

Nov. 18, 1947.

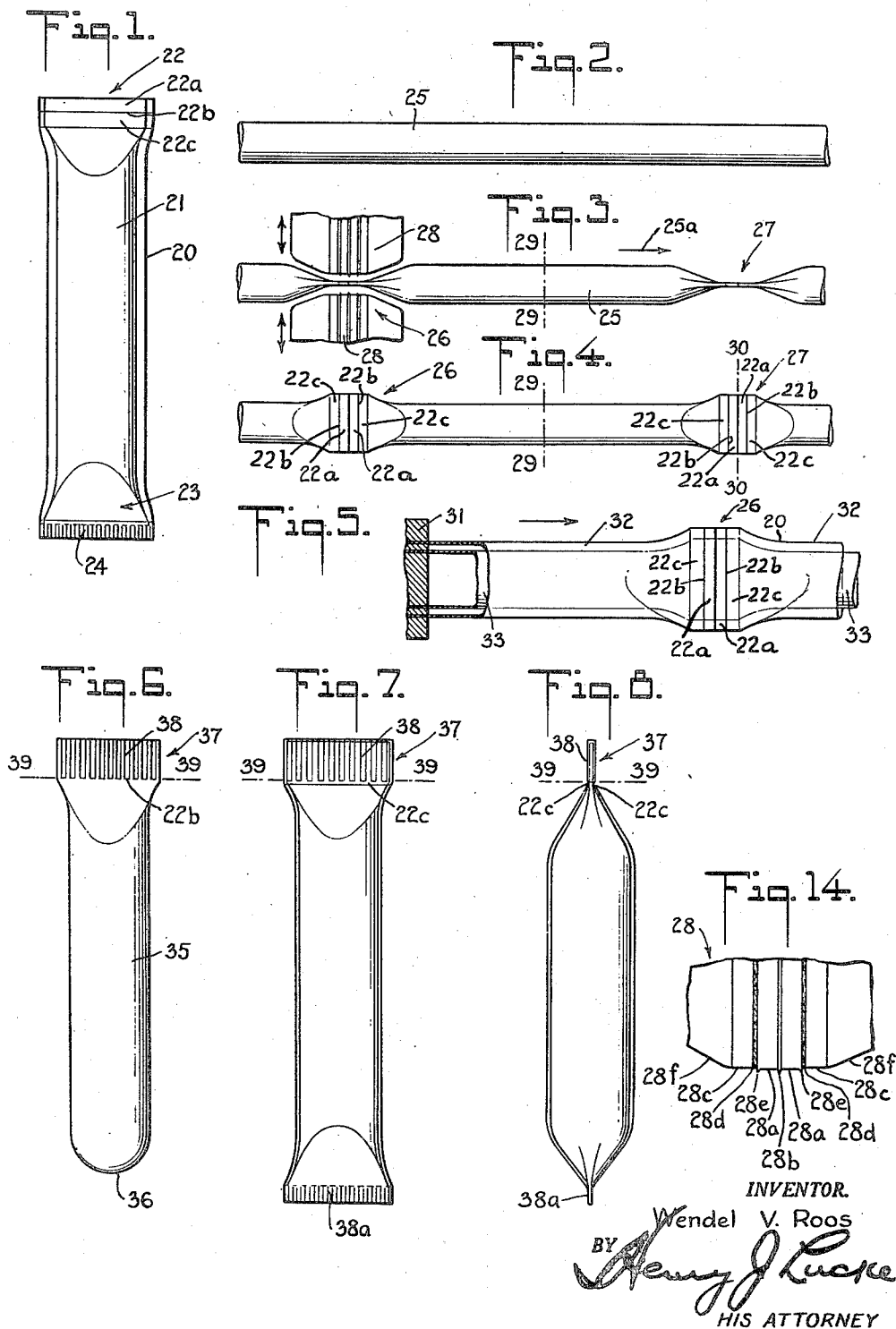
W. V. ROOS

2,430,995

END-SEALED THERMOPLASTIC CONTAINER BODY

Filed Dec. 31, 1942

2 Sheets-Sheet 1



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END-SEALED THERMOPLASTIC CONTAINER BODY

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Fig. 9.

