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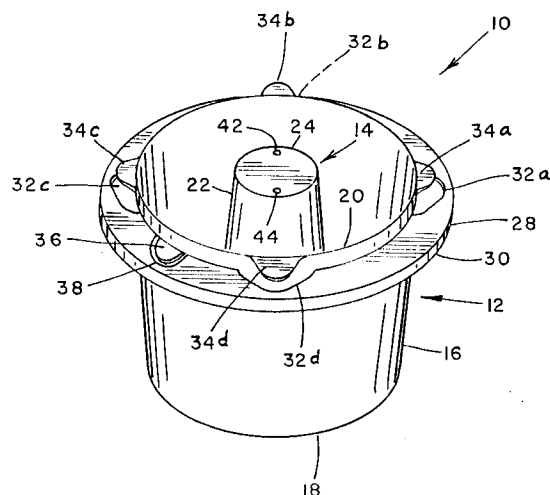
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(54) **Polymer pallet leg for a cardboard pallet base.**

(57) A polymer pallet leg (10) for a cardboard pallet base (50) including a first truncated cone (12), a second truncated cone (14) within said first truncated cone inversely positioned with respect thereto, a rim (28) surrounding and offset below a top edge of said first truncated cone, and a plurality of locking tabs (34) extending outwardly from a top edge of the first truncated cone. The locking tabs (34) engage with corresponding tab holes (52) of a cardboard pallet about a pallet leg hole (51). The second truncated cone includes a flat surface (24) for engaging with any object placed on the pallet and is about the same height as the top edge of the first truncated cone. An optimal braking tab (36) can also be provided for engaging the cardboard further locking the leg in position. A pallet leg insert (70) engages into the second inverted cone for attaching a bottom pallet base (86) to the polymer pallet legs (10).

**FIG. 1****EP 0 487 180 A1**

The present invention relates to pallets and to pallet legs for use in the construction of pallets. The invention is concerned particularly, but not exclusively, with pallet legs formed from polymer, (also referred to below as "polymer pallet legs") and their use with pallet sheets of cardboard (for example, corrugated cardboard) or similar material in the construction of non-wooden pallets.

Owing to environmental concern, wooden pallets have become undesirable because of the problem of disposing of them, their cost and, most important, landfills not accepting them for the reason that they are not recyclable. Wooden pallets quickly fill up a landfill, do not degrade promptly and generally have become a burden upon the ecological society because of the filling up of landfills with bulky substance. Further, use of wooden pallets cause the destruction of trees which is not feasible from an ecological standpoint.

Prior art polymer pallet legs, such as that in US Patent No. 3 915 099 by Weis, et al., issued on October 28, 1975, for "Support Column and Disposable Pallet Structure" are limited in the "unit weight per surface area", as well as for statics and dynamics reasons resulting from their single cup support structure. This is a severe practical problem.

The present invention overcomes the disadvantage of the prior art by providing a pallet leg which includes a supporting structure and an inverse supporting structure. The pallet leg is preferably of a polymeric recyclable material but the invention is not limited to pallet legs of polymeric material.

In a first aspect the present invention provides a pallet leg for engagement with a pallet sheet (50) in the construction of a pallet, the leg comprising:

a first truncated conical member (12) (also referred to herein as a "first truncated-cone") which tapers from a first end to a second end thereof;

a second truncated conical member (14) (also referred to herein as a "second truncated-cone") which tapers from a first end to a second end thereof and is disposed within and secured to said first truncated conical member; and

a locking means (28, 34) carried by said first truncated conical member in the region of said first or second end, for said engagement with the pallet sheet (50).

Pallet legs of the invention can be used with a single pallet sheet or other platform to provide a pallet. Thus, in a second aspect the present invention provides a pallet comprising a plurality of pallet legs (10) according to the first aspect of the invention and a first pallet sheet (50) comprising a planar member having formed therein a plurality of spaced-apart apertures (51) each aperture including at its periphery two or more recesses (52), the aperture being of shape and dimensions such that

it will pass the tabs (34) but not the support (28), whereby the leg (10) can be secured to said first pallet sheet (50) by presenting it to one of the apertures so that the tabs pass through the recesses and then rotating the leg so that said first pallet sheet becomes engaged between the support and the tabs.

In an alternative form of pallet of the present invention first and second pallet sheets are secured, respectively, to first and second ends of pallet legs of the first embodiment. This form of pallet is reversible in that either said first pallet sheet or said second pallet sheet can be used to support goods. Thus, in a third aspect the invention provides a pallet of the second aspect which includes a second pallet sheet (86) spaced apart from and parallel to said first pallet sheet (50) the second pallet sheet having formed therein a plurality of spaced-apart apertures; and

the second pallet sheet being secured to the pallet legs by means of pallet leg inserts (70) each of which mates with a respective one of said apertures in the second pallet sheet and frictionally engages the internal surface of the second truncated conical member.

In the description that follows said first pallet sheet is also referred to as "pallet sheet" and as "top pallet base", and said second pallet sheet is referred to as "bottom pallet base".

In a preferred form the present invention concerns a polymer pallet leg for a recyclable pallet including recyclable polymer pallet legs and a recyclable corrugated cardboard pallet sheet, wafer board or other pallet surface. The polymer legs engage and lock into a pallet surface, and integrate to form a pallet (referred to below also as "a pallet system"). One of the interesting aspects and features of the pallet system is that the pallet leg, when eventually discarded, can be ground to form new pallet legs and the pallet sheet can be recycled to form new pallet sheets. Therefore, there is no need to scrap or throw away either the polymer plastic legs or the corrugated cardboard pallet sheets, as both can be recycled to again be manufactured into recycled components of the plastic leg and the pallet sheet of the pallet system. The entire pallet system can be made again from recycled materials. A pallet leg insert of the invention is provided to attach a pallet base bottom to the bottom of the polymer pallet leg. The combinations of the top base and/or bottom base, the polymer pallet leg, and the polymer leg insert form the pallet system.

