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MOISTURE-PROOF CONTAINER

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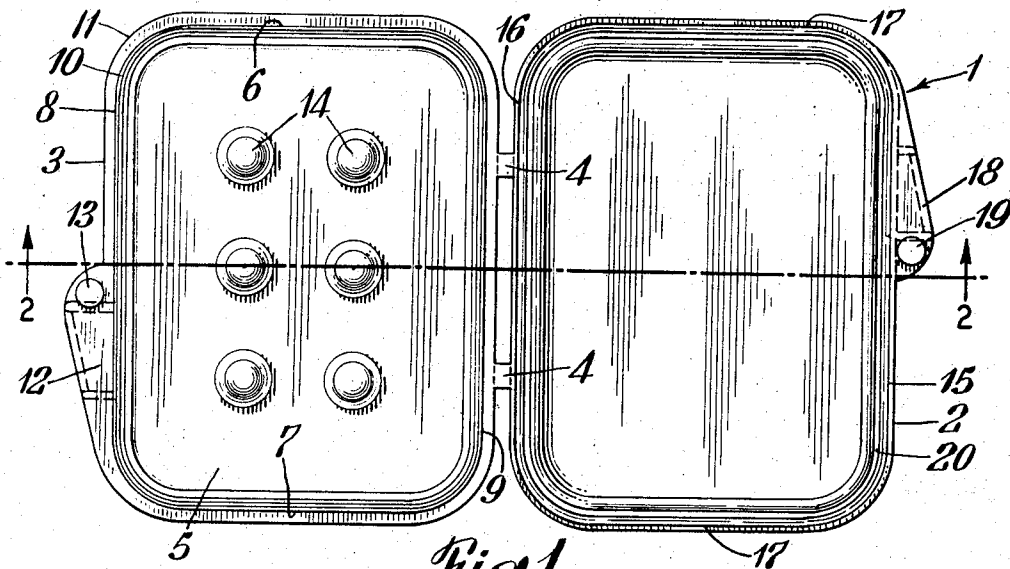


Fig. 1.

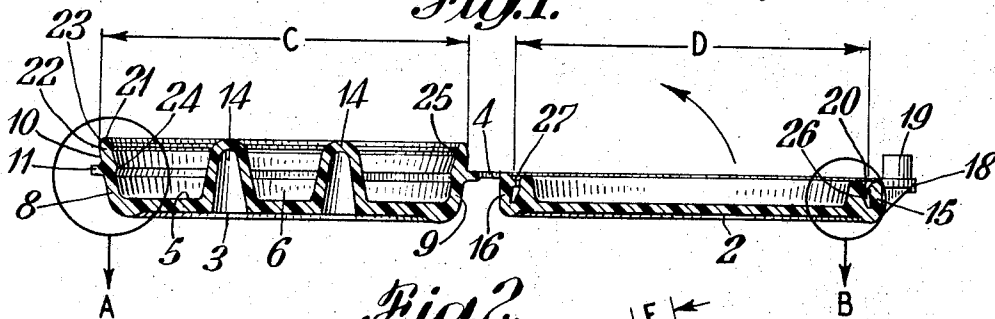


Fig. 2.

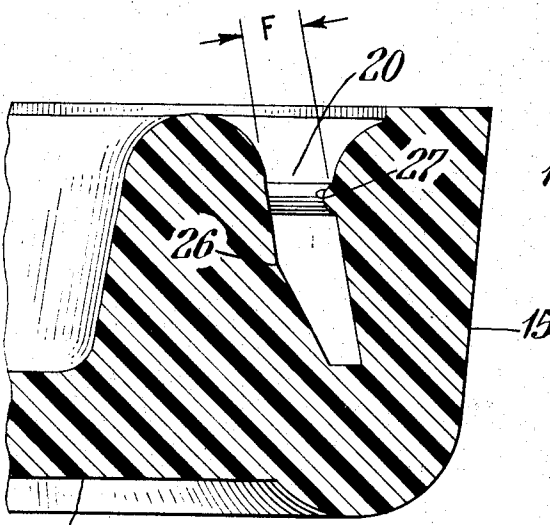


Fig. 3.