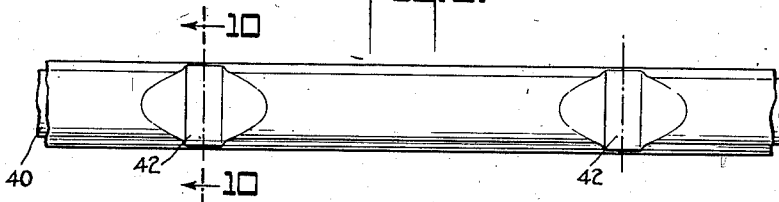


Fig. 10.

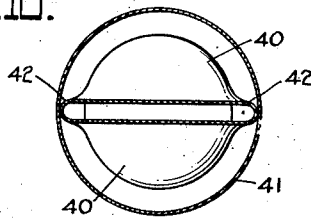


Fig. 11.

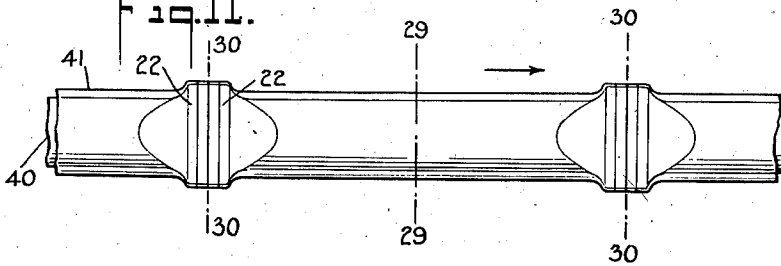


Fig. 12.

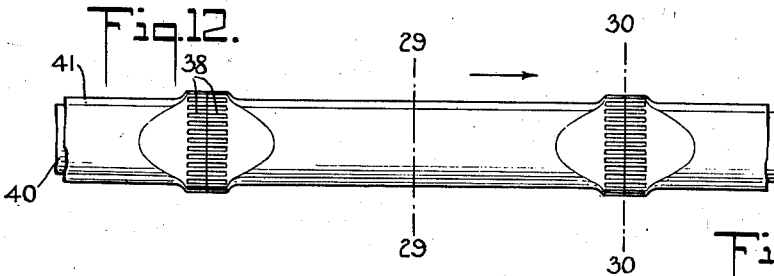


Fig. 13.

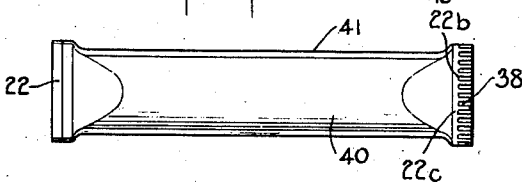
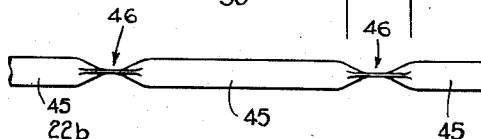


Fig. 15.



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2,430,995

END-SEALED THERMOPLASTIC CONTAINER
BODY

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Application December 31, 1942, Serial No. 470,813

4 Claims. (Cl. 222-107)

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The present invention relates to thermoplastic container bodies which are sealed at one end, and applicable to be filled at an open end which open end is subsequently suitably closed, the dispensing opening of container being effected upon breakage of the seal at the originally sealed end.

An object of the present invention is to provide an ampoule or other container formed of suitable material capable of being hermetically sealed and also of the nature of being severable by mere application of severing force.

Among the objectives of my invention is the provision of an ampoule or other container for embodying approved pharmaceutical and other medications available for use under emergency and other conditions, such as for first-aid on the battlefield, first-aid administered by air wardens, domestic use, and in other circumstances where professional medical attention is not available, as well as for use in hospitals and by the medical profession in general.

Embodiments of my invention are also applicable for use as dispensing containers for tooth paste, shaving and other creams, lotions, and the like.

Certain preferred embodiments of the invention include a double container, that is to say, an outer container embracing and usually protecting the inner container, the latter or both enclosing material to be dispensed. The outer container may also enclose a pharmaceutical or other medication applicable for complementary application with the material contained in the inner container. Such types of embodiment of the invention are particularly applicable for containing and dispensing medications which require sterilization or like aseptic treatment to render the contents and the interiors of the containers and the clearance between the outer container and the inner container aseptic as well as to kill contained spores or other septic matter.

