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PROTECTIVE SHOCK RESISTANT PACKAGE FOR FRAGILE OBJECTS

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FIG. 1

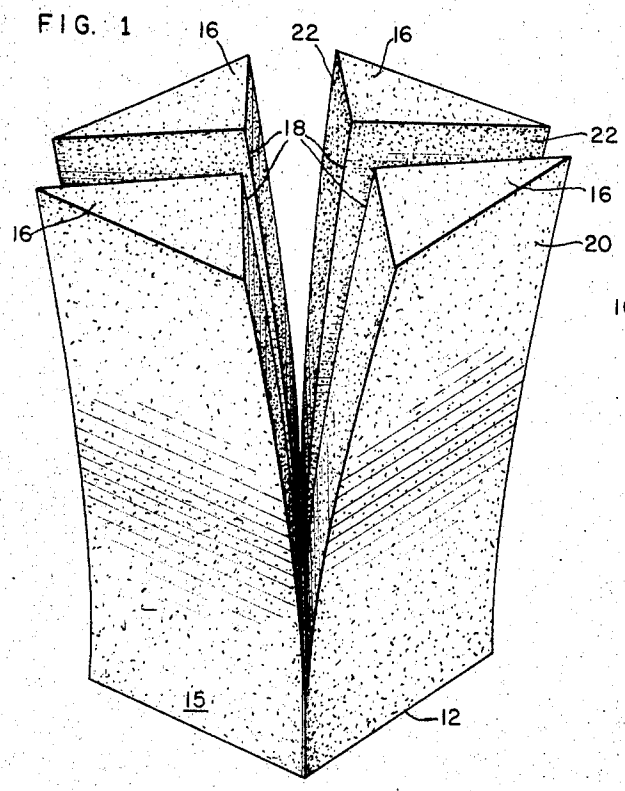


FIG. 3

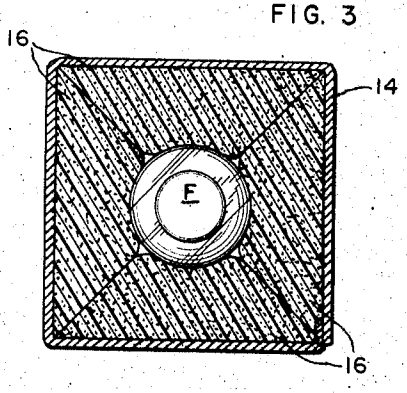


FIG. 4

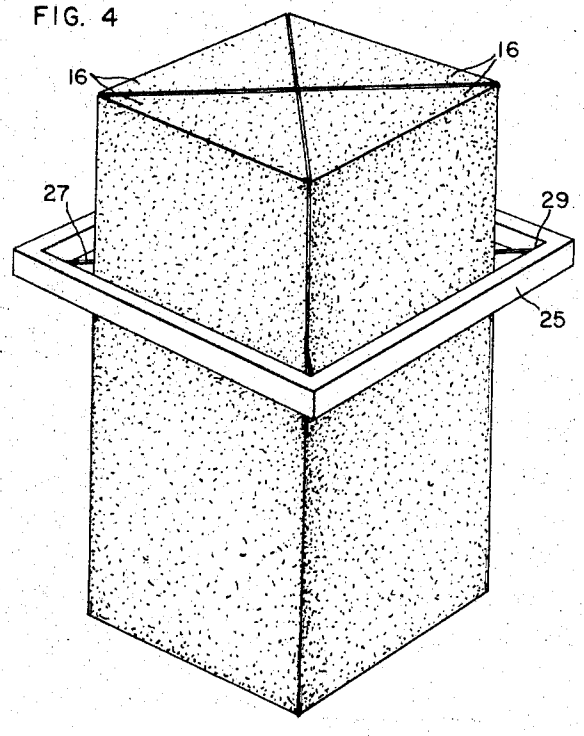
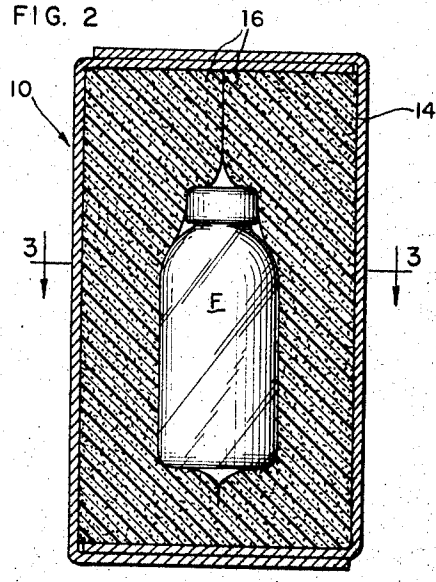


FIG. 2



INVENTORS
DALE W. SOBEK
DAVID B. GIACOMELLI
BY Warren, Rubin
Brucker & Chickering
ATTORNEYS

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PROTECTIVE SHOCK RESISTANT PACKAGE FOR FRAGILE OBJECTS

Dale W. Sobek and David B. Giacomelli, Oakland, Calif., assignors to Polymir Industries, Inc., a corporation of California

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ABSTRACT OF THE DISCLOSURE

The following detailed disclosure relates to a protective shock resistant package for fragile objects in which an essentially homogeneous body of relatively soft resiliently compressible material is adapted to envelope the object to be packaged. The body, with the enclosed object, is urged into a relatively stiff container such as a cardboard box or can, the volume of which is no greater than the unstressed form of the body so that a compressive load is placed on the body, the magnitude of which is sufficient to hold the object therewithin resiliently, yet firmly in place.

