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(54) **Apparatus and method to more effectively vacuum package foods and other objects**

(57) Raised irregular surfaces (29,30,32,34) on the walls of packaging, with specific application to the interiors of evacuated flexible wall packaging which contains food or other articles. Such raised irregular surfaces may facilitate package evacuation and, when contrasted against regular pattern raised surfaces, may eliminate undesirable, unnatural, regular patterns from being imprinted on package contents caused by: cooking, freezing, storage, chemical reaction, microbes, evacuative pressure or other reasons.

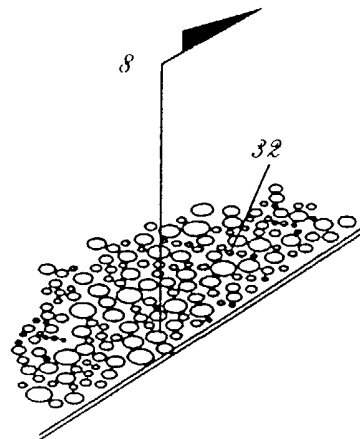


Fig 3

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Description

FIELD OF THE INVENTION

[0001] The present invention is directed to flexible packaging and method which is more efficient and effective than current designs in containing and protecting foods and other articles, and in particular has specific advantages when used in conjunction with evacuated containment.

BACKGROUND OF THE INVENTION

[0002] Flexible packaging used for containing foods and other articles is widely used throughout the world.

[0003] In recent years, one market has emerged which offers home users advantages which earlier, only commercial users had enjoyed. Vacuum packaging using flexible film at one time required expensive and cumbersome commercial equipment. Today several companies offer attractively priced and relatively compact vacuum packaging products for home use. These products offer home users the ability to store foods and other articles for periods far exceeding packaging which does not utilize evacuated packaging.

[0004] Examples of this new home use equipment may be found in US Patents 4,561,925, 4,941,310, 5,048,269, 5,352,323, 5, 784, 862, 5,893,822, and 6,256,968. Essentially, this new equipment can be broken into two subcategories; the machinery that performs the evacuation and sealing operations; and the packaging materials that ultimately contain the articles being packaged. The present application is primarily directed to such packaging materials. As will be suggested in the following specification, however, much broader uses are apparent for the present inventions.

[0005] Earliest flexible packaging utilized single ply flexible films or sheet stock to contain goods. Closure was accomplished by wrapping goods, such as with clear plastic films, or by twist ties, overlapping closures, clips, molded in zippers, or by other means. Later improvements to closures included heat welding pouches of single ply material around stored articles.

[0006] An improvement over single ply materials used two or more ply laminate sheets which allowed for a heat sealable layer backed by a gas impermeable layer, thus preventing oxygen or other harmful gasses from seeping in and contaminating package contents. To further reduce damage done by undesirable gasses, vacuums were used to reduce package gas content, and where appropriate, to help retard microbe growth.

[0007] However, it was difficult to pull a vacuum in a pouch which had smooth inner walls because the inner walls of the container would choke around the orifice where the vacuum was being pulled and retard or prevent the rest of the container from being evacuated.

[0008] Two inventors in US patents 2,778,171, and 4,756,422 (Re. 34,929) suggested ways to prevent this.

Both utilized raised regular patterns embossed or pressed into the inside container surfaces. These caused gas evacuation channels leading to interior parts of the container to be formed which generally allowed more complete evacuation of the container to occur.

[0009] A problem which remains, however, is that even with the protrusions caused by these regular patterns, there is a still large amount of predictable surface contact between package contents and the flexible sheet which forms part or all of the container. This can cause sticking of packaging to contents after freezing, and result in artificial looking patterning on the outside of foods or other contained articles after freezing or cooking. It can also lead to small pockets between the container and its contents harboring moisture, microbes or harmful gasses.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 is a perspective view of a first embodiment of the present invention. More specifically, figure 1 is a perspective view of a pouch formed of film having an irregularly textured inner surface.