Thermoplastics having the characteristics applicable to the requirements called for by the objectives of my present invention are preferable, in that such thermoplastics usually possess the property of being readily severed, and when severed do not introduce the factors of sharp edges or fractured material of the nature encountered when glass vials are employed for such packaging.

My present invention is an improvement of that described and claimed in my U. S. Patents No. 1,753,665, dated April 8, 1930, entitled Collapsible tube, and No. 2,188,191, dated January

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23, 1940, entitled Hermetically sealed automatic closure for collapsible tubes and the like. In the latter of my stated patents, I have disclosed the employment of cellulose acetate or other suitable cellulose compound as the material of the therein described collapsible tube, and the formation of an automatically closing opening for dispensing the contents from stage to stage, and the hermetical sealing of such self-closing dispensing opening in its original status.

One phase of my present invention resides in the method of continuously producing thermoplastic ampoules or other containers, provided originally with a hermetically sealed opening later serving as the dispensing opening, from continuous tubular stock of the desired thermoplastic or other suitable material. My present disclosure also includes a preferred method of producing double or other multiple ampoules or containers in the relationship of outer and one or more inner containers, or serially related, and preferably produced in a continuous manner by simultaneous treatment of mutually enveloping indefinite lengths of tubular stock.

Preferably, the inner ampoule or container is disposed substantially uniformly within the outer container or containers. In the production of such embodiments of the invention, the indefinite lengths of inner and outer tubular stock may be effected by extrusion through suitable dies, wherein the die head serves also to maintain substantially uniform clearance between the inner and outer lengths of tubular stock, which are treated under heat and pressure to produce the hermetically sealed self-closing closures at the desired locations serving when severed as the dispensing openings of the resulting individual multiple containers.

In the production of tubular ampoules or containers, single or double or other multiple, one end of the ampoule or container is open, affording the filling of the same pursuant to conventional practice with conventional or other approved filling and usually weighing or measuring machines. Pursuant to my process of treating indefinite lengths of tubular stock, the same are treated along the lengths of such stock at locations approximately twice the length of the eventual individual ampoule or container; the tubular stock between the treated locations is cut into two, thus providing an open end thereat for the respective ampoules or containers.

Thermoplastics possessing the characteristics applicable as material for containers pursuant to my present invention include cellulose acetate,

saran, vinylidene chloride resins, lucite and such other thermoplastics of such character that are immune with respect to the contents packaged and capable of withstanding sterilization or other treatment for packaged contents. By thermoplastics I include all materials in addition to the commonly termed thermoplastics which materials lend themselves to be formed, i. e., shaped by heat and pressure or like procedure from an original tubular, i. e., hollow stock to attain the objectives of the variant types of embodiments of my invention as set forth.

Further features and objects of the invention are more fully set forth in the following detail description and the accompanying drawings, in which

Fig. 1 is a side elevation typical of a multiple tubular container, pursuant to the invention;

Fig. 2 is a side view of an indefinite length of tubular stock from which the inner and/or outer container is produced.

Figs. 3 and 4 illustrate in edge and top plan views a length of tubular stock such as is indicated in Fig. 2, treated to produce double lengths of individual single tubular containers;

Fig. 5 represents in diagrammatic plan view a continuous method of forming indefinite lengths of inner and outer tubular stock, the inner tubular stock being substantially uniformly positioned within the outer tubular stock. Fig. 5 illustrates also a joint treatment of an inner and outer tubular stock for producing double tubular containers, in this instance the treatment being similar to that for producing the single tubular container indicated in Fig. 4;

Fig. 6 is a side elevation of one type of single tubular container hermetically sealed at its dispensing opening, the opposite end of the container having a conventional semi-spherical configuration;

Fig. 7 is a side elevation of a single tubular container hermetically sealed at its opposite ends.

Fig. 8 is an edge elevation of Fig. 7;

Fig. 9 is a top plan view of indefinite lengths of inner and outer tubular stock, the inner tubular stock being partially flattened at predetermined locations to afford substantially uniform positioning of an inner stock relative to the outer stock;

Fig. 10 is a detail cross-section view on line 10-10 of Fig. 9, on an enlarged scale.

Fig. 11 is a diagrammatic top plan view indicating a manner of treating the inner and outer lengths of tubular stock indicated in Figs. 9 and 10.