In a preferred forms of the present invention, for example the embodiments described below with reference to the accompanying drawings, the polymer pallet leg is stackable within other like polymer pallet legs prior to and after use.

According to one embodiment of the present invention, there is provided a polymer plastic leg including a truncated cone with a base and an expanding cylinder wall extending upwardly, a rim extending thereabout with a downwardly extending lip spaced below a top edge of said wall, a plurality of locking tabs extending outwardly from a top edge, an inverse cone positioned within the truncated cone and including a top surface in a same plane as the locking tabs, whereby the top surface of the inverse cone, as well as the locking tabs, support an object placed upon the pallet sheet. The polymer pallet leg engages into four locking tab holes. The rim engages the bottom surface of the pallet sheet. There can also be provided a brake tab for engaging up against and into the corrugated surface of the pallet sheet, and for locking the polymer plastic leg into position. A certain amount of corrugated cardboard is thus displaced by the engagement of the brake tab. The bottom surface of the inner cone provides additional support for goods placed on the pallet. A pallet base insert is also provided for frictional engagement with the polymer pallet leg for distributing the weight of the polymer pallet leg over a bottom pallet base and also for increasing the bottom surface area of the polymer pallet leg. The bottom pallet base also provides for conveying, handling and any other requirements for a bottom pallet base.

Significant aspects and features of the present invention include a polymer pallet leg which is three dimensional in static and dynamic stability, including a lower support surface for base support and an upper support surface for object support at the plane of the pallet.

Another significant aspect and feature of the present invention is a polymer pallet leg which is easily utilizable by any individual for engagement with a pallet sheet, and which can be readily engaged and disengaged from the pallet sheet for recycling.

A further significant aspect and feature of the present invention is a polymer pallet leg which is recyclable, as well as a recyclable pallet support sheet. The entire pallet system is recyclable.

An additional significant aspect and feature of the present invention is a pallet base insert for engagement into the polymer pallet leg to provide a larger base surface area, especially for passage across a conveyor system or for handling.

There is now described, by way of example and with reference to the accompanying drawings, preferred embodiments of the pallet leg of the first aspect of the invention and preferred embodiments of the pallets of the second and third aspects of the present invention.

In the drawings:

FIG. 1 illustrates a perspective view of a polymer pallet leg of the present invention;

FIG. 2 illustrates a cross-sectional view of the pallet leg of Fig. 1;

FIG. 3 illustrates a top view of the pallet leg of Fig. 1;

FIG. 4 illustrates a perspective view of the polymer pallet leg utilized with a corrugated cardboard pallet sheet to form a pallet;

FIG. 5 illustrates a side view of the lower right corner of Fig. 4;

FIG. 6 illustrates a top view of an alternative embodiment;

FIG. 7 illustrates a perspective view of a pallet leg insert of the present invention;

FIG. 8 illustrates a bottom pallet base secured to a pallet leg by the pallet leg insert of Fig. 7; and

FIG. 9 illustrates the groove-to-ring engagement of the pallet leg insert to the polymer pallet leg with a bottom pallet base therebetween.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a perspective view of a polymer pallet leg 10 of the present invention, including a truncated cone 12 and an inverse truncated cone 14. The first truncated cone includes an extending side 16, a base 18, and a top edge 20. The inverse truncated cone 14 includes an inverse extending side 22, a top surface 24, and a base edge 26 as illustrated in FIG. 2. The height of the top surface 24 is about the same or equal to the height of the top edge 20. A rim 28 with a downwardly extending edge 30, and spaced from the top edge as illustrated in FIG. 3, extends about the top edge 20 and includes locking tab mold holes 32a-32d. Locking tabs 34a-34d extend outwardly about the top edge 20. An optional fifth brake tab 36 with a corresponding locking tab hole 38 is provided to engage upwardly and into the corrugated cardboard surface as illustrated in FIG. 5 and as later described in detail.

FIG. 2 illustrates a cross-sectional view where all numerals correspond to those elements previously described.

FIG. 3 illustrates a top view where all numerals correspond to those elements previously described. Holes 40a-40d are in the base 18.

MODE OF OPERATION

FIG. 4 illustrates a perspective view of the polymer pallet leg 10 for insertion into a top cardboard or chip board pallet base 50. The polymer leg 10 is inserted into a top pallet base 50 in the lower right hole in the cardboard pallet to form the pallet, along with three other holes to retain the

polymer pallet legs. Operation for insertion only requires a push of the polymer pallet leg 10 and a twist of the leg 10 for assembly to install the polymer pallet leg 10. The top pallet base 50 can be made of any suitable recyclable material.

FIG. 5 illustrates a side view of the lower right hand corner of FIG. 4 where all numerals correspond to those elements previously described. Illustrated in particular is the brake tab 36 which is angled up slightly from the planar surface of the rim 28 to frictionally engage the lower surface of the cardboard top pallet base 50.

FIG. 6 illustrates a top view of an alternative embodiment of a polymer pallet leg; it has a plurality of vertical supports 60a-60n connecting the cones together. The vertical supports tie the inner cone to the outer cone providing still further structural stability between the cones.

The height of the top surface 24 can be about equal to that of the top surface of the locking tabs 34, and can also be slightly higher or slightly lower than the top surface of the locking tabs as may be predetermined. Hole 42 and 44 release vacuum suction which can occur between the inner cones when the legs are stacked together. The pallet can be of any other suitable materials, such as corrugated plastic, a polymer sheet, chip board, plywood, etc. The distance between the locking tabs and the rim is determined by the thickness of the pallet base. The plastic pallet leg can also be color coded, as well as the pallet base for designation of the type of goods, the designation of manufacturer, etc.