Objects of the type for which the package of the present invention have particular, although not exclusive utility, include delicate medical and scientific instruments, small vials and fragile glass containers of perfumes, medicines, and volatile, corrosive and explosive liquids, and any other object which is susceptible to damage by shock or by vibration.

Objects of this type are presently packaged in various materials such as excelsior, cotton batting, popcorn, natural and synthetic rubbers, and more recently, in expanded polystyrene, either in bead form or molded. Cellular materials including polyurethane and polyvinylchlorides have also been used, but typically in the form of a series of strips or other parts which must be wrapped about the object, or otherwise assembled, in a series of operations, to form the package.

It is an object of the present invention to provide an improved shock and vibration resistant package for fragile and delicate objects which comprises a body of relatively soft resiliently compressible material adapted to envelope the object and secure the same against externally applied shock and vibration.

It is another object of the invention to provide an improved package for fragile objects which positively grips and holds the object in place within the package, thereby preventing slippage or movement which might alter the balanced compressive load placed on the object.

Still another object of the invention is to provide a package for fragile objects which is so constructed that the object to be packaged is readily enveloped, gently but firmly held in place during transit, and quickly removed, thereby simplifying the handling of the object by both shipper and receiver.

Another, and still further object of the invention, is to provide an improved method for the manufacture of a package of this type herein described making the package economical to use.

These and other objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof, taken in conjunction with the drawings, wherein:

FIGURE 1 is a perspective of an exemplary body member constructed in accordance with the invention, and adapted to receive and envelope a fragile object therein;

FIGURE 2 is a section through a completed package illustrating the relative positions of the object to be packaged, the body which is enveloping the same and the container in which the body is placed;

FIGURE 3 is a section of the completed package taken along line 3—3 of FIGURE 2; and

FIGURE 4 is a perspective illustrating a method of forming the body construction of FIGURE 1.

While the invention is susceptible to various modifications and alternative constructions, a certain illustrative embodiment is set out in the drawing and will be described in detail hereinafter. It will be understood that the invention is not intended to be limited to the particular disclosed form, but rather to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

With reference now to the drawings, a protective shock-resistant package, constructed in accordance with the invention, is indicated generally at **10**. The package, which is adapted to envelope and protect a fragile object F, comprises a body member **12** constructed of a relatively soft resilient compressible material, and a container **14** for receiving the body member and object enveloped therein.

With particular reference now to FIGURE 1, wherein an exemplary body member is detailed, it will be seen that the member is divided along intersecting planes into contiguous segments **16**. In order to enhance the ease with which the body member may be handled, and at the same time for the purposes of maintaining proper orientation between the various segments, and the object to be enveloped within the body, the segments are joined at at least one of their ends. This is readily accomplished, as may be observed in FIGURE 1, by dividing the body into segments over the greater portion thereof, but not all the way through. Accordingly, a portion **15** of the body member remains uncut, and the segments comprise integral extensions of the uncut portion. Such a construction, as may be seen in FIGURE 1, permits the segments to be articulated toward and away from one another by simply spreading them apart at their free ends. Because, however, they are held by an uncut portion of the body member, their orientation with respect to one another remains essentially the same.

By spreading the segments, essentially as shown in FIGURE 1, an opening in the body member is provided for receipt of the fragile object F to be packaged. The object, which may assume any shape, is inserted substantially along the line defined by the intersection of the planes along which the segments were cut.

It will be appreciated that approximate longitudinal centering of the object within the body **12** is easily accomplished since the segments themselves extend upwardly from an uncut portion **15** thereof. Accordingly, while the resiliency of the body material will permit it to deform to a certain extent as the object is pressed between the segments, resistance to the deformation will increase as the object approaches the uncut portion of the body and limit the depth to which the object may be inserted. This arrangement minimizes the prospect of the object being insufficiently protected at any point by being too close to the wall of the container and thus not having enough of the body material between the container wall and the object.

In defining the segments by intersecting planes, each segment is provided with an edge **18** which lies along the line of intersection of the planes. The edge **18** will, when an object is placed within the body, be the initial portion of the segments to contact the surface of the object. Moreover, the dimension from this leading edge **18** radially outwardly to the peripheral surface **20** of the segment will, at least in the case of body portions which are geometric in form, be the thickest portion of the

segment. Accordingly, when the body, with enveloped object therein, is urged into the container **14**, an initially higher compressive force will be applied to the object along the edges **18** of the segments. This is so because a greater volume of material must be compressed between the edge and peripheral surface of the segment than at other points along the segment itself. In this manner an initial line or edge loading of the object is achieved which assists in maintaining the proper orientation of the object within the body.