Fig. 12 is similar to that of Fig. 11, illustrating another method of treatment of inner and outer tubular stock indicated in Figs. 9 and 10.

Fig. 13 is a top plan view of a double tubular container hermetically sealed at its opposite ends by variant forms of sealing.

Fig. 14 is an elevational view of one of the heating and pressure treating dies shown in Fig. 3, on a somewhat enlarged scale.

Fig. 15 is an elevation of a chain of two or more (two only being shown) ampoules or containers embodying my invention.

Referring more particularly to Fig. 1, the outer container of thermoplastic or other suitable material is designated 20; 21 designates the inner ampoule or container which may also be of thermoplastic or other suitable material. One end, viz., the end designated generally 22, may serve as the dispensing end, and in this instance is provided with an originally hermetically sealed

closure, which when severed, as described hereinafter, is provided with a self-closing opening. As shown, such hermetically sealed closure consists generally of an outermost sealing, oppositely related and mutually fused flattened areas 22a, provided with a marginal scoring 22b, which is partially cut into the material or otherwise formed to weaken the material at such scoring 22b, and oppositely related and mutually face-to-face contacting but unfused flattened areas 22c. Upon severing at the marginal scoring 22b, the flattened areas 22c mutually serve as the self-closing closure of the dispensing opening, similarly as set forth in my above referred to Patent #2,188,191. Such provision of flattened areas give rise to a general frusto-conical configuration of the material approaching the dispensing opening, two sides of which are substantially flat and taper convergently to the respective flattened face-to-face contacting areas, 22c, the remaining two opposite faces being of general arcuate configuration.

The container illustrated in Fig. 1 is shown closed at its opposite end 23, also in a hermetically sealed manner, by a form of crimping designated 24, described more particularly herein-after.

By crimping, I include corrugations, milling, knurling or the like, whereby fusion is afforded between the areas brought into face-to-face engagement under heat and pressure. Such crimping or equivalent possesses also the advantage that the so treated areas may be grasped without slipping of the fingers, in the circumstance that the areas are wet, when it is desired to sever or break the thus fused sealed closure, for freeing the dispensing opening of the ampoule or container.

Figs. 2, 3 and 4 indicate diagrammatically a preferred method of producing ampoules or containers, embodying the features of my present invention. In this instance the container is shown of single tubular form.

The material 25, serving as the stock, indicated in Fig. 2 is illustrated of substantially circular tubular formation and represents an indefinite length of such stock. At desired spacings indicated between the locations 26 and 27 in Fig. 3, such stock 25 is treated to provide, preferably, the above referred to originally hermetically sealed closure. In the instance of using thermoplastic stock, such treatment is accomplished under heat and pressure, for which purpose, the sets of complementary, heated pressure twin dies 28, 28, typify suitable instrumentalities for effecting such treatment. Such dies 28, 28 are suitably mounted and reciprocated, as indicated by the applied double arrows, in proper timed relation to the intermittent travel (indicated by the arrow 25a) of the thermoplastic stock, as will be understood by those skilled in the art. Such dies 28, 28 may be heated electrically under thermostat control.

Fig. 14 illustrates one of such heating and pressure treating twin dies 28, which essentially includes the flat faces 28a, 28a, which are heated to a temperature which upon pressure engagement with the thermoplastic stock flattens the same and effects fusion and consequent sealing of the opposing thus flattened areas corresponding to the above referred to fused flattened areas 22a, see Fig. 1; between the faces 28a, 28a, of the dies is a scoring rule 28b, serving to cut-score the thermoplastic material at the margin between the fused flattened areas. The faces 28c, 28c of the dies are flat faced and are heated to a tem-

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perature less than fusing temperature of the thermoplastic, for effecting flattening but not fusion of the face-to-face engaging areas, corresponding to the above referred to face-to-face engaging areas 22c, 22c, see Fig. 1, serving mutually as a self-closing closure for the dispensing opening. Between each die face 28c and its associated die face 28a, heat insulation indicated at 28d is interposed to preserve the controlled differential temperatures; also, I provide the cut-scoring rule 28e between each die face 28a and 28c for effecting the cut-scoring 22b, see Fig. 1, for weakening the thermoplastic at the margin, see 22b, Fig. 1, between the sealed area 22a, 22a, and the unsealed face-to-face engaging area 22c, 22c, when it is desired to unseal the container for dispensing.

