

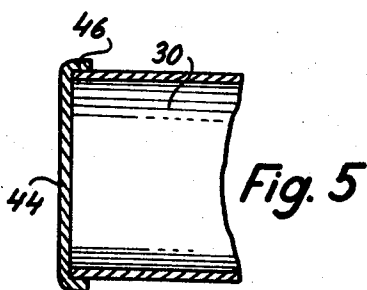
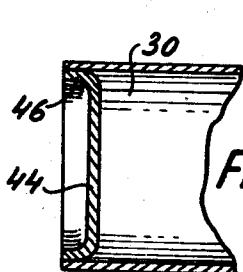
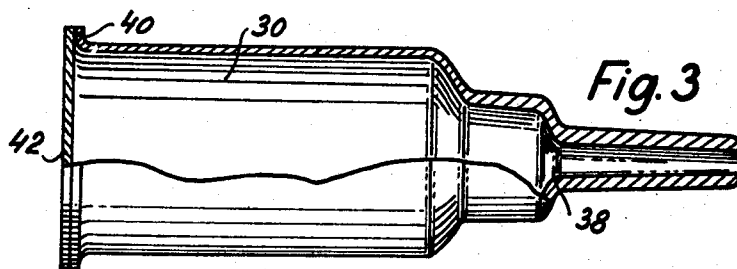
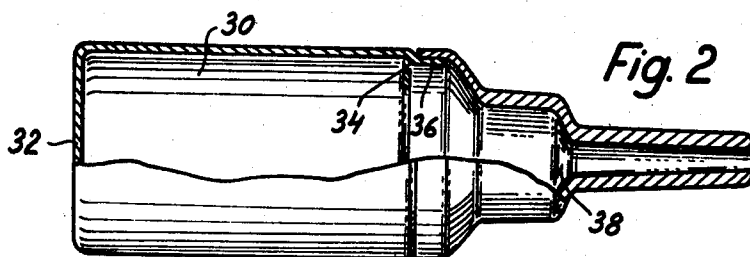
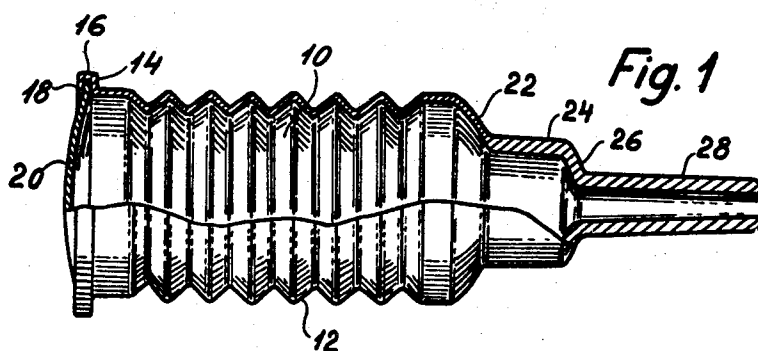
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AMPULE FOR STERILE STORAGE OF LIQUID MEDICAMENTS

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## AMPULE FOR STERILE STORAGE OF LIQUID MEDICAMENTS

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3 Claims. (Cl. 128—272)

The present invention relates to an ampule for sterile storage of liquid medicaments for injection, comprising a deformable, metallic container.

Medicaments enclosed in metallic containers, which are hermetically sealed, are durable for a long time under varying external conditions, for which reason medicaments so contained are specially suitable for export and for depots storing supplies to the armed services, A.R.P. personnel, ships' crews, factory personnel, and other institutions. This presupposes that as material for the container is chosen a metal, which does not attack medicaments and is not attacked thereby. Under medicaments are reckoned in the present connection not only such agents as possess therapeutic or stimulating properties, but also vaccines, sera, and other prophylactics.

