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(54) **Container with a non-planar seal between base and lid**

(57) A non-planar seal between a container (10) having a base (12) and lid (14). The base (12) has a rim (22) which includes a first seal component (28). The lid has a rim (26) which includes a second seal component (30). The first and second seal components (28,30) interact to provide a seal, for example a water-tight seal, when the lid (14) is mounted to the container (10) to thus protect the contents of the container (10). The seal is formed along a locus of points defining a non-linear plane, or curved surface. The first and second seal components (28,30) are oriented so as to extend substantially normal to the non-linear plane at any given point along the seal. This arrangement permits greater design possibilities due to fewer restraints on seal component placement, while still providing excellent sealing properties for the container (10).

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates in general to sealed containers for storage. In particular, the present invention relates to an improved arrangement for sealing a container about a locus of points defining a non-planar surface.

[0002] Sealed containers in general are well known, especially for household use and for storing of food. Such containers are exemplified by Tupperware® brand containers having a base defining a volume for receiving a quantity of material, typically food, and a lid secured to the base to close same. The fit between the base and lid is typically designed to provide a liquid-tight seal, and possibly a gas-tight seal. This seal is achieved in a number of different ways well known in the art.

[0003] These containers have taken a variety of shapes, with outer peripheries ranging from relatively square to round, with bases ranging from relatively flat platforms to deep concavities, and with lids ranging from deep inverted concavities to relatively flat covers. Despite this variety in shape, however, the actual points of contact between the base and lid, i.e., the actual seal, has typically been along a locus of points which defines a plane. In other words, regardless of the shape of the assembled base and lid, the base and lid joined along a linear plane passing through this assembly. This linear plane permitted the lid to be placed on the base by moving in a direction normal to such plane.

[0004] This has limited design potential for the containers. It has been known to place this plane at an angle, and at various vertical positions. It has also been known to provide a gentle curvature to the plane about one axis. Each of these variations has expanded design possibilities, but has had limits. In particular, even with the gently curved seal the components forming the seal were oriented vertically. In other words, the lid was still placed on the base (i.e., the sealing direction) by pure vertical movement (discounting the radial flexing of the plastic components). While this is acceptable for minimal curvature in the sealing plane, more pronounced curvatures resulted in poor seal fits. With the present invention, the design possibilities are expanded further. With the present design, the curvatures of the plane may be much more radical, as the sealing direction varies about the plane. This variation in sealing direction requires variation in the sealing components, generally such that they are normal to the plane of the seal.

SUMMARY OF THE INVENTION

[0005] An object of the present invention is to provide a container having a base with sealing lid.

[0006] Another object of the present invention is to provide such a base and lid in which the seal between the two is along a locus of points defining a non-linear

plane.

[0007] A further object of the present invention is to provide such a base and lid in which the sealing components are oriented substantially normal to the non-linear plane.

[0008] These and other objects are achieved by a non-planar seal between a container having a base and lid. The base has an rim which includes a first seal component. The lid has a rim which includes a second seal component. The first and second seal components interact to provide a seal, for example a water-tight seal, when the lid is mounted to the container to thus protect the contents of the container. The seal is formed along a locus of points defining a non-linear plane, or curved surface. The first and second seal components are oriented so as to be substantially normal to the non-linear plane at any given point along the seal. This arrangement permits greater design possibilities due to fewer restraints on seal component placement, while still providing excellent sealing properties for the container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The objects and features of the invention noted above are explained in more detail with reference to the drawings, in which like reference numerals denote like elements, and in which:

Fig. 1 is a perspective view of a first embodiment of a container according to the present invention;
Fig. 2 is a side view of the container of Fig. 1;
Fig. 3 is a detail cross-sectional view along line 3-3 of Fig. 1;
Fig. 4 is an exploded view of the assembly of Fig. 3;
Figs. 5 and 6 are exploded detail views similar to Fig. 4, showing alternative prior art sealing arrangements; and
Fig. 7 is a detail view along line 7-7 of Fig. 1, with components exploded.