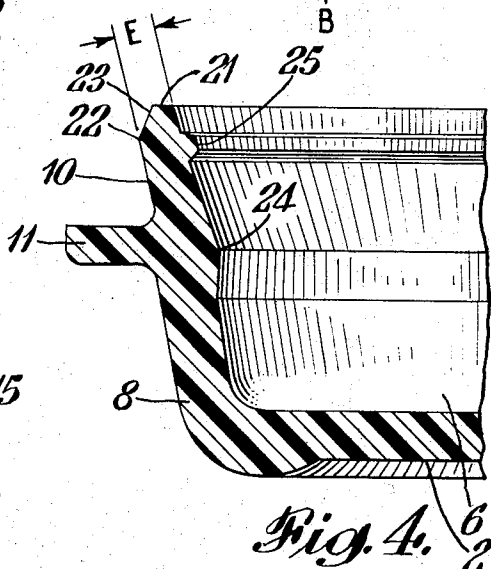


Fig. 4.

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MOISTURE-PROOF CONTAINER

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ABSTRACT OF THE DISCLOSURE

The application describes an air-tight, moisture-proof, dust-proof container consisting of bottom and top portions which are hingedly connected on one side. These portions meet in a tongue and groove seal, the outside diameter of the tongue being greater than that of the groove and the tongue also being oversized with respect to the groove.

This invention relates to containers made of resilient materials. More particularly, it relates to air-tight, moisture-proof and dust-proof containers constructed of resilient or flexible plastic materials, e.g., polyethylene, polypropylene, etc. It has special application to containers of this character which have a hinged lid or cover that may be opened and closed and which can serve as carriers or dispensers for hygroscopic materials (e.g., pharmaceutical tablets, powders, pills, etc.) or other materials which tend to be deleteriously affected by moisture and/or air, dust, etc.

Resilient or flexible plastics are rapidly becoming the material of choice in many areas of the packaging industry. Their advantages over metal and glass in certain application are well-known. However, in the application of these plastics to specific uses many problems arise which need to be solved before these plastics may be employed practically. Furthermore, the advent of plastic materials of the type with which we are presently concerned have made it possible to package articles in a fashion which was not possible with the older type packaging materials.

In dispensing certain types of pharmaceutical tablets, it is useful to be able to carry a supply of them in a small, flat container that can be conveniently carried in a man's pocket or a lady's handbag. This container should also have a lid or cover that may be easily lifted so that access may be had to the contents of the container and then readily closed.

The dispensing of certain types of pharmaceutical tablets in small flat containers that are designed to be frequently opened and closed present a special problem. These tablets are of the variety that are hygroscopic in nature or otherwise tend to be deleteriously affected by moisture, air, dust, etc. Of special interest in this regard are tablets that contain aspirin as a major constituent.

It is an object of the present invention to provide containers made of resilient or flexible materials, which are suitable for carrying and dispensing materials that are deleteriously affected by the atmosphere.

It is a further object of the present invention to provide a small, flat container made of resilient or flexible material, suitable for being carried in a man's pocket or a woman's handbag that is moisture-proof, and/or air-proof, and/or dust-proof when closed and yet readily opened to gain access to the contents of the container.

Other and more detailed objects will be apparent from the following description and accompanying drawings in which:

FIGURE 1 is a top plan view of a container embodied in this invention in full open position;

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FIGURE 2 is a cross-sectional view of FIGURE 1 taken along line 2—2;

FIGURE 3 is an enlarged view of Section B encircle in FIGURE 2; and

FIGURE 4 is an enlarged view of Section A encircle in FIGURE 2.

Referring to the drawings wherein the same number is used to designate the same structure in the various views, the container embodied in this invention is shown generally at 1 in FIGURE 1 and consists of a top 2 and bottom 3 hingedly connected together by means of a pair of hinges 4. Top 2, bottom 3 and all the components thereof, as well as hinges 4 are preferably molded as a single piece from a resilient or flexible plastic material, e.g., polyethylene, polypropylene, etc. Hinges 4, in this form of the invention, thus, preferably take the shape of a pair of simple flexible strips of plastic material which are securely anchored along their front and rear edges to and preferably integral with top 2 and bottom 3. Because of the flexibility of hinges 4, it is possible to bend top 2 toward bottom 3 from the open to the closed position of container 1. Hinges 4, however, should be sufficiently strong as not to be broken by the bending action.