Each die 28 also comprises the upwardly receding flat forming faces 28f, 28f, which are heated to low temperature to suitably form the outwardly converging dispensing portion of the ampoule or container approaching the stated dispensing opening area 22c.

Desirably, the spacing between the series of locations 26 and 27 along the length of stock 25 is twice the length of an individual container, whereby upon cutting the intermediate stock in half, indicated by the dot-and-dash line 29—29, there is derived a two-container length of stock, having its opposite ends open. This two-container length of stock is cut on the scored line 30—30, see Fig. 4, resulting in two individual containers, each having a full opening at one end and a hermetically sealed closure at its opposite end.

Fig. 5 indicates diagrammatically a manner of producing double ampoules or containers following the procedure set forth hereinabove with respect to the two container procedure of producing single ampoules or containers in seriatim as indicated in Figs. 2, 3 and 4. 31 in Fig. 5 indicates an extrusion die through which is extruded under pressure the thermoplastic composition in fluid status from which the stock is formed. The extruded outer stock is indicated 32, and the extruded inner stock is indicated 33. The walls—suitably supported, not shown—of the extruding apertures of the die 31 serve in this instance to substantially uniformly position the formed inner tubular stock 33 within the outer tubular stock 32. A heat and pressure stage of the thermoplastic stock is indicated at 26 corresponding to the stage 26, and similarly at stage 27, of Figs. 3 and 4 and by the employment of complementary sets of heated pressure twin dies, similar to the above described dies 28, 28, the outer and inner stock are simultaneously treated to produce the desired double hermetically sealed closures thereat. The resulting treated stock is then cut in half on a line corresponding to the dot-and-dash line 29—29 of Figs. 3 and 4, and also cut mid-way on a line corresponding to the line 30—30 of the double hermetically sealed closures to produce double containers each having a double open end and a double hermetically sealed end, generally corresponding to the structure of Fig. 1.

The open end of the inner ampoule or container serves as the filling opening for charging therethrough the contents of the inner ampoule or container; in some instances it may be desired to charge the outer ampoule or container, which may be effected through its annular opening.

Fig. 6 illustrates a single ampoule or container 35 having one end 36 of conventional semi-spherical formation. Its opposite end 37 is her-

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metically sealed in this instance by a series of substantially parallel longitudinally extending flattened areas by crimping, indicated at 38, under heat and pressure treatment, which may be carried out as indicated in Figs. 2, 3 and 4. Assuming the stock to be of substantially circular tubular formation, such heat and pressure treatment results in configurating the portion immediately approaching its sealed end of oppositely positioned substantially flat areas extending longitudinally and converging outwardly toward the hermetically sealed closure and oppositely positioned configurations which are of general arcuate formations.

The ampoule or container shown in Figs. 7 and 8 is also of the single type, and has one end, i. e. its end 37, similar to that of Fig. 6, whereby it is hermetically sealed by heat and pressure crimping 38. The ampoule or container shown in Figs. 7 and 8 is also provided at its end 37 with oppositely related face-to-face engaging, but not fused, areas 22c, 22c, corresponding to the areas 22c, 22c, of the structure of Fig. 1, serving mutually as a self-closing closure, similarly as in my above referred Patent #2,188,191.

Such crimping 38, see Figs. 6, 7 and 8, functions to weaken the material of the container at the indicated line 39—39, to effect severing thereat to open the original hermetical seal afforded by the crimping 38.

The ampoule or container shown in Figs. 7 and 8 is illustrated as closed at its opposite end by crimping 38a, which may be of the severing type 38 of simple crimping, employed in the structure of Fig. 6, to afford dispensing of contents at either end.

Figs. 9 and 10 illustrate another procedure employing inner and outer stock for the production of containers of the double type from indefinite lengths of such stock. Pursuant to this procedure, the inner stock 40 is treated prior to its insertion within the outer stock 41 to provide partially flattened zones indicated at 42 which serve as means for guiding and substantially uniformly positioning the inner stock 40 within the outer stock 41. Desirably, such partially flattened zones 42 are spaced along the indefinite length of the inner stock 40 corresponding to the spacing of double lengths of the desired ampoule or containers, similarly as in the procedure of Figs. 3 and 4.

