This invention relates to packaging tablets and the like in rigid or semi-rigid receptacles, such as bottles, jars or boxes made of glass, plastic, metal or paperboard, so as to immobilize the tablets therein to prevent excessive shifting or rattling thereof and the consequent abrasion or fragmentation of the contents. Although particularly intended for packaging tablets, i.e., small concreted objects of any kind or shape, which are more or less friable or fragile, the invention may be applied to the packaging of other small objects, especially capsules and medicinal pills.

It is known to immobilize tablets in bottles by inserting a resilient packing, such as cotton wadding or a sponge, between the tablets and the lid when such bottles are first filled at a factory or dispensary; it is further known to attach such packing to the lid for facile removal from the bottle. Such known packings are intended only to fill the relatively small empty space which exists after the bottle was initially filled for the purpose of avoiding damage to the contents during shipment and was neither intended nor adapted for immobilizing the tablets which remained within the bottle after significant depletion thereof, inasmuch as the packing was not sufficiently compressible. Thus, if sufficient packing were used to occupy the whole or the greater part of the space within the bottle for immobilizing a small fraction of the tablets after significant depletion, it could not be compressed into the relatively small vacant space initially present at the top of the bottle without the application of a crushing pressure on the tablets; such pressure would, moreover, make it difficult to apply the lid. It was, moreover, inconvenient to insert such packing into the bottle because the packing had an irregular shape and because it was stringed and long. Also, spillage was apt to occur upon withdrawal of such packing from the bottle, particularly when tablets were small in relation to the cross section of the bottle, because the tablets adhered readily to the fuzzy or irregular sides of the filler and because such tablets often became lodged at the side of the packing.

On the other hand, it is also known to employ springs, such as coiled metallic springs, that exert a resilient, expansive force between the lid and a plunger or flat plate which engages the tablets at various levels in accordance with the degree of fullness of the bottle. Drawbacks of such devices are their high cost in relation to the cost of the bottle and lid, and the fact that such springs are resilient, whereby the force exerted against the tablets—and the lid—is proportionate to the contents, resulting in a many-fold variation in the force. This, again, often leads to excessive pressure when the bottle is full if the spring is of sufficient stiffness to exert an effective immobilizing force when the contents are materially reduced. Further, such devices are awkward to insert into the bottle, being apt to become bent out of shape as well to jump away when inexpertly handled.

It is, therefore, an object of the invention to provide an improved packing for tablets and the like which is economical, which will effectively immobilize the tablets without excessive pressure thereon both when the receptacle is substantially full and when it is materially depleted of tablets, and which can be conveniently inserted into and withdrawn from the receptacle even when it has a narrow mouth. A further object is to provide a package for tablets and the like containing an immobilizing filler which is effective both when the receptacle contains large tablets and when it contains tablets which are so small that each covers only a minor fraction of the cross sectional area of the receptacle, whereby the tablets collectively present an irregular upper surface; and to obviate the annoyance of spilling tablets due to adherence to the immobilizing filler, especially at the sides thereof, when the filler is withdrawn.

In summary, according to the invention the tablets or other small objects are packaged in a rigid or semi-rigid container of any desired configuration and construction material and are immobilized therein by a filler consisting of one or of several pieces of a material which is highly compressible by a force which, up to a characteristic "bottoming" point, does not increase proportionally with the extent of compression but which, nevertheless, has good restitution characteristics as described hereinafter, particularly polyurethane foam. It is preferred to use a filler having a length, when unstressed, at least as great as the major part of the depth of the container, advantageously equal to the full depth to immobilize even the last tablet.

The invention is particularly advantageous when the receptacle has an appreciable depth, e.g., greater than one inch, wherein the special compressibility characteristics are specially utilized. The invention is herein described as applied to a vial, i.e., a relatively deep, tubular container of narrow cross section, but is, of course, not so limited. The filler is preferably formed with regular sides, e.g., of constant cross section equal to the size of the mouth or neck of the container when it is a bottle or vial; in the latter case the filler may have a size to fill substantially the total volume within the otherwise empty vial when placed therein beneath the lid.

The invention will be described further by reference to the accompanying drawing forming part of this specification and showing two embodiments by way of example, wherein:

FIGURE 1 is an elevation view of a transparent vial containing large tablets and a filler according to the invention;
FIGURE 2 is a transverse section, taken on the line 2--2 of FIGURE 1;
FIGURE 3 is a longitudinal section of the filler and lid;
FIGURE 4 is an elevation showing the vial and filler applied to packaging small tablets; and
FIGURE 5 is a longitudinal section through a partly opened package showing a modified construction.