FIG. 7

illustrates a perspective view of a pallet leg insert 70 for securing a planar pallet bottom base member as later described for a series or group of pallet legs 10. The pallet leg insert 70 includes a planar member 72 formed as a circle which includes a beveled edge 74, as illustrated in FIG. 8. A tubular member 76 extends upwardly at a right angle from the planar member 72. A plurality of like segmented gripping members 78a, 78b, 78c and 78d extend outwardly and upwardly from the upper portion of the tubular member 76, each containing a plurality of arcular grooves including arcular grooves 80a, 80b and 80c and a beveled surface 82 extending from the top of the groove 80a to the inner circumference 85 of the tubular member 76. Arcular grooves 80a-80c in each of the segmented gripping members 78a-78d snappingly engage with frictional engagement a ring in the lower inner portion of the pallet leg 10 as later described in detail. Spaces 84a-84d between the segmented gripping members 78a-78d allow for inward flexing of the segmented gripping members 78a-78d for ease of engagement with the pallet leg 10. The beveled surface 82 allows for ready alignment and

ingress to the pallet leg 10. Three arcular grooves 80a-80c are illustrated by way of example and for the purpose of illustration only, and is not to be construed as limiting of the scope of the present invention.

FIG. 8 illustrates the pallet leg insert 70 securing a bottom pallet base 86 to the base 18 of the pallet leg 10. A hole 88 is drilled in the bottom pallet base 86. The segmented gripping members 78a-78d are forcibly maneuvered through the hole 88 in the bottom pallet base 86. Any of the set of arcular grooves 80a-80c in the segmented gripping members 78a-78d snappingly engage an annular rib or ring 90 at the base of the inverted truncated cone 14, thus holding and securing the bottom pallet base 86 between the planar member 72 and the base 18 of the pallet leg 10. Any number of internal rings or internal rims 90 may be used in succession for engagement with one or more of the plurality of arcular grooves 80a-80c. One ring only is illustrated by way of example only, and is not deemed to be limiting of the scope of the present invention.

FIG. 9 illustrates the engagement of arcular groove 80b with the annular rib or ring 90 at the base of the truncated inverted cone 14 where all numerals correspond to those elements previously described.

The truncated conical members (truncated - cones) described herein with reference to the accompanying drawings are truncated right circular cones. However, the invention is not thus limited, and includes truncated cones of other shapes, for example truncated elliptical cones.

Pallet legs according to preferred embodiments of the present invention are as follows:

1. A leg of a plurality of legs for engaging with a cardboard base to form a pallet comprising:
 - a. a first truncated cone including a rim about said cone;
 - b. a second truncated cone within said first truncated cone; and
 - c. at least one locking tab ending outwardly from said first truncated cone.
2. A polymer pallet leg comprising:
 - a. a first truncated cone including a top edge;
 - b. a rim spaced below said top edge;
 - c. a plurality of locking tabs extending outwardly from said top edge; and
 - d. a second truncated cone inversely positioned within said first cone.
3. A polymer pallet leg comprising:
 - a. a first truncated cone including a top edge;
 - b. a rim below said top edge;
 - c. a plurality of locking tabs extending outwardly from said top edge;
 - d. a second truncated cone inversely positioned within said first cone; and

e. vertical members extending between said first cone and said second cone.

Combinations according to preferred embodiments of the present invention, including a polymer pallet leg, are as follows:

4. In combination, a polymer pallet leg and a pallet sheet comprising:

- a. a polymer pallet leg including a first truncated cone including a top edge, a rim spaced below said top edge, a plurality of locking tabs extending outwardly from said top edge, and a second truncated cone inversely positioned within said first cone; and
- b. a pallet sheet including holes with locking tab slots for receiving and locking said polymer pallet legs into said pallet sheet.

5. In combination, a polymer pallet leg, a pallet sheet, a pallet base, and a pallet leg insert comprising:

- a. a polymer pallet leg including a first truncated cone including a top edge, a rim spaced below said top edge, a plurality of locking tabs extending outwardly from said top edge, and a second truncated cone inversely positioned within said first cone and including a lower internal rim;
- b. a pallet sheet including holes with locking tab slots for receiving and locking said polymer pallet legs into said pallet sheet; and,
- c. a pallet leg insert including engaging means engaged into a pallet base and frictionally engaged about said rim into said second truncated cone.

Claims

1. A pallet leg for engagement with a pallet sheet (50) in the construction of a pallet, the leg comprising:
 - a first truncated conical member (12) which tapers from a first end to a second end thereof;
 - a second truncated conical member (14) which tapers from a first end to a second end thereof and is disposed within and secured to said first truncated conical member; and
 - a locking means (28, 34) carried by said first truncated conical member in the region of said first or second end, for said engagement with the pallet sheet (50).
2. A pallet leg according to Claim 1, wherein the second truncated conical member is inverted with respect to the first truncated conical member.
3. A pallet leg according to Claim 1 or 2, wherein the first truncated conical member and the

second truncated conical member are co-axial to each other and are of substantially the same axial length.

4. A pallet leg according to Claim 1, 2 or 3, wherein the first and second truncated conical members are united by an annular member (18) which closes an annulus between said second end of the first truncated conical member and said first end of the second truncated conical member.
5. A pallet leg according to any of the preceding claims, wherein the locking means is carried by said first truncated conical member in the region of said first end.
6. A pallet leg according to any of the preceding claims, wherein said second end of the second truncated conical member is bridged by a bridging member (24) substantially transverse to the axis of the second truncated conical member.
7. A pallet leg according to Claim 6, wherein the bridging member (24) is substantially parallel to said annular member (18).
8. A pallet leg according to any of the preceding claims, wherein the locking means (28, 34) comprises an outwardly extending rim or other support (28) to support the pallet base, and a plurality of outwardly extending tabs (34) to hold the pallet base in place on the support.
9. A pallet leg according to Claim 8, wherein the support is an annular flange disposed substantially transverse to the axis of the first truncated conical member.
10. A pallet leg according to any of the preceding claims, which includes reinforcing webs or other members (60) each extending between and secured to the first and second truncated conical members thereby to enhance the strength of the pallet leg.
11. A pallet leg according to any of the preceding claims, in which the first truncated conical member has a projection (36) which, when the pallet leg is in engagement with said pallet sheet (50) is in frictional engagement with said sheet.
12. A pallet comprising a plurality of pallet legs (10) as claimed in any of the preceding claims and a first pallet sheet (50) comprising a planar member having formed therein a plurality of

spaced-apart apertures (51) each aperture including at its periphery two or more recesses (52), the aperture being of shape and dimensions such that it will pass the tabs (34) but not the support (28), whereby the leg (10) can be secured to said first pallet sheet (50) by presenting it to one of the apertures so that the tabs pass through the recesses and then rotating the leg so that said first pallet sheet becomes engaged between the support and the tabs.