The ampule indicated by the invention comprises a cylindrical main part of a material which is so thin that it is axially compressible. At one end the container is closed by a substantially plane bottom. Preferably the generatrices of the cylindrical main part are wavy. At its other end the container is shaped as a tube tip, preferably of increased wall thickness compared with the other part of the container. Hereby are obtained certain advantages, which will be mentioned in the following.

The principal object of the invention is to indicate an ampule which in filled condition will remain sterile and which can easily be emptied in the simultaneous process of injecting the medicament. Another object of the invention is to provide an ampule for the purpose described of a cheap and reliable construction and easy to handle in use.

With the above and other objects in view the present invention consists in the combination and arrangement of parts, hereinafter more fully described, illustrated in the accompanying drawing and more specifically pointed out in the claims, it being understood that changes may be made in the form, size, proportions, and details of construction without departing from, or sacrificing any of the advantages of the invention.

In the following the invention will be particularly described with reference to the drawing, wherein:

Figs. 1-3 show different embodiments of an ampule according to the invention, as seen from the side, partly in section, and

Figs. 4 and 5 show other constructional forms of attaching the bottom to the main part.

In all embodiments the container constituting the ampule is made of a deformable metal or alloy. It may e.g. consist of tin, aluminium or lead or alloys of said metals.

In the embodiment shown in Fig. 1 the container comprises a substantially cylindrical main part 10 with corrugated surface, the cylinder generatrix being a wavy line 12. The wave may be sinusoidal or its flanks may be made up of parts of straight lines, which are connected above and below by curved lines.

At the end shown to the left in the drawing the part 10 has a protruding flange 14 and a cylindrical collar 16, the extreme portion 18 of which is pressed inwardly, after

a disc-shaped bottom 20 has been inserted in the collar, whereafter the edge of the bottom is folded in. This mode of assembling does not constitute part of the present invention. The bottom 20 is slightly arched outwardly. At the right end of the main part 10 is formed a neck thereby, that said part 10 merges through a substantially cone-shaped part 22 into a cylindrical part 24, which again through a cone-shaped part 26 merges into a slightly tapered tube-shaped part 28. The wall thickness of the parts 24-28 exceeds that of the other parts of the container, the reason being that in the shown embodiment the container is supposed to have been produced from a blank, which is made in the manner known from tubes, the parts 24-28 being formed by the tube tip. Originally, the cylindrical part 10 of the container has rectilinear generatrices and is subsequently made wavy by being rolled between cam rollers of suitable profile. The flange 14 and the collar 16 may be produced by rolling or spinning, and the folding-in of the bottom 20 may be produced by a similar process. Thereafter the bottom 20 is finally secured by an exterior soldering, so that complete tightness is provided.

In Fig. 2 is main part of the container, here denoted 30, is made integral with a plane bottom 32 in the shape of a cup, e.g. by drawing. At the open end of the cup a shoulder 34 has been formed, whereby a reduced part 36 is produced. To the latter part is attached a tube tip 38, of the same design as in Fig. 1. The connection is secured by soldering. In this as well as in the following embodiments the cylindrical part 30 has rectilinear generatrices.

Fig. 3 is different from Fig. 2 in that the cylindrical part 30 as in Fig. 1 is integral with the tube tip 38. At the opposite end the part 30 has a protruding flange 40, to which is attached a plane or slightly arched bottom 42 by soldering.

Figs. 4 and 5 serve to illustrate other ways of attaching the bottom. In Fig. 4 the bottom 44 has an upright collar 46, which is inserted in the cylindrical main part 40. In Fig. 5 the collar 46 surrounds the part 40. In either case the connection is secured by soldering.

After the ampules have been cleaned, they are filled through the open tube tip with the medicament concerned, whereupon the tube tip is closed, e.g. by being compressed and subsequently soldered or welded. Depending upon the nature of the medicament the container is sterilized before or after filling and closing.