As may be seen in FIGURES 2 and 3, with the body member centrally enclosed within the container, the characteristic deformation of the body material results in substantial area contact with the object resulting in optimum overall protection. When the body member **12** is of a standard geometric cross section, such as the square cross section illustrated, placement of the same in a container **14** results in substantially balanced compressive forces being applied about the object in planes transverse to the longitudinal axis thereof. Moreover, the object is protected by a suitable thickness of body material on all sides and is thus protected from shock and vibration transmitted in any direction to the container. Objects having high density, or bottles with liquids or a number of heavy objects may respond to high amplitude forces by moving within the package from the desired predetermined position. The use of a cellular material in fabricating the body member minimizes these undesirable inertial effects.

The body **12** is readily molded or fabricated from polyurethane, polyethylene or polyvinylchloride foams, neoprenes, and still other such foam rubber of either natural or synthetic origin. When the segments are formed, such as by cutting with a hot wire, or the use of a saw or other cutting instrument, the cellular structure of the material is interrupted along the surfaces **22** of the segments. This results in substantial numbers of cells on the surfaces being opened outwardly on the surfaces. These open surfaces define pockets which act as minute suction cups when they are pressed against the surface of the encapsulated object and the body member is compressed. Accordingly, an increased resistance to movement within the body member is achieved and the object may be placed within the body in a predetermined position for maximum protection with assurance that it will remain substantially in the same position until removed from the body member upon unpackaging.

From the foregoing, it will be appreciated that the body member may be of any configuration, although the more common geometric shapes provide an economic and completely satisfactory form. It will be further appreciated that, while two intersecting planes defining four segments have been illustrated, that any appropriate number of intersecting planes may be employed without departure from the invention. Furthermore, while the cut portion of the body member extends longitudinally through the body to a position near one end thereof, it will be understood that both ends of the segments may be secured with an opening defined by intersecting planes occurring in the center thereof. Likewise, the body member may be cut inwardly from either end, leaving the center portion uncut, thereby providing enveloping segments at either end of the body member.

Still another refinement occurs in the use of a body having on form, such as the one shown in FIGURE 1, and placing the same in a circular container. In so doing, the compressive forces in transverse planes will vary in proportion to the thickness of the material between the container wall and the enveloped object. In this way selective preloading may be achieved.

With reference to FIGURE 4, a method of fabricating the body member is illustrated. A frame **25** is shown as having, in the illustrated case, wires **27** secured between diagonal corners **29** thereof. The wires lie in intersecting planes, and when heated, are moved downwardly through the block which comprises the body member, cutting the same to form the segments as illustrated in FIGURE 1. The frame **25** may be manually or automatically moved, and the wires may be electrically resistive, and caused to be heated to the proper temperature for cutting the material involved by passing a predetermined electric current therethrough. The frame **25** preferably takes the shape of the cross section of the body member to be fabricated to confine the same somewhat and insure an evenness of cut, and accordingly, may assume any number of geometric shapes in accordance with the use contemplated.

We claim:

1. A protective shock resistant package for fragile objects comprising, a body of relatively soft resiliently compressible material composed of a plurality of contiguous segments having a normally closed-together on-stress form, said segments being joined for articulation to and from each other to envelope therebetween a fragile object to be packaged, and a container for said body supporting the exterior thereof to a volume of said body substantially no greater than said on-stressed form.

2. A package as set forth in claim **1** wherein said segments are defined by intersecting planes, and edge portions of said segments at the line of intersection of said planes positioned for engagement and compression against said object.

3. A package as set forth in claim **2** wherein said planes intersect along an axis and said segments are joined in a portion of said body disposed substantially perpendicular to said axis.

4. A package as set forth in claim **3** wherein said body is of a rectangular form with said planes extending diagonally thereof and intersecting along the longitudinal axis of said body.

5. A package as set forth in claim **2** wherein said material is of open cellular form along the surfaces defined by said planes.

6. A package as set forth in claim **5** wherein said material is polyurethane foam.

7. The method of packaging a fragile object comprising steps of:

(a) providing a body of relatively soft resiliently compressible material,

(b) dividing said body along intersecting planes to define a plurality of contiguous segments joined for articulation to and from each other,

(c) nesting a fragile object between said segments, and

(d) inserting said body in a container supporting the exterior thereof to a volume substantially no greater than said on-stressed form.

8. The method as set forth in claim **7** wherein only a portion of said body is divided, whereby another portion thereof remains undivided, and each of said segments are joined with said undivided portion for articulation toward and away from the other segments.

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JAMES B. MARBERT, *Primary Examiner.*