13. A pallet according to Claim 12, which is reversible and includes a second pallet sheet (86) spaced apart from and parallel to said first pallet sheet (50) the second pallet sheet having formed therein a plurality of spaced-apart apertures; and

the second pallet sheet being secured to the pallet legs by means of pallet leg inserts (70) each of which mates with a respective one of said apertures in the second pallet sheet and frictionally engages the internal surface of the second truncated conical member.

14. A pallet according to Claim 13, wherein the second truncated conical member has at its first end an internal circumferentially disposed projection (90); and

pallet leg insert (70) comprises:

a cylindrical shank (76) which mates with one of the apertures in the second pallet sheet; an outwardly directed flange (72) at one end of the shank to contact the second pallet sheet (86) and

an annular friction means (78, 80) frictionally to engage said internal projection.

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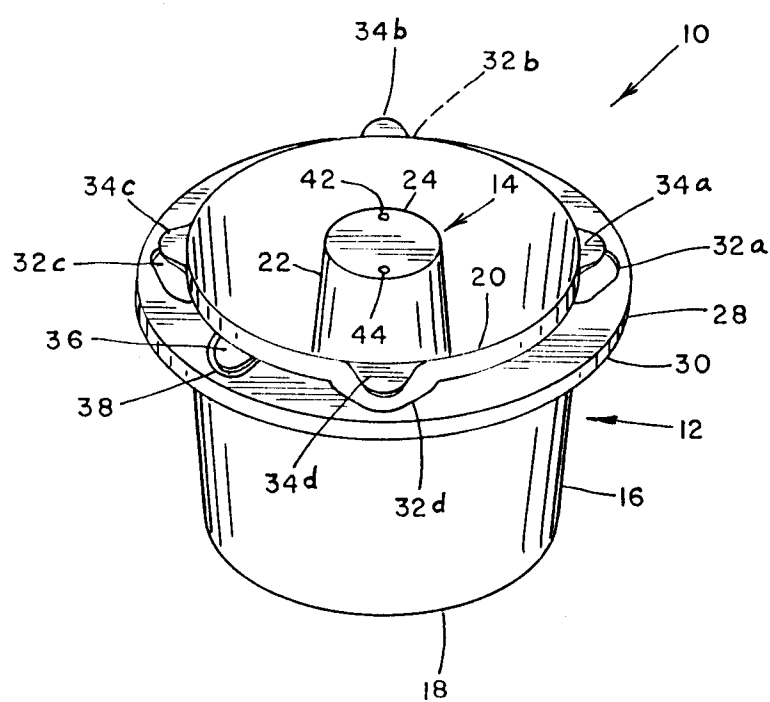