DETAILED DESCRIPTION OF THE INVENTION

[0010] With reference to Fig. 1, a first embodiment of a container according to the present invention is generally designated by reference numeral 10. The container 10 includes a base 12 and a lid 14. The base 12 and lid 14 together define an interior 16 (Fig. 3) which will receive material for storage within the container 10. The interior 16 is formed by one or both of the base 12 and lid 14 having a concave configuration, typically the base 12, as shown in Fig. 1.

[0011] In the first embodiment, the base 12 includes a bottom wall 18 having an outer periphery, and one or more side walls 20 extending upwardly from the bottom wall 18 to form a base rim 22. The lid 14 includes a top wall 24 having an outer periphery which defines a lid rim 26. It will be apparent that these components could be inverted such that the lid 14 acts as the base, and the

base 12 acts as the lid. Alternatively or additionally, the lid 14 could have a depth which contributes appreciably to the interior 16 by addition of side walls (not shown) in a manner similar to that shown for base 12.

[0012] The base rim 22 and lid rim 26 are configured to form a mating seal when assembled together. To this end, the base rim 22 includes a first seal component 28 and the lid rim 26 includes a second seal component 30. In the first embodiment, the first seal component 28 takes the form of a vertically extending rib, and the second seal component 30 takes the form of a downward opening groove which closely receives this rib. As best shown in Fig. 4, it is known in the prior art to form this groove with a variation in width, such as by a protrusion 32. As may be envisioned, this protrusion will serve to pinch the rib when assembled. While the rib may be closely received within the groove at all points, it is at this protrusion 32 that the actual seal is formed for strong seals, such as water-tight.

[0013] To achieve a tight fit, and thus produce a good seal, it is preferred that at least one of the first seal component 28 and/or second seal component 30 at least include a material having elasticity. This elasticity may be relatively minor, and be provided by forming the second seal component 30 from sheet metal. For ease of manufacture and maintenance, it is preferred however that this elastic material be a plastic. For example, the lid 14 may be formed of a monolithic piece of plastic material such as polyethylene.

[0014] As noted above, in the prior art these seal components would lie along a linear plane (as do the portions of the seal components shown in Figs. 3 and 4). Further, in the prior art it is known to provide a better seal by providing the seal components with a slight angle with respect to vertical. This is illustrated by the angle A in Fig. 4. In terms of the present invention, it is seen that prior art seal components are placed at a slight angle with respect to the plane of the seal (i.e., a horizontal plane in Figs. 3 and 4), and are thus not normal to such plane. For the purposes of this invention, this angle is encompassed by the phrase "substantially normal" when referring to the locus of points defining the seal. As such, the portion of the seal components shown in Figs. 3 and 4 is substantially normal to the linear horizontal plane.

[0015] In the prior art the locus of points defining the seal (i.e., the contact points between the protrusion 32 and base rim 22) would typically form a linear horizontal plane. Further, the seal components (i.e., the base rim 22 and lid rim 26) extend in a parallel, vertical direction. In the one prior art container known to applicants in which the locus of points defining the seal is not a linear plane, the curvature of the plane is gentle and small, and the seal components still extend in a parallel, vertical direction.

[0016] The first seal component 28 and second seal component 30 may take various other forms known in the art. Examples of other seal components are shown

in Figs. 5 and 6. In Fig. 5, a prior art container 34 includes a base 36 and lid 38. The base 36 includes an upper rim 40, and the lid 38 includes a depending skirt 42 sized to closely surround the upper rim 40. The first seal component 28 in this embodiment is a peripheral projection 44 extending laterally outward from the upper rim 40, and the second seal component 30 is the inner face of the skirt 42. As may be envisioned, upon assembly the projection 44 will press against the inner face of the skirt 42 to form the actual seal.

[0017] In this arrangement the locus of points defining the seal again forms a linear, horizontal plane, and the seal components (i.e., the upper rim 40 and skirt 42) again extend in a parallel, vertical direction.