Figure 2 is a detail of Figure 1 as indicated by dotted area 20 in Figure 1.

Figure 3 is the detail shown in Figure 2 of dotted area 20 showing an alternate embodiment construction.

Figure 4 is the detail shown in Figure 2 of dotted area 20 showing a second alternate embodiment construction.

Figure 5 is a section taken through Figure 2 as indicated in figure 2 showing a possible embodiment construction.

Figure 6 is the same section shown in Figure 5 showing an alternate embodiment construction.

Figure 7 is the same section shown in Figure 5 showing a second alternate embodiment construction.

Figure 8 is a section taken through Figure 3 as indicated in Figure 3 showing a possible embodiment construction.

Figure 9 is a section taken through the first embodiment shown in Figure 1 as indicated in Figure 1.

Figure 10 is the same section shown in Figure 9 showing an alternate embodiment construction.

Figure 11 shows how the profile shown in Figure 7 might contact a smooth surface.

Figure 12 show another alternative embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Prior art as explained earlier has utilized raised regular and predictable patterns on the inside of evacuated flexible wall packaging primarily to help in evacuation. Such patterns have included waffle patterns, parallel lines, divergent lines, patterned dimples, etc.

[0012] A first embodiment of the present invention, as shown in Figure 1, comprises sheets 22 and 24, welded together along side seams 26 and 28, and bottom seam 30 to form pouch 31.

[0013] Figures 2, 3 and 4 show three example constructions for dotted area 20 defined in Figure 1. All three show raised irregular surface 29 (Figure 1) with differences between constructions comprising primarily the distribution and form of irregularities.

[0014] Raised irregular surfaces, such as 30, 32 and 34, shown in Figures 2, 3 and 4 respectively, form air passages 36 within pouch 31 when the interior of sheet 24 is formed flat, as shown in Figure 9, or is formed with a raised irregular surface 41, as shown in Figure 10. Raised irregular surfaces 30, 32 or 34 may also form air passages 38 when contacting smooth surfaces 40 of pouch 31 contents, as shown in Figure 11.

[0015] Air passages 36 and 38 allow circulation of gasses within pouch 31. As examples, this circulation may be used to more fully evacuate pouch 31 when pulling a vacuum from end 42 of pouch 31, or to help preserve pouch 31 contents, such as the use of CO₂ sealed inside a closed container to help preserve apples. Air passages 36 and 38 may also help to provide for a more uniform environment to help more evenly preserve and protect pouch 31 contents.

[0016] Raised irregular surfaces 30, 32 and 34 shown in Figures 2, 3 and 4 respectively, as well as air passages 36 and 38 may also help provide physical protection for pouch 31 contents if pouch 31 and its contents are struck against other objects, or pouch 31 and its contents are rested for periods of time against adjacent surfaces.

[0017] Raised irregular surface 29 (see Figure 1) may be continuously irregular, as a few examples; like the surface of sandpaper (see example - Figure 6) or the bubbles on the surface of beer foam (see example - Figure 5); or raised irregular surface 29 may have spaced apart irregular protuberances from an otherwise regular surface (see example - Figures 3 and 8). Raised irregular surfaces may have orientation such as the surface of a steel wool pad which has parallel linear orientation of irregularly undulating elongated fibers. Such orientation may also be in the form of a star burst, or a splay, or a weave, etc.

[0018] Raised irregular surface 29 (see Figure 1) may

be: irregular in plan view but uniform in profile; or irregular in profile but regular in plan view; or irregular in both plan and profile. Such use of the terms "irregular" or "raised irregular surfaces" herein shall encompass all of the above descriptions.

[0019] Sheet 24 may be fabricated in many different ways. As an example, it may be embossed through a set of rollers or in a press. This would produce a sheet with texture on both sides and a relatively uniform material thickness across the entire sheet (see examples - Figures 5, 6 and 8). Alternatively, sheet 24 might be textured on one side only (see Figure 7) through a set of rollers or by a press or by other means. Sheet 24 might be textured on both sides through rollers or a press or other means. Any of the above might be done during a lamination process. Many other fabrication techniques also might be employed in conjunction with the above or as an alternative.