It is intended that the ampules described in the foregoing shall be placed in a special appliance for emptying, wherein at first the bottom 20 is pierced by a cannula, and thereupon the container is compressed in axial direction, whereby the medicament is ejected through the cannula. In the embodiment shown in Fig. 1 the compression of the ampule is particularly easily effected, as the cylinder wall is waved, so that it is subjected to an accordion folding. The reduced wall thickness, which has been produced by the rolling of the waves, further diminishes the force necessary for the compression. In the other embodiments the compression proceeds irregularly, although it causes no difficulties, when suitable material and wall thickness are used for the cylindrical main part. In the last stage of the compression the part of the cannula, which has pierced the bottom, enters the cavity in the part 24, Fig. 1, and possibly also in the tube-shaped part 28, so that the point of the cannula is not damaged. A cannula is rather expensive, for which reason it is often desired to preserve it for renewed use.

A medicament stored in the ampules described above will stand prolonged storage, because a metallic material offers a good protection against diffusion. In this connection it is an expedient feature of the embodiment shown in Fig. 1 that the cylindrical part of the container is finished

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by rolling as described in the foregoing, whereby the tightness of the material is increased. The bottom is punched from sheet material, which has been subjected to rolling beforehand. The tightness of the material in the tube tip is secured by means of a comparatively large wall thickness. As the tube tip constitutes a small part only of the whole ampule, the increased wall thickness at this place does not involve any material increase of weight.

Even if the production of the ampules, indicated by the invention, has been described in the foregoing as involving the technique known from the production of tubes, preferably as an initial operation, the invention is not restricted thereby, as other methods can be employed, which may have the effect that the part designated the tube tip in the foregoing will be differently designed. With a view to the filling and subsequent closing of the ampule by molten metal it may be advantageous that the ampule is terminated by a tube-shaped part at the end opposite to the bottom. Said part may also suitably serve to cooperate with a displaceable member in the aforesaid appliance during emptying, whereby a guiding of the movable end of the ampule can be obtained during the compression thereof. In several of the shown embodiments, however, it is also possible to fill the ampule from the bottom end before attaching and soldering the bottom. Alternatively ampules with tube tip may be emptied through the tip, e.g. by the piercing of same.

The term "liquid" medicaments shall be taken to comprise not only thin and viscous medicaments, but also medicaments of unguentary consistency. The medicament can be present in solution or suspension in a vehicle.

What I claim and desire to secure by Letters Patent is:

1. A package comprising a sealed self-sustaining ampule and a sterile injectable liquid medicament enclosed therein, said ampule comprising a deformable, metallic, elongated body axially compressible when being emptied

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of the medicament, said body having an elongated substantially cylindrical main portion with an accordion-pleated side wall, a disc-shaped slightly outwardly arched end wall sealingly closing one end of said main body portion, said end wall being of a thickness adapted to be readily pierced by a hypodermic needle, and a tube tip with a narrow axial opening merging with the other end of said main body portion in an area of intermediate diameter, said opening being closed by solidified molten metal to provide a hermetically-sealed enclosure for said medicament, and said tube tip and said area of intermediate diameter representing a substantial portion of the ampule length.

2. A package as defined in claim 1, wherein the wall thickness of said tube tip is greater than the wall thickness of the main portion of said ampule.

3. A package as defined in claim 1, wherein said tube tip and said intermediate area are defined by a cone-shaped portion merging with said accordion-pleated wall, a cylindrical portion merging with said cone-shaped portion, and gradually tapered tubular portion merging with said cylindrical portion, said last-named portion receiving said molten metal.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

719,175	Bierley et al. ....	Jan. 27, 1903
801,227	Drummond .....	Oct. 10, 1905
1,015,952	Greeley .....	Jan. 30, 1912
2,129,119	Davis .....	Sept. 6, 1938
2,636,644	Taylor .....	Apr. 28, 1953

##### FOREIGN PATENTS

Great Britain, 386,298, Apr. 8, 1931. (Complete specification not accepted. Application became void. Specification printed 1933.)