FIG. 1

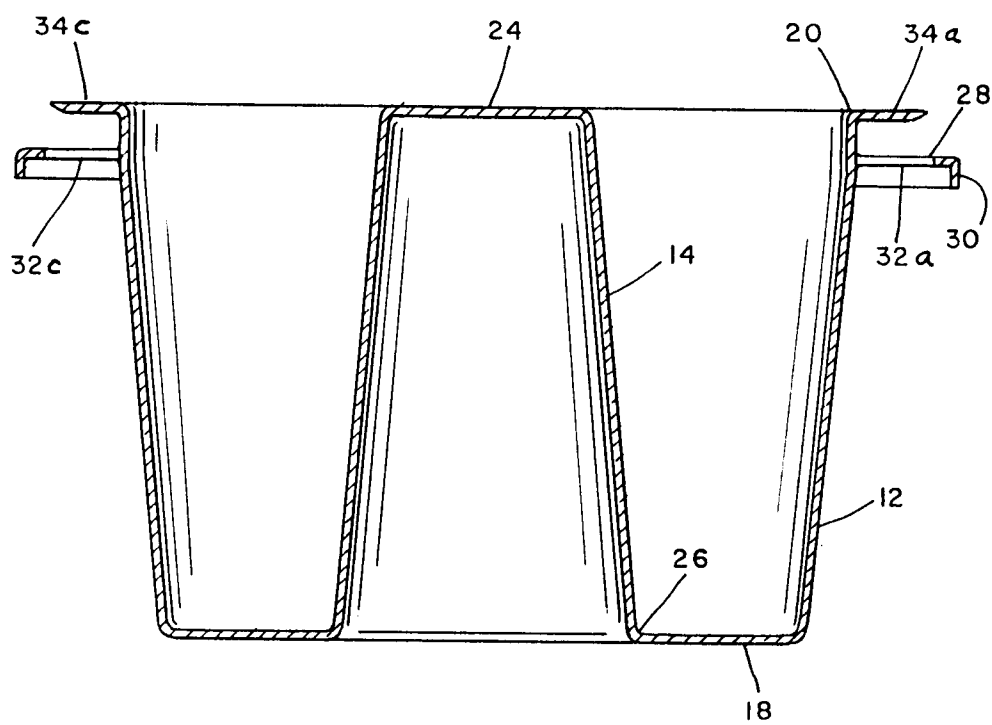


FIG. 2

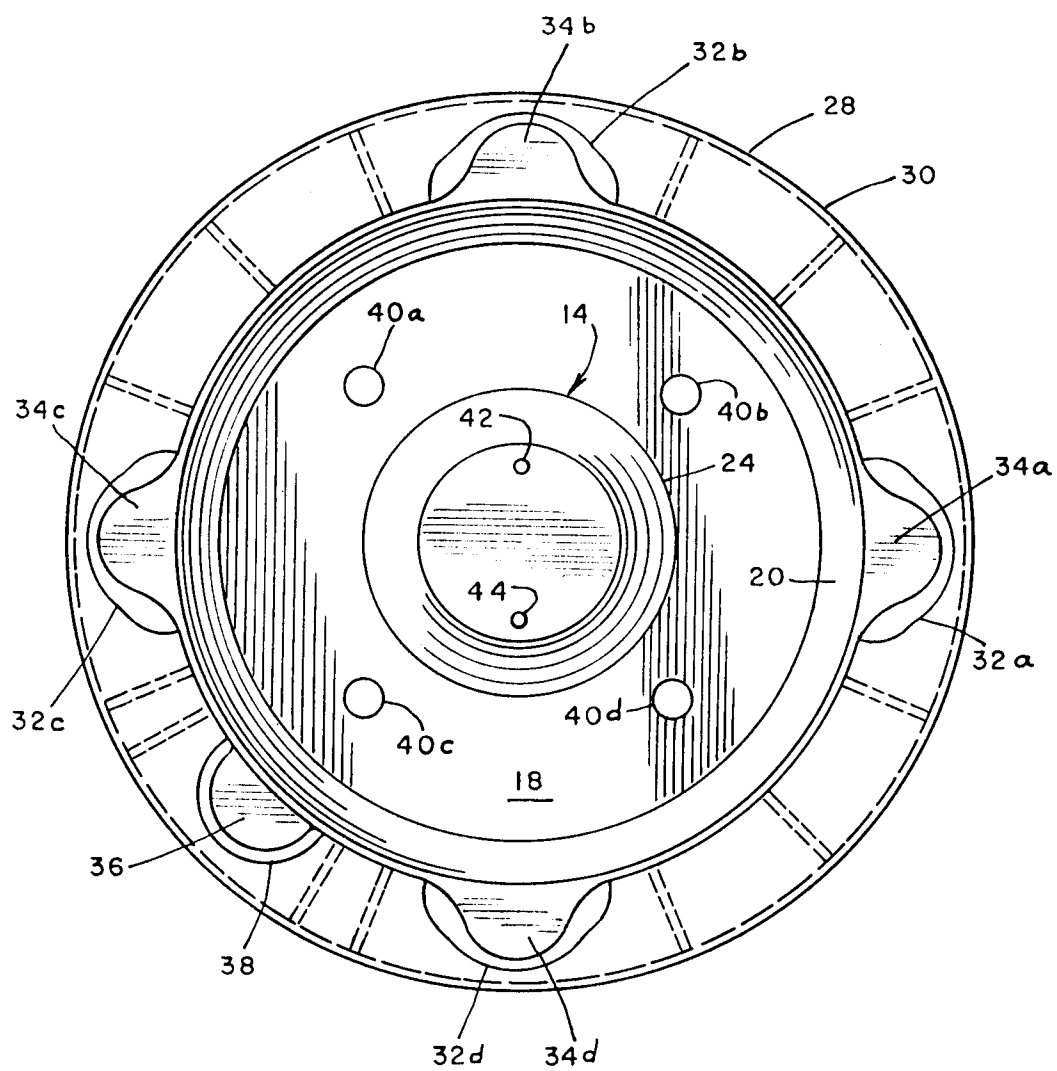


FIG. 3

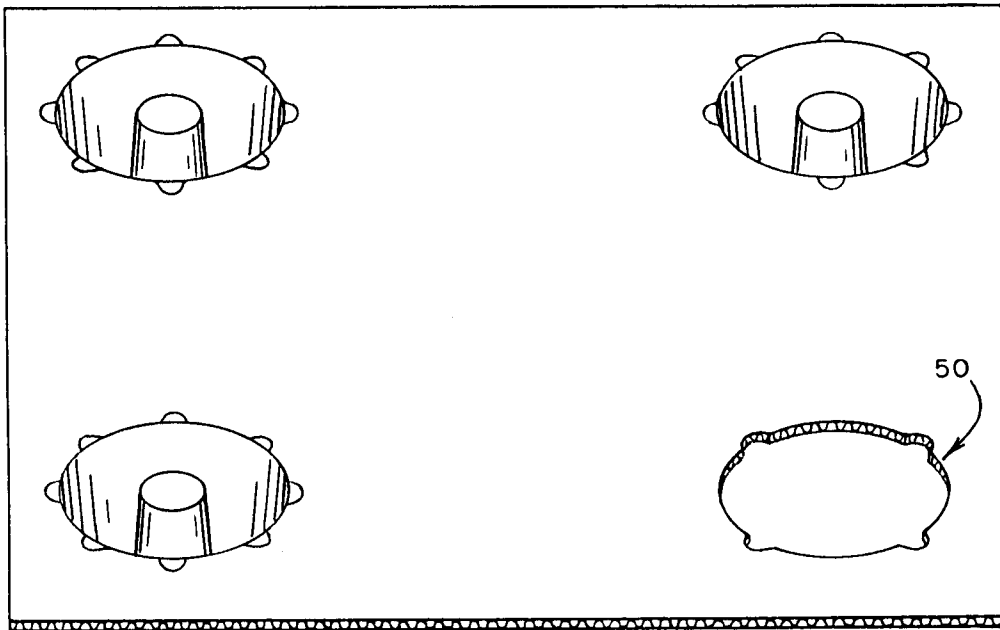
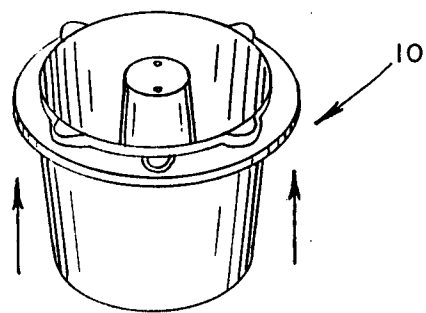


