindrical portion being serrated and sharpened.

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