Referring to FIGURES 1--5, the package includes a glass or plastic vial 10 which is closed by a cap or lid 11 secured in any manner, for example, provided with a peripheral skirt 12 having frictional engagement with the outside of the vial. Attached to the underside of the lid, e.g., by an adhesive, is a filler plug 13 having a cross sectional shape that corresponds to that of the vial and is almost as large and a length, when unstressed, substantially equal to the inside vertical dimension of the vial. Because of such a length the plug will engage the lowermost tablet 14 at the bottom when only that tablet is contained within the vial.

The filler plug 13 is made of high compressible material, preferably polyurethane foam, or a material having similar compressibility and restitution characteristics. Such a material has a compressibility curve which exhibits a characteristic "bottoming effect." In other words, it can be compressed into a small fraction of its normal volume by the application of a force which, instead of increasing proportionally with compression as in the case of elastic
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3. compression, rises only very little until a certain limit is reached, after which a sharply increased force is required to effect further compression. Yet this material has good restitution characteristics and expands readily to its normal shape and volume, although the expansion is gradual or delayed and not as rapid as in the case of elastic restitution. It therefore differs from foam rubber and related materials. A material of such desired compressibility and restitution characteristics is herein, for brevity, designated as one which is highly compatible with a compressibility curve exhibiting a bottoming effect and which has a gradual restitution.

Because of such characteristics the filler plug 13 is able to exert an effective immobilizing force on the lowermost tablet 14 when it alone is beneath the plug without exerting an excessive force against the lid and tablets when the vial is filled substantially to the top. In FIGURE 1 the vial is shown about one-third full, with the plug 13 partly compressed and bearing against the uppermost tablet 15.

The plug, being formed of a single piece of cohesive material and having a regular external shape or outline, is easily inserted into the vial by hand, without the inconvenience of compacting it laterally to force it into the opening or mouth of the receptacle, which is slightly wider than the plug. Also, the plug can be easily retracted from the vial by simply removing the lid, to which it is attached; however, since the plug exerts only a low expansive force it will not tend to pop the lid open. Further, the particular compressibility characteristics of the plug make it unlikely that the plug will escape from the user's grasp by resilient expansion. It should be noted, however, that the invention is not restricted to the use of plugs of one piece or that are secured to the lid.

In the preferred construction the plug, or at least the bottom portion, extends over substantially the full area of the vial, thereby applying an even pressure on the uppermost tablet present. Further, by shaping the plug substantially to the contour of the vial throughout the length thereof the plug is better able to apply the immobilizing force, being supported laterally so as to overcome the tendency toward buckling which would be encountered with a narrow column.

The configuration of the plug considered above is of especial utility when the vial contains small tablets 16, as shown in FIGURE 4. It is evident that such a mass of tablets presents a highly irregular upper surface, to which the compatible plug conforms readily to apply an immobilizing force against each without crushing the highest tablets. Also, because of the extended area of the bottom of the plug all of the tablets exposed at the top of the mass are engaged, thereby preventing any from becoming wedged at the sides thereof; this avoids the danger of accidental spillage when the plug is withdrawn because tablets are not dragged up with the plug.

FIGURE 5 shows a modified construction wherein the vial 10 is provided with a cap 17 which has a peripheral skirt 18 shaped to enter the vial for internal frictional engagement therewith. In this embodiment the plug 13 may be secured by mere frictional engagement with the interior, cylindrical face of the skirt. It operates in the manner previously described to immobilize a variable number of tablets 19, thereby preventing any rattling or excessive movements thereof when the vial is being carried or handled.

It was found in practice that the force exerted by the plug according to the invention is sufficiently small to permit the lid, or cap to be secured by friction without the plug being of substantially equal to the full internal depth of the container.

2. The combination according to claim 1 wherein said filler plug is situated above said objects.

3. The combination according to claim 1 wherein said material is polyurethane foam.

4. The combination according to claim 1 wherein said container is a vial and said plug has a cross sectional shape corresponding to and occupying substantially the entire cross section of the vial.

5. A package comprising an elongate vial having an open end, a closure removably secured to said end of the vial, a plurality of objects such as tablets within the vial, and a filling plug situated within the vial and compressed longitudinally between the said objects and said closure, said plug having, when extended, a length equal to substantially the full length of the vial and a cross section which corresponds to the shape of the vial and occupies the major part of the width of the vial, said plug being made of highly compatible material such as polyurethane foam having a compressibility curve exhibiting a bottoming effect and a gradual restitution.

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