Fig. 11 illustrates, similar to Fig. 4, the heat and pressure simultaneous treatment of the inner and outer stock of Figs. 9 and 10, to provide at the predetermined locations of treatment hermetically sealed closures thereat, and as stated advantageously coincident with the locations of the partially flattened zones 42 of the inner stock. In the instance of the hermetic seal indicated in Fig. 11, the same is shown of the type 22, Figs. 1 and 5.

Fig. 12 illustrates the procedure of producing double ampoules or containers, generally similar to that of Fig. 11, and desirably employing the inner and outer stock shown in Figs. 9 and 10; Fig. 12 shows in particular the formation of double crimpings 38, 38, corresponding to the individual crimping 38, 38, of the single type ampoule or container shown in Figs. 6, 7 and 8.

The stock after the treatment indicated in Figs. 11 and 12, is cut at the respective lines of severing, 29—29 and 30—30, to produce individual double ampoules or containers, each having an open and charging end and an opposite hermetically crimped sealed end.

Fig. 13 shows a double ampoule or container hermetically sealed at one end pursuant to the type 22, hereinabove described with respect to Fig. 1, and at its opposite end sealed of the crimped type 38, having self-closing flattened face-to-face engaging, non-fused areas 22c, 22c, hereinabove described with respect to Figs. 7 and 8 thus affording a dispensing opening at either end.

In like manner, each ampoule or container may be formed of two or more inner container elements, and provided with single or two hermetically sealed dispensing openings.

Fig. 15 illustrates a series of thermoplastic ampoules or containers 45, 45, 45, etc., which may be treated at the locations 46, 46, etc., under pressure and heat, say, as indicated in Figs. 2, 3 and 4 for a single type or as indicated in Fig. 5 or in Figs. 9, 10 and 11 or 12 for a double or other multiple type. The individual ampoules or containers 45, 45, 45, etc., may be charged with the desired contents as may be preferred; one effective manner of charging may be by the means of a hyperdermic needle employed to pierce a wall of an ampoule or container and to inject a measured quantity of the charged material and upon withdrawal of such injecting instrument the pierced opening may be sealed as by the use of acetone or the like for thermoplastics of the nature of cellulose acetate or the like, or with collodion solution, etc., advantageously of the character of withstanding sterilizing or other aseptic treatment, and also of a nature not to contaminate the contained material or otherwise defeat the medicinal or other beneficial purposes of the contained material. Any other suitable method of charging such series of ampoules may be employed. Any individual ampoule or container may be detached from its companion by merely breaking or otherwise severing its sealed closed end and dispensing its contents in whole or in part by compressing its sides.

If desired, the heat and pressure treatment of the tubular stock may be carried out by continuous longitudinal movement of the stock, the heat and pressure dies, such as the sets of dies 28, 28, see Figs. 3 and 14, being given a reciprocal transverse movement coincidental with that of the tubular stock at the stage of engagement therewith by the dies, or the dies may be of the rotary type and rotated at an effective peripheral speed equal to longitudinal rate of travel of the treated stock.

The dies are desirably heated electrically and controlled thermostatically. Advantageously, the die faces of the higher, i. e., fusing temperature are heated by its source of heat independently of the heating of the die faces of lower temperature.

For use in first aid, say, for containing sulfanilamide or sulfathiazol or sulfadiazine or the like, in an inner ampoule or container of a double or other multiple type of ampoule or container formed, say, of cellulose acetate as the container stock, it is desirable and in many instances necessary to subject the packaged medication to sterilizing temperature of the range, say, from 105° C. and upwards, as for example to kill spores or otherwise render the contents and the interior of the container sterile; accordingly, the container stock is selected of such character as to maintain its hermetic seal intact, and also desirably to generally preserve its configuration.

When put to use, assuming the ampoule or con-

tainer, single or double or other multiple, to have a hermetic seal of the self-closing type 22, referred to with respect to Figs. 1, 4, 5, 7, 8, 11 and 13, the outermost fused and hermetically sealing areas are severed, either by any suitable severing tool or by mere forceful bending and breaking; this is readily accomplished by resort to the provided-for partially cut and weakened line of scoring. Such severing is performed wholly free from danger of cutting or causing abrasion of the fingers or the hand of the user, and is far superior to present practice of employing glass as the material of the ampoule or container. Present day first-aid kits are equipped with glass containers, and in some cases covered with silk or other fabric for minimizing the danger of broken glass, a desirable objective but not certain in attainment.