FIG. 4



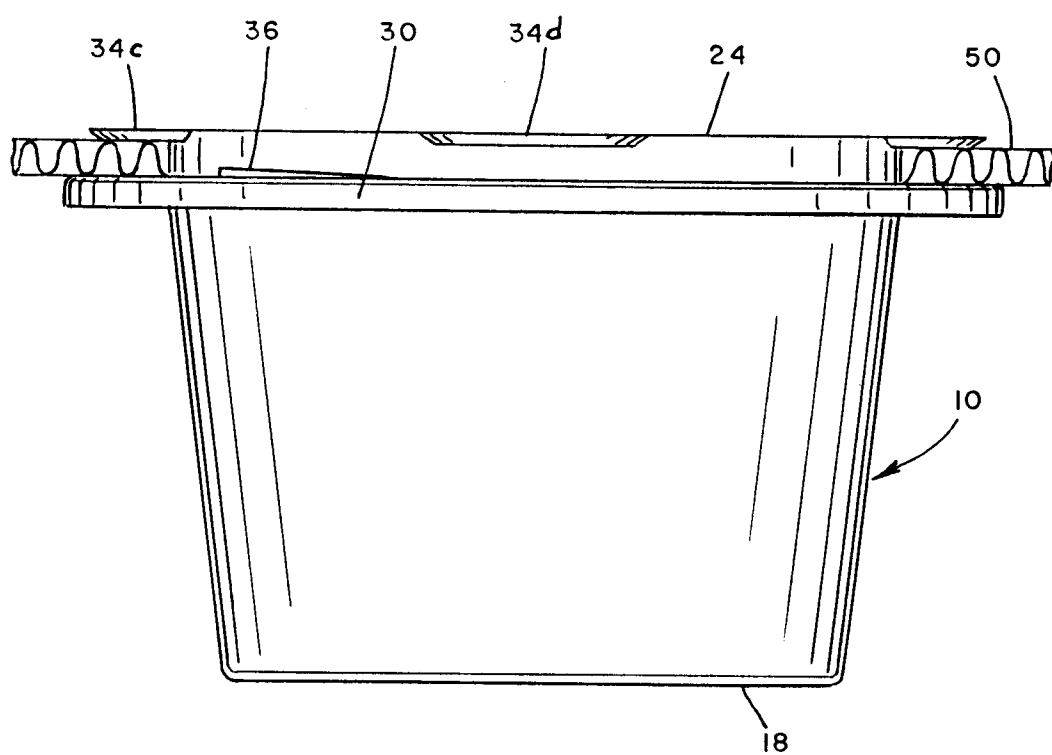


FIG. 5

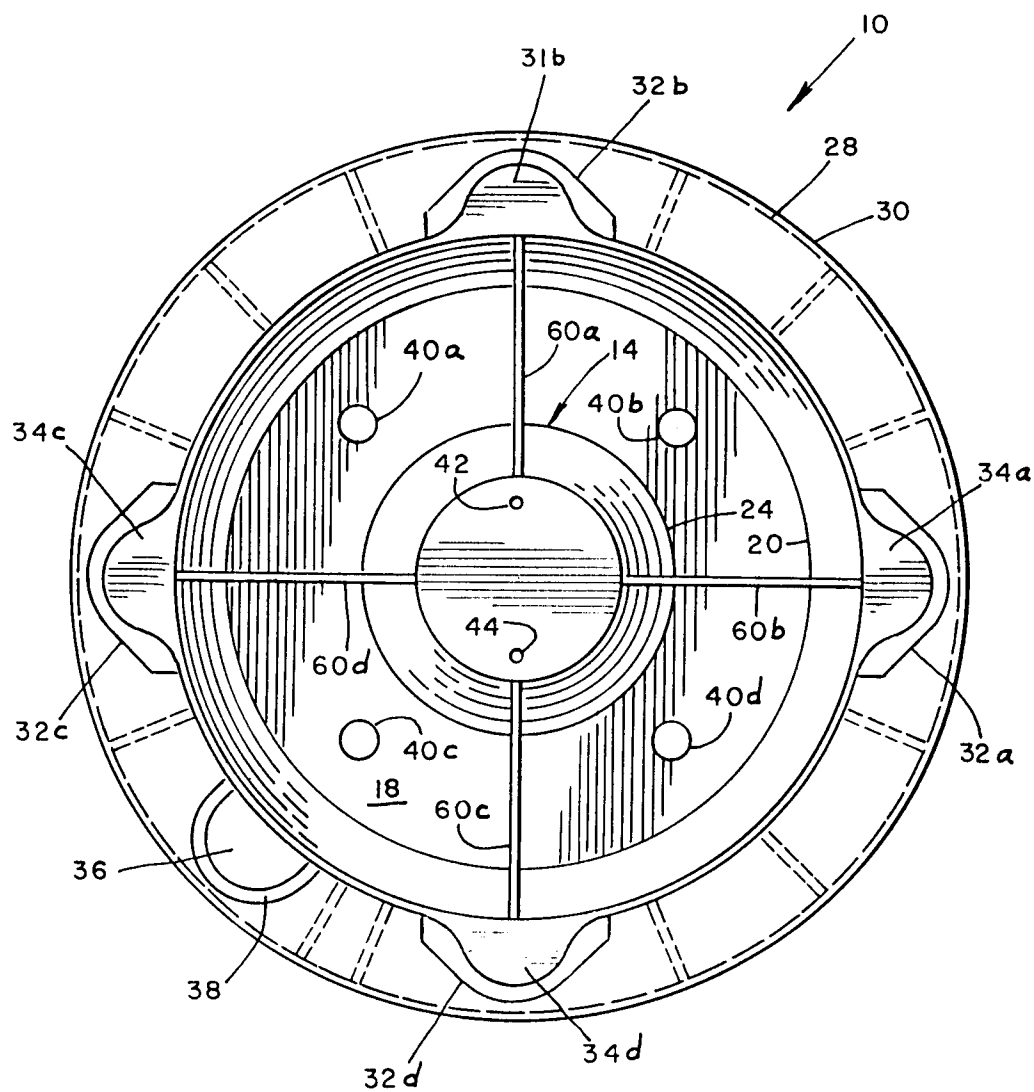


FIG. 6