[0020] Where the transparency of sheet 22 is desirable, irregular texturing may have minimal impact on such transparency, particularly because such irregular texturing generally is in close proximity to the inside surface of sheet 22 and the contents it may contact which are to be viewed. Alternatively, raised irregular surface 29 might be interrupted where and if in any way it impaired desired transparency.

[0021] Raised irregular surface 29 of sheet 22 may also reduce after freezing sticking between pouch 31 and its contents. This is because there is generally less surface contact between pouch 31 and its contents than if the interior of pouch 31 were formed flat without texture. As an example, a flat surface resting against another flat surface may have near 100 percent contact, whereas a properly designed and engineered raised irregular surface may have less than 80 percent, and possibly less than 60 percent, surface contact area relative to the full exposed surface area, when contacting a flat surface (see Figure 9).

[0022] When compared to flat or regular raised surfaces, raised irregular surfaces may also provide a wider variety of surface contact points for package contents with each contact point having its own unique individual contact area and amount of pressure. This in turn may provide gas circulation with a more diverse and natural flow.

[0023] Raised irregular surfaces, when compared to raised regular surfaces, cannot replicate a regular pattern on the outer surfaces of the objects they may contact. As an example, objects placed in pouches having raised regular interior surfaces, may have the interior pattern of the raised regular surfaces imprinted on the object's exterior caused by freezing, cooking, storage, contact pressure against other objects, or other processes. Because raised irregular surfaces have no regular pattern, they can leave no imprint of an unnatural regular pattern where they contact objects.

[0024] Undesirable replication of raised regular surface patterns may be caused by the soft surfaces of

packaged contents, or by microbes, or by freezer burn, or by uneven heating during cooking, or by chemical reaction, or by other reasons.

[0025] Raised irregular surfaces may also reduce freezer burn by more uniformly and naturally distributing moisture around contents being contacted by the raised irregular surfaces, when compared to raised regular surfaces or flat surfaces. Also, if freezer burn does occur to any degree and replicates the raised irregular surface on the surfaces of package contents, such replication is far less noticeable due to the more natural appearance of the irregular surface when compared to regular and predictable surface patterns.

[0026] Raised irregular surfaces may be used in a variety of applications including applications for both home and commercial use. They may be used in wrapping sheet, pouches, bags, carton interiors, or in other packaging vehicles. This may include such specific applications as Ziploc™ type bags, Saran™ Wrap type food wrapping, Food Saver™ type vacuum and heat sealable bags and rolls, etc.

[0027] In certain applications it may be desirable to combine raised irregular surfaces with laminated sheets. As an example, in pouch 31 shown in Figure 1, where a vacuum may be pulled and thereafter a heat welded seal made on end 42, a gas-impermeable heat-sealable laminate may be desirable for both sheets 22 and 24. Sheet 22 might be fabricated with outer layer 44 (Figure 9) made of Mylar™ and inner layer 46 (Figure 9) made of polypropylene, with the texture being added using embossing rollers either during, before, or after the lamination process. Other processes and materials are alternatively possible including using three or more laminate layers etc.

[0028] Raised irregular surfaces described herein may be constructed at any scale. As just one example, raised irregular surface 30 in figure 2 might have a surface texture of sandpaper and might have texture comparable in scale to a grit of sandpaper ranging from 40 grit to 400 grit, depending on the application.

[0029] Raised irregular surfaces may also be beneficial when food pouches are either boiled or microwaved. This is because, as explained earlier, there may be less surface contact and less predictable surface contact between the pouches and their contents thus allowing more complete contact between liquid and solid contents of the pouch during the cooking process.

[0030] Raised irregular surfaces, when used with vacuum pouches, may provide more complete evacuation of the pouch when compared with raised regular surfaces or flat surfaces. This is because the non uniformity of raised irregular surfaces may provide more complete and extensive pathways for gasses to evacuate.