Medications have heretofore been packaged in glass containers, ampoules or in paper envelopes, in turn loosely enclosed in one or more outer envelopes or the like, usually Cellophane or like material. However, in such form of packaging it is necessary when dispensing the contents to separately break or tear the several envelopes individually.

As appears from the present disclosure, in the several embodiments of my various ampoules or containers, but one operation of tearing or other severing is required to break the seal and dispense the contents, by reason of the "line" of tear or other severing of the respective ampoules or containers being coincidental and the inner ampoule or container or ampoules or containers being fixedly related to the outer ampoule or container. Upon breaking of the seal, the contents are dispensed by mere pressure upon the sides of the ampoule or container, similar to the manner of dispensing from a conventional collapsible metal tube.

Single or double ampoules or containers of thermoplastic in accordance with my present invention may be enclosed in an outer envelope of Cellophane. To unseal such enclosed single or double ampoule or container, the outer Cellophane is grasped about the location of the hermetic sealed end, and subjected to bending force, to sever the thermoplastic at its provided-for line of weakening, which act of severing effects also a tear in the outer Cellophane thereby enabling the portion of the Cellophane extending beyond the dispensing opening of the ampoule or container to be readily removed while support of the ampoule or container is afforded by the remainder of the Cellophane envelope within which the ampoule is still enclosed, to thereby preserve sterility in the operation.

The volume or capacity and the size and configuration of the tubular ampoule or container, single or multiple, is selected in accordance with particular requirements.

The self-closing closure for ampoules or containers pursuant to my present invention, typified by the above described closure 22 having oppositely related and mutually engaging flat areas, indicated in Figs. 1, 4, 5, is particularly advantageous for multiple "shot" use, whereas the above described simple crimped type of closure is of advantage for one "shot" application.

In the claims I have employed the term "container" or "containers" and include by such term ampoule or ampoules as well as other forms of containers.

Whereas I have described my invention by reference to specific forms thereof, it will be under-

stood that many changes and modifications may be made provided they do not depart from the scope of the claims.

I claim:

1. An article of manufacture, a container comprising a hollow body portion having a hollow outwardly converging dispensing portion of thermoplastic material; oppositely related and mutually face-to-face normally contacting but unfused flattened areas of thermoplastic material disposed immediately adjacent the outward end of said dispensing portion; and mutually fused areas of thermoplastic material disposed outwardly of said oppositely related and mutually face-to-face normally contacting but unfused flattened areas, said mutually fused areas serving to seal the outward end of said dispensing portion prior to being opened, the area of the thermoplastic material between said mutually face-to-face normally contacting but unfused flattened areas and said mutually fused areas being weakened, whereby the container is rendered openable upon breakage of the thermoplastic material at said weakened area, the thermoplastic material being seamless throughout the article.

2. An article of manufacture as defined by claim 1 in which said weakened area is provided with scoring to facilitate breakage thereat.

3. An article of manufacture, an assembly of two hollow container bodies, each having a hollow outwardly converging dispensing portion of thermoplastic material; oppositely related and mutually face-to-face normally contacting but unfused flattened areas of thermoplastic material disposed immediately adjacent the outward end of said dispensing portion; and mutually fused areas of thermoplastic material disposed outwardly of said oppositely related and mutually face-to-face normally contacting but unfused flattened areas, said mutually fused areas serving to seal the outward end of said dispensing portion of the container prior to being opened, the area of the thermoplastic material between said mutually face-to-face normally contacting but unfused flattened areas and said mutually fused areas being weakened, whereby the container is rendered openable upon breakage of the thermoplastic material at said weakened area, said thermoplastic material being seamless throughout the article.

4. An article of manufacture as defined by claim

3 in which one hollow container body is disposed within the other hollow container body, and said mutually face-to-face normally contacting but unfused flattened areas of the respective container bodies are mutually superposed relative to one another and said mutually fused areas of the respective container bodies are mutually superposed relative to one another.

WENDEL V. ROOS.

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