[0018] The arrangement of Fig. 5 may also be reversed, such that the skirt is received within the upper rim, and the skirt includes a ridge which abuts the inner face of the upper rim. This is similar to the prior art arrangement shown in Fig. 6. In this arrangement a container 46 includes a base 48 and a lid 50. The base 48 again includes an upper rim 52, which in this case includes an inward extending peripheral rim forming a downward directed shoulder 54. The lid 50 includes a lid rim 56 surrounding a depressed top wall 58. The inner face of the lid rim 56 includes a ridge 60 positioned to seat beneath the shoulder 54 when the lid 50 is assembled to the base 48. This abutment of the projection 60 against the shoulder 54 forms the seal in this arrangement.

[0019] Here again the locus of points defining the seal define a linear, horizontal plane, and the seal components (i.e., the upper rim 52 and lid rim 56) extend in a parallel, vertical direction.

[0020] Various other seal component structures are known in the prior art. In each case however, the locus of points defining the seal is believed to lie within a linear, typically horizontal, plane. Further, the seal components are believed to extend in a parallel, typically vertical, direction. To the extent, however, that these other seal components may be used according to the present invention, they are intended to be encompassed hereby.

[0021] To this point the description of the container 10 has focused on those aspects which are identical to the prior art. The present invention, however, differs from the prior art in an important respect. This difference is the formation of the seal components such that the locus of points forming the seal defines a non-linear plane, and that the seal components extend in a direction normal to such plane at any particular point along the seal.

[0022] As shown in Fig. 2, the side walls 20 have a reduced height adjacent the left end, such that the base rim 22 slopes downward toward this end. In a similar manner, the lid 14 and lid rim 26 slope downward as well. As may be envisioned, the locus of points defining the seal will thus be a non-linear plane. In this simple example, the non-linear plane includes a single line of

curvature between two linear planar portions. Other, more complex, forms are of course possible. This non-linear plane is a first aspect of the present invention. The second aspect is the orientation of the seal components, which is best illustrated in Fig. 7.

[0023] As shown, the base rim 22 and lid rim 26 (with associated protrusion 32) slope downward adjacent this end of the container. The seal components do not extend vertically, however, but instead extend substantially normal to the non-linear plane at each point along the seal. In other words, a true normal N to the non-linear plane extends perpendicular to the edge of the base rim 22. The seal components may, however, be offset from this true normal N by the small angle A to increase the operability of the seal as is known in the art. As such, the seal components extend substantially normal, as defined above. This offset may not be required in all configurations, however, and true normal orientation is of course also encompassed within "substantially normal".

[0024] As noted, this is a simple example showing only a single line of curvature between two linear planar portions. The principle of the present invention may however, be applied to more complex forms having multiple lines of curvature extending in multiple directions with multiple radii. In each case the locus of points defining the seal will define a non-linear plane, and in each case the seal components will extend in a direction substantially normal to such plane at any point along the seal. This arrangement permits a good seal to be formed about the entirety of the base, while greatly increasing the design possibilities for containers.

[0025] While this principle is relatively simple, the actual production of containers according to the present invention is more problematic. Specifically, molding such containers using injection molding techniques presents issues of blockage and release. For example, in Fig. 7 it may be seen that for the base the typical parting line between mold portions would be at the edge of the base rim 22. This presents no problems. However, the outward extending lip 62 does. The upper face of this lip 62 extends inward, such that the mold portion forming this upper face would tend to block release of the base from the mold (i.e., movement in the vertical direction in Fig. 7). Similar problems may be seen with regard to molding the lid 14, and in particular the lid rim 26. These problems may be eliminated, however, by use of movable mold portions as are known in the art. While the use of movable mold portions is not feasible for all applications, it will still permit a wide range of container forms to be produced according to the present invention.

[0026] From the foregoing it will be seen that this invention is one well adapted to attain all ends and objects hereinabove set forth together with the other advantages which are obvious and which are inherent to the structure.

[0027] It will be understood that certain features

and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

[0028] Since many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative, and not in a limiting sense.

[0029] The features disclosed in the foregoing description, in the following claims and/or in the accompanying drawings may, both separately and in any combination thereof, be material for realising the invention in diverse forms thereof.