[0031] Properly designed raised irregular surfaces, by reducing surface contact between packaging and package contents as explained earlier, may also reduce the chances of small, inaccessible pockets being formed between packaging and packaging contents when com-

pared to raised regular surfaces and flat surfaces. Such pockets might house moisture, or microbes, or other things deleterious to package contents.

[0032] As shown in Figures 9 and 10, in pouches, such as illustrated in Figure 1, raised irregular surfaces may be used throughout the interior of a bag or pouch or container or on one side only or on a portion of one or two sides, depending on the needs and economics of the application. Such surfaces may be interrupted as shown in Figure 4 by interruptions 46 to: ease the marking of containers, or to create measuring lines, or for creating a labeling surface, or for increased transparency, etc.

[0033] Use of the embodiments described herein may vary. As just one example, a bag might be formed using sheet material or a fabricated tube or by other means. The bag would have raised irregular surfaces on at least part of its interior. Contents would be placed in the bag and subsequently air would be withdrawn from the bag relying at least in part on evacuation air channels formed between the raised irregular surfaces and surfaces they contact. Such evacuation could be done through the top entrance of the bag, or through a hole in the bag, or by other means. The bag would then be sealed air tight using: heat welding, adhesives, mechanical fasteners, or other means. The bag then might be: stored at room temperature, put into cold storage, boiled in water, frozen, put into additional packaging, or some combination of the above, possibly with other processes and/or materials involved. As an example, leftovers might be put into the bag, and the bag stored in the freezer. Later the bag might be removed from the freezer and put into boiling water to heat the contents, and then the bag might be cut open and the contents put onto a plate for serving.

[0034] An alternative example of embodiment use would use sheet material to be sealed around contents and air withdrawn through an edge or hole in part relying on air passages formed by raised irregular surfaces contacting other surfaces.

[0035] Whether one or two walls of a bag or pouch use raised irregular surfaces on their interiors, such surfaces may help in opening the bag as such surfaces space apart the two edges at the bag entrance and thus make it easier to separate the top of the bag for opening and loading.

[0036] It is believed that a surface texture resembling that of 60 grit sandpaper and having a texture depth from peak to adjacent valley of between .004 and .029 inches offers advantages over other designs for use in evacuated pouches and other packaging used in the home or for commercial purposes. These advantages include relatively rapid air evacuation and good economics in production using current commercially available packaging films and manufacturing techniques. It is also believed for similar reasons that raised irregular surfaces in general that practice the present inventions gain advantage if their depth from peak to adjacent valley is at least .001 inches and with particular advantage when

this dimension is more than .004 inches. It is further believed that there are distinct advantages to applying raised irregular textures to most or all of both sheets forming a pouch, or to most or all of perimeter walls forming packaging (more than 50% of the interior surface), with such advantages including, but not limited to, reduced chance of imprinting undesirable regular patterning on package contents and reduction of sticking of packaging to package contents after freezing. None of the specifications contained in this paragraph are to be considered limitations of the present inventions, but merely as guidelines where advantages may be gained.

[0037] Although evacuation and heat sealing are not inherently necessary to practice the present inventions, both gain advantages, as described herein, when used in conjunction with the present inventions. Also, packages using the present inventions need not necessarily be frozen, cooked, refrigerated, or stored. However, packaging undergoing each of these processes may gain advantages as described herein from practicing the present invention. Packaging practicing the present invention may be sealed shut using heat welding, adhesives, static attraction, mechanical fasteners, or by other means.

[0038] What has been described herein are exemplary embodiments that incorporate the present invention. One knowledgeable in the art will readily recognize that many variations are possible from the descriptions herein without departing from the nature and spirit of the invention. As but a few brief examples: surface textures such as might be found on concrete or macadam roadway or leather might be used; different materials might be employed such as ceramics, metal foils or laminates using metal foils; the raised irregular surfaces might be used on the interiors of cartons or containers either in conjunction with vacuum or with freezing or with cooking or not; etc.