The bottom 3 of container 1 is composed of a flat floor 5, and four upwardly extending walls 6, 7, 8, and 9. Walls 6 and 7 form the side walls of bottom 3; wall 8 forms the front wall, whereas wall 9 constitutes the rear wall. The upper ends of walls 6, 7, 8, and 9 form a tongue 10, described in more detail below, which runs around the whole circumference of bottom 3.

Extending outwardly from the outer surface of the walls of bottom 3 and spaced from the top thereof, there is provided a lip 11 which also runs around the whole circumference of bottom 3. This serves as a stop for the top 2 when it is brought into the closed position. Lip 11 is provided in front with an extension 12 on which is mounted cylindrical button member 13. These together serve as gripping means for the opening of container 1. In the rear lip 11 is attached to and preferably integral with hinges 4.

Extending upwardly from floor 5 and secured thereto are a plurality of spacers 14. These are preferably molded of the same material as the remainder of this container and are integral with it and serve to keep the tablets disposed in said container in an orderly arrangement.

Top 2 is designed to mate with and serve as a hinged lid or cover for bottom 3. It is accordingly also provided with front and rear walls 15 and 16 respectively, as well as side walls 17. Extending outwardly from front wall 15 of top 2 is extension 18 on which is mounted a cylindrical button member 19 similar to button member 13 of bottom 3. These together also serve as gripping means for opening container 1.

Cut in the upper surface of all the walls of top 2 and forming a channel that runs continuously around top 2 is groove 20. This mates with tongue 10 in a manner described in more detail below.

Important aspects of the present invention are the sealing features that make possible a moisture-proof, air-tight and dust-proof container. To accomplish this, a plurality of different types of cooperating sealing effects are employed simultaneously. The basic sealing structure is the tongue and groove seal. However, imposed on this are 4 additional sealing effects.

Thus, there is a sealing effect due to the distortion or bending of the tongue element 10 so that when seated in the groove 20, the long axis of the tongue element is bent at an angle with regard to the normal axis of the tongue. Since the material of which the tongue is made is resilient, it tends to return to its normal position and thus exerts a sealing force up against the wall of the

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groove that causes its distortion. This is termed herein the distortion sealing effect.

In addition to the above, use is also made of sealing effects obtained by wedging the tongue 10 into the groove 20. For this purpose, as will be described in more detail below the tongue is made oversized with respect to the groove. This is termed herein the wedging sealing effect.

Added to the two sealing effects above, the present invention utilizes two so-called contact sealing effects. This effect is brought about by the provision of protuberances on the respective tongue or groove member as also described below in more detail.

The distortional sealing effect can best be understood by reference to FIGURE 2 of the drawings and a consideration of the relative dimensions of the respective parts. The important distances are the maximum outside diameter C of bottom 3 which occurs near the top of tongue 10 and the distance D measured from the outside wall of groove 20 on one side of top 2 to the outside wall of groove 20 on the opposite side of the top. In accordance with the present invention distance C is made slightly larger than distance D.

When top 2 is brought to the closing position by rotating it in the direction of the arrow in FIGURE 2 around the axis of hinges 4, the groove 20 engages tongue 10. By applying a little pressure on top 2, tongue 10 is bent inwardly toward the center of the container because of its resiliency and to accommodate itself to the smaller distance D of the groove 20 in which it becomes seated. The pressure of the bent resilient tongue 10 up against the outside wall of groove 20 forms a seal between the atmosphere and the contents of container 1.

The wedging sealing effect and the contact sealing effect can best be understood by reference to FIGS. 3 and 4 of the drawings which show the details of the construction of tongue 10 and groove 20.

As will be seen in FIG. 4, tongue 10 is an extension of the walls of the bottom 3 of the container which flare outwardly from the bottom up. It can be demarked as extending from tip 21 to the level of the upper surface of lip 11. The outside surface of tongue 10 flares outwardly until it reaches a maximum at 22 at which point it changes direction and runs inwardly to form bevel 23. This beveling of the tip of tongue 10 facilitates its entry into groove 20.