Claims

1. In a container having a base and a lid, with the base having a first seal component and the lid having a second seal component, the first and second seal components interacting to form a seal when said lid is mounted to said base, the improvement comprising:

said seal extending along a locus of points defining a non-linear plane, and said first and second seal components extending substantially normal to said non-linear plane at any particular point along said seal.

2. The improvement of claim 1, wherein said base includes a base rim and said lid includes a lid rim, and wherein said first seal component comprises a face of said base rim and wherein said second seal component comprises a projection extending from said lid rim to abut said face of said base rim.
3. The improvement of claim 1, wherein said base includes a base rim and said lid includes a lid rim, and wherein said second seal component comprises a face of said lid rim and wherein said first seal component comprises a projection extending from said base rim to abut said face of said lid rim.

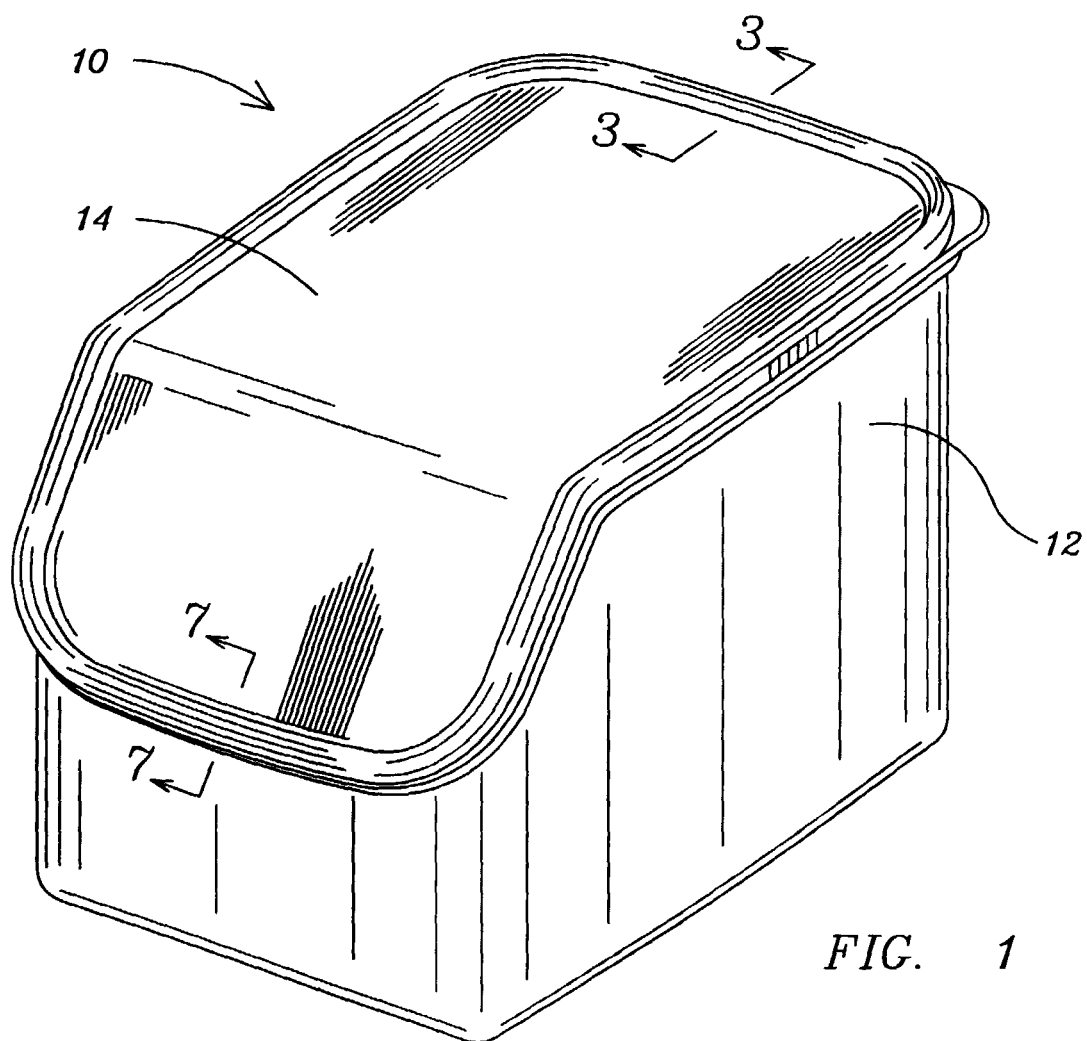


FIG. 1

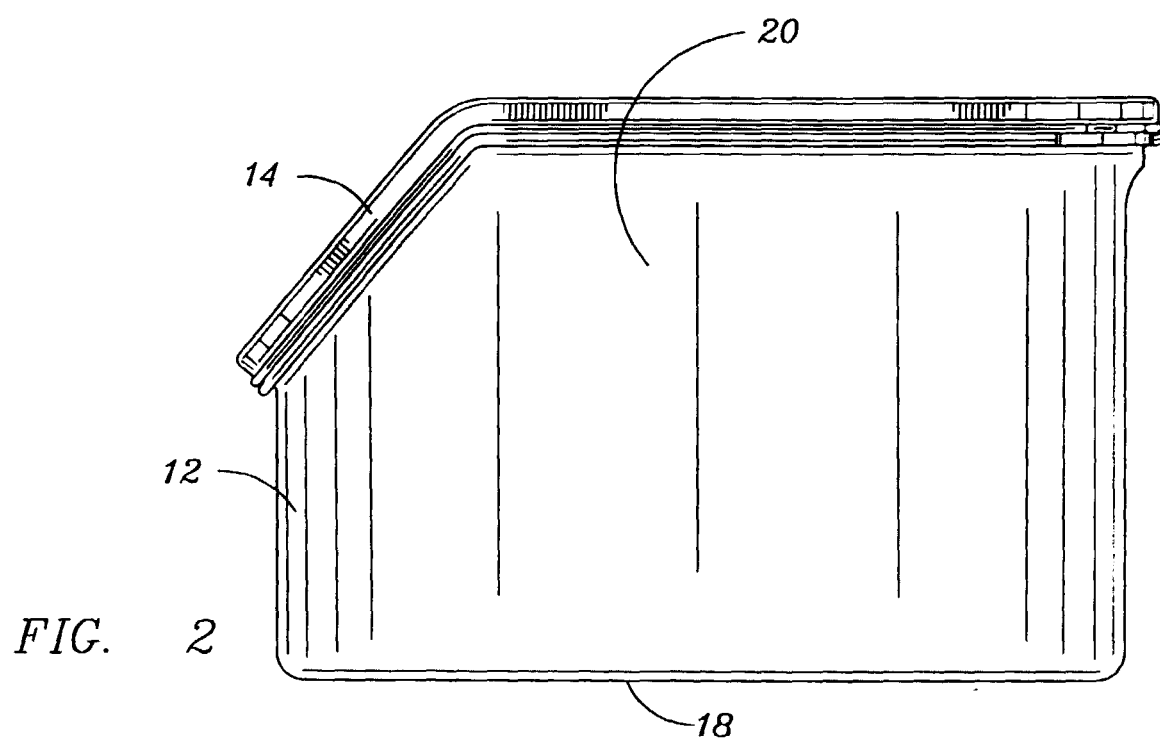


FIG. 2

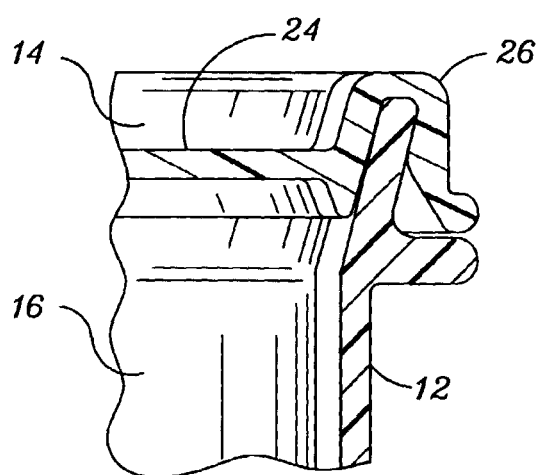


FIG. 4

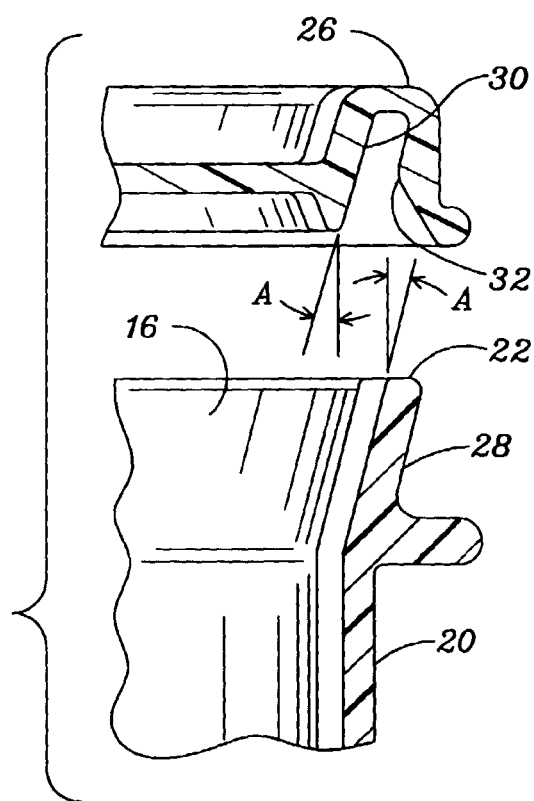


FIG. 3

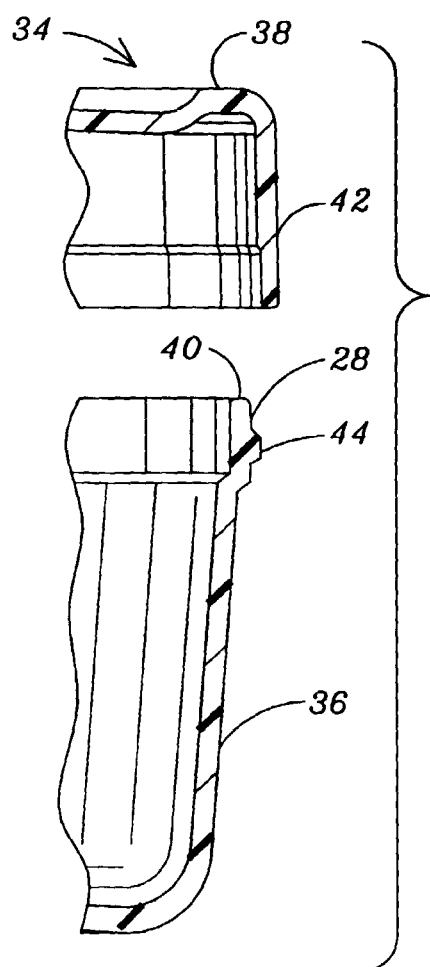


FIG. 5

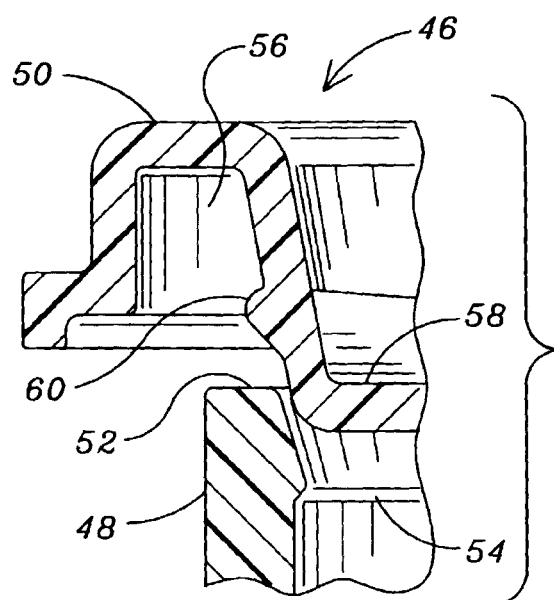
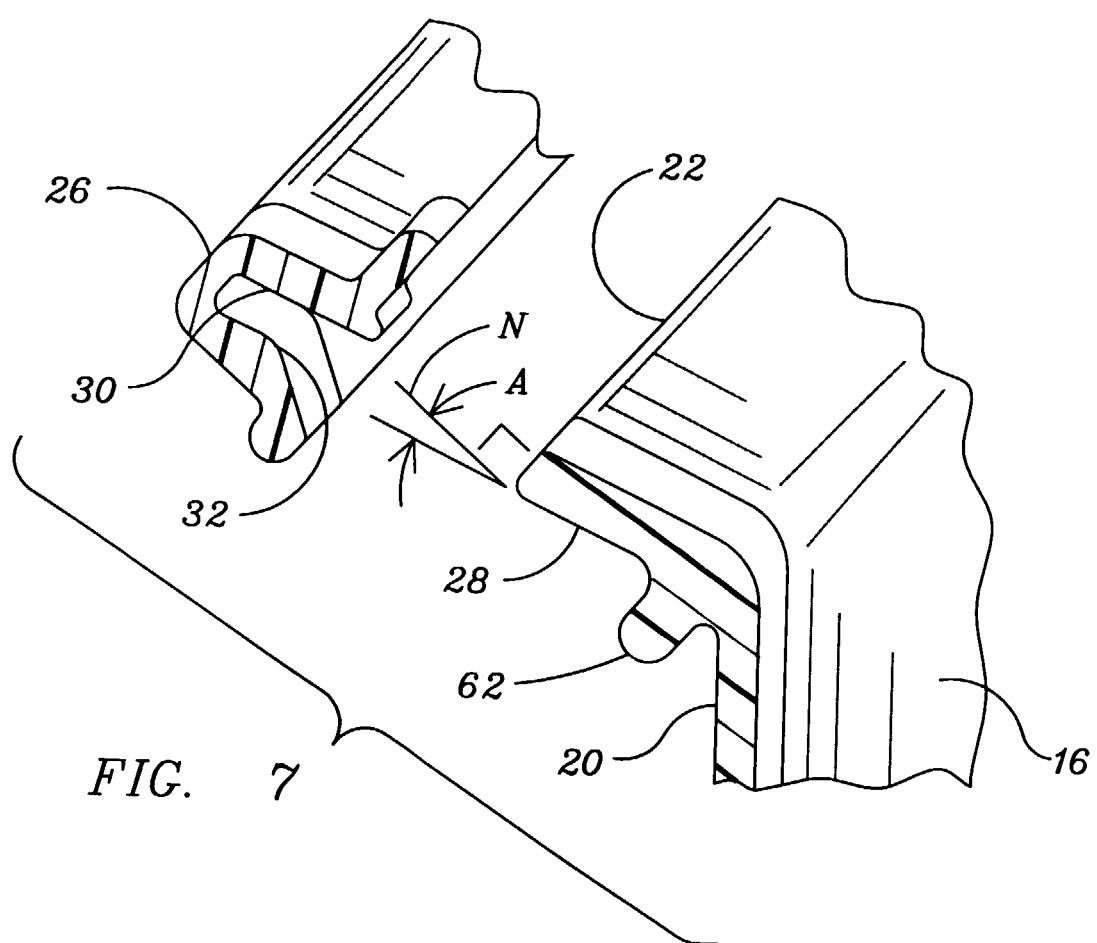


FIG. 6





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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 9589

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	FR 2 693 172 A (VYNEX SA) 7 January 1994 (1994-01-07) * figures 1,2 *	1-3	B65D43/02
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			B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 December 2000	Examiner Sunde11, 0
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 11 9589

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12-12-2000

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