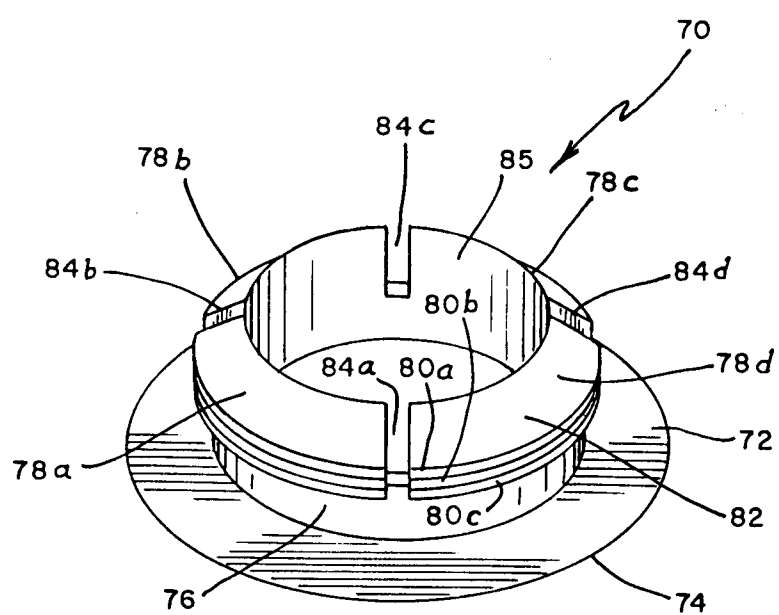


FIG. 7

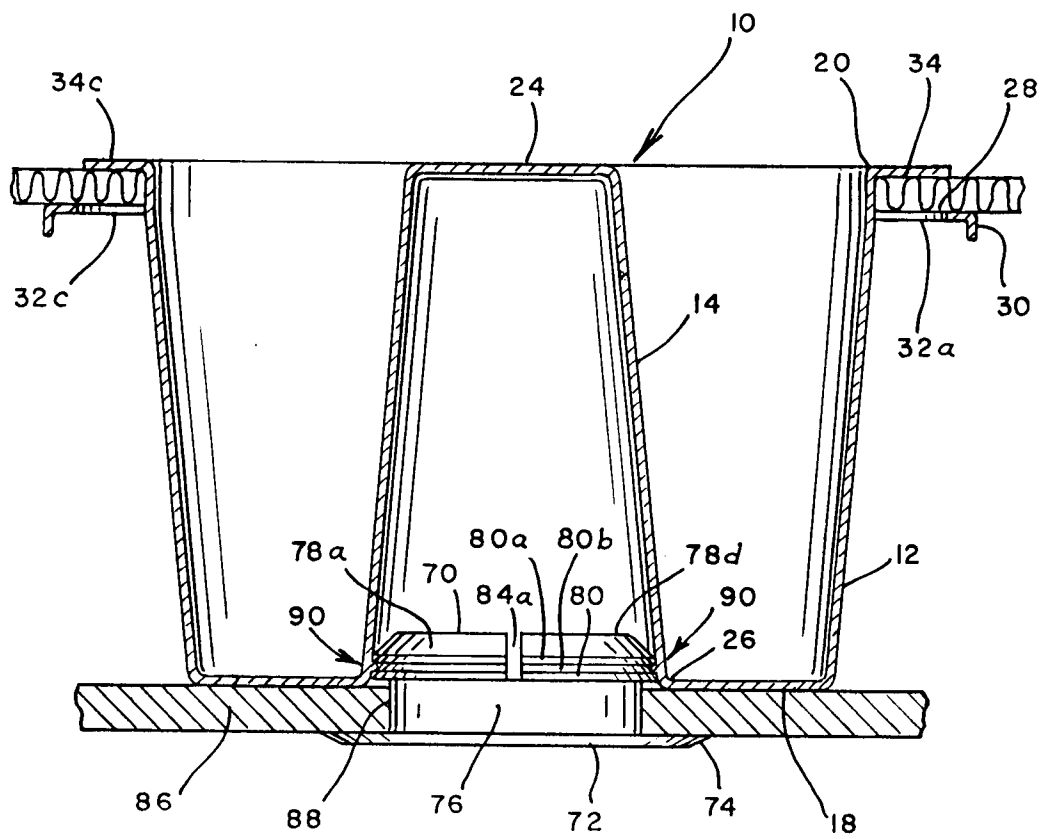
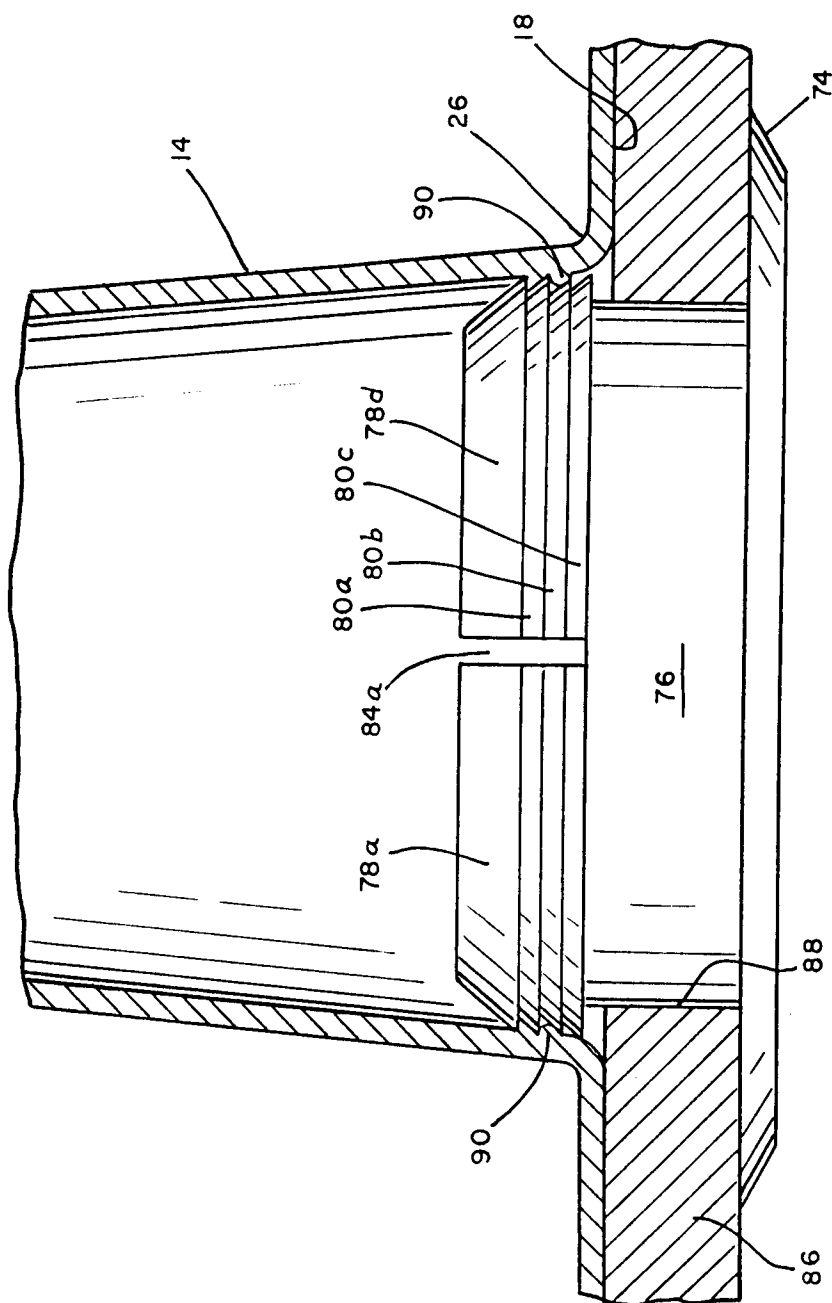