The inner surface of tongue 10 is marked by the sharp angle that it makes at 24 with the inner surface of the walls of bottom 3. It is also provided with a protuberance 25 which is instrumental in forming part of the contact seal described in more detail below.

Groove 20 in general is shaped to accommodate tongue 10. Its inner surface is formed in two planes which form an angle at 26. Its outer surface tapers inwardly and is also provided with a protuberance 27 that is involved in the contact seal described in more detail below.

To provide the wedging sealing effect tongue 10, although generally of the same shape as groove 20, is oversized with respect thereto. Thus, dimension E is made larger than dimension F. Thus, when tongue 10 is inserted in groove 20, because of its greater dimensions, and because of the resiliency of the materials, groove 20 is stretched and put under tension. The pressure on the respective tongue and groove surfaces by which they tend to return to their normal condition forms the so-called wedging seal.

The contact sealing effect is twofold. On the insertion of tongue 10 into groove 20 protuberance 27 is caused to bear on the outside surface of tongue 10. At the same time protuberance 24 of tongue 10 is caused to bear on the inside wall of groove 20. In this fashion a double contact seal is obtained.

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Container 1 of the present invention may be made of any of a variety of resilient or flexible materials and particularly moisture-impermeable plastic or polymeric materials. Typical of the materials that can be employed are low density (.91-.925), medium density (.926-.940) and high density (.94-.965), polyethylene; polypropylene; polyallomer (mixtures of polyethylene and polypropylene), etc. The material of choice, however, is the medium density polyethylene.

The purposes of the present invention are obtained largely through the cooperation of the above-described sealing effects. The ability of those to provide a container with the ability to keep out the atmosphere has been demonstrated experimentally. Thus, tablets containing a large percentage of aspirin were stored for 8 weeks in the container described above at 100° F. and 80% relative humidity. This can be extrapolated to 1½ to 2 years of ordinary field storage life. The tablets after 8 weeks were acceptable in all respects.

The package described above, containing tablets having a large percentage of aspirin, was also subjected to underwater vacuum tests to test the tightness of the seal. To this end said package was immersed in a quantity of water disposed in a vacuum desiccator. A vacuum of 15" of mercury was pulled on said desiccator for 1 minute. The vacuum was then broken and the package was removed from the water, opened and examined. No leakage of any practical consequence was noted.

Although the invention has been described with reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of this invention.

What is claimed is:

1. A container comprising top and bottom members hingedly secured to each other on one side and engaging each other in the closed position in a tongue and groove seal, said tongue and groove being made of resilient material and extending substantially around the circumference of said top and bottom members, the maximum outside diameter of said tongue as measured from one side of the container to a point diametrically opposite it being greater than the maximum corresponding outside diameter of said groove whereby on seating said tongue into said groove the tongue is bent inwardly toward the center of said container; said tongue also being oversized with respect to said groove whereby on seating said tongue in said groove, said groove is stretched to accommodate said tongue.

2. A container according to claim 1 wherein both said tongue and groove are provided with a protuberance, the protuberance of said tongue bearing on a surface of said groove and the protuberance of said groove bearing on a surface of said tongue, whereby additional contact sealing points are provided.

3. A container according to claim 2 wherein said whole container is made of resilient polymeric material.

4. A container according to claim 3 wherein all the elements are molded as a single integral piece of said resilient polymeric material.

5. A container according to claim 4 wherein each of said bottom and top members are composed of a flat base from which extend the walls of said top or bottom, the height of said walls being small with regard to the diameter of said flat base, whereby the container has the form of a flat pack which readily fits into a man's pocket or a lady's handbag.

6. A container according to claim 5 including a plurality of tablet spacer means distributed on one of said flat bases, whereby tablets may be arranged in an orderly fashion in said container.

7. A container according to claim 6 including gripping means extending outwardly from said top and bottom members, said gripping means being adopted to be grasped

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between the fingers so as to facilitate the opening of said container.

8. A container according to claim 7 wherein said container is molded from polypropylene or polyethylene.

9. A container according to claim 8 having incorporated therein a plurality of tablets which tend to be deleteriously affected by the atmosphere.

10. A container according to claim 9 wherein the tablets contain aspirin as a major constituent.

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