FIG. 8



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Proposed Amendment

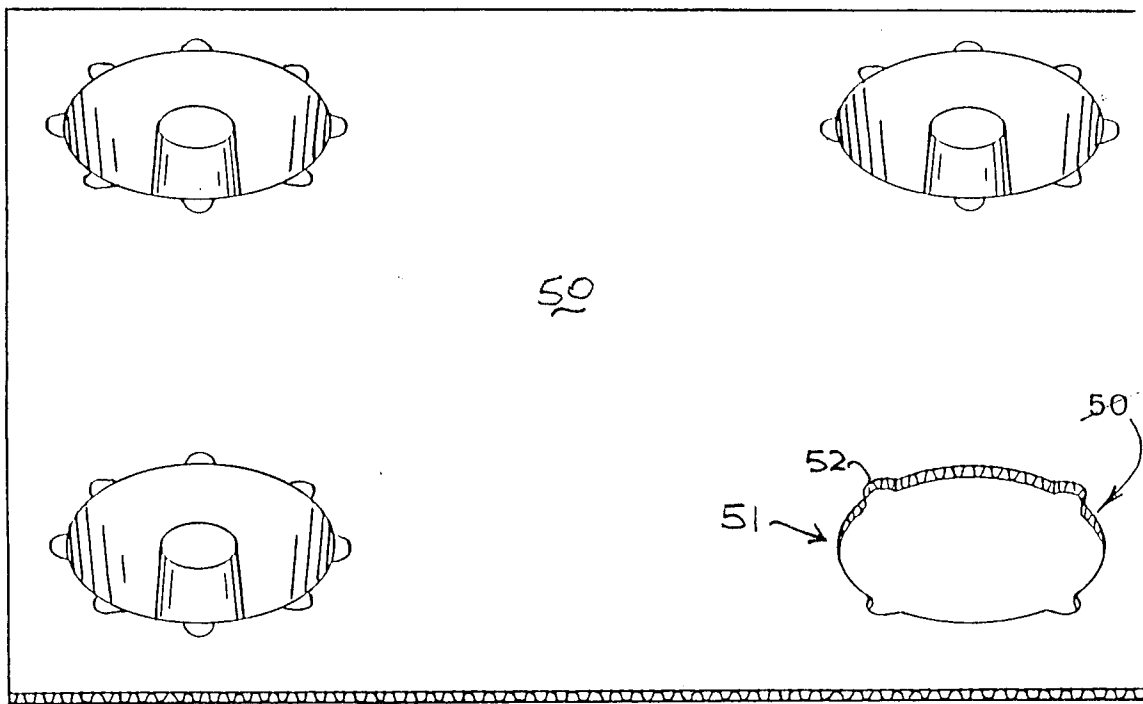
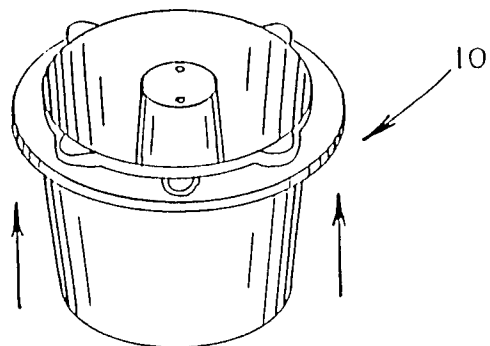


FIG. 4





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 5099

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X, D	US-A-3 915 099 (WIES ET AL.) * column 3, line 33 - column 5, line 4; figures 1, 2, 5, 7 *	1-2, 4-5, 8-13	B65D19/40
Y	---	6-7, 14	
X	FR-A-2 128 033 (SOCIETE BORDELAISE DE MATIERES PLASTIQUES) * page 3, line 6 - line 19; figure 4 *	1-2, 4-5, 11	
A	---	3	
Y	US-A-4 799 433 (LUFT) * figure 11 *	6-7	
Y	GB-A-1 362 075 (MARDON ILLINGWORTH LIMITED) * page 2, line 56 - line 78; figure 3 *	14	

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 FEBRUARY 1992	Examiner BRIDAULT A.A.Y.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			