[0039] Such variations should be incorporated by inference into the teachings herein. Accordingly, the protection afforded this application shall be limited only by accepted claims and their legal equivalents.

Claims

1. A bag used for vacuum packaging items comprising:

a first wall and an opposing second wall which act together in the formation of a bag;
the first and second walls both being made of gas impermeable material;
the first wall having a first interior face which fronts the second wall;
the second wall having a second interior face which fronts the first wall;
the bag having an opening through which the bag may be evacuated;

the first wall having on the first interior face adjacent to the opening, a first raised irregular surface, and the first raised irregular surface extending away from the opening along the first interior face such that the bag is adapted to be evacuated by drawing air through the opening and through interior air passages, at least some of which are formed between the first raised irregular surface other surfaces it contacts; and a seal to close the opening air tight after the bag is evacuated.

2. The bag of claim 1 wherein the raised irregular surface has a depth from peak to adjacent valley of at least .001 inch.
3. The bag of claim 1 wherein the raised irregular surface has a depth from peak to adjacent valley of between .004 and .029 inches.
4. The bag of claim 1 further including the first wall having an essentially uniform thickness in areas containing the first raised irregular surface.
5. The bag of claim 1 further including the first wall having a first exterior face which fronts away from the second wall and the first exterior face being generally flat in locations backing areas containing the first raised irregular surface.
6. The bag of claim 1 wherein the first wall has a first and a second layer with the first layer including the first interior face and being able to be welded to the second interior face, and the second layer being gas impermeable.
7. The bag of claim 1 further including the second wall having a second raised irregular surface along the second interior face, such that the bag is adapted to be evacuated by drawing air through the opening and through air passages, at least some of which are channels created between the second raised irregular surface and other surfaces it contacts.
8. The bag of claim 7 further including at least half of the combined surface area of the first and second interior faces including a raised irregular surface.

9. A package for containing foods or other articles and the package comprising:

a flexible perimeter containment wall;
the flexible perimeter containment wall being integral to a formed container;
an opening through which air may be evacuated from the container;
the containment wall including an inside face fronting the interior of the container;

a raised irregular surface extending along the inside face, from a location adjacent to the opening, to an area away from the opening; and the container adapted to be evacuated by air being drawn out of the container through the opening and through air channels, at least some of which are formed between the raised irregular surface and surfaces contacted by the raised irregular surface.

10. The package of claim 9 further including an air tight seal adapted to close the opening after the container has been evacuated.

11. The package of claim 9 further including the raised irregular surface having a depth of between .004 and .029 inches from peak to adjacent valley.

12. The package of claim 9 wherein at least 50% of the interior surface of the flexible perimeter containment wall includes a raised irregular surface.

13. The package of claim 9 further including the containment wall being transparent.

14. The package of claim 9 wherein the raised irregular surface is transparent.

15. The package of claim 9 wherein the package is adapted to receive foods having a soft outer surface which is able to be imprinted by a raised patterned surface being pressed against the package contents by pressures caused by the evacuation of the container.

16. The package of claim 9 wherein the package is adapted to receive foods having an outer surface able to be imprinted by a raised patterned surface causing uneven freezer burn while the foods are in frozen storage.

17. A method of food storage using evacuated flexible wall containers which have interior wall faces which include a raised irregular surface, comprising the steps of:

forming a container having flexible containment walls which include an interior raised irregular surface;
loading contents into the container;
drawing air out of the container at least in part using air passages formed between the raised irregular surface and surfaces it contacts; and
sealing the container air tight.

18. The method of claim 17 further including sealing the container air tight using heat welding.

19. The method of claim 17 further including the contents being food.

20. The method of claim 17 with the further step after sealing the container air tight of placing the container in cold storage.

21. The method of claim 17 with the further step after sealing the container air tight of placing the container in a microwave oven.

22. The method of claim 17 with the further step after sealing the container air tight of placing the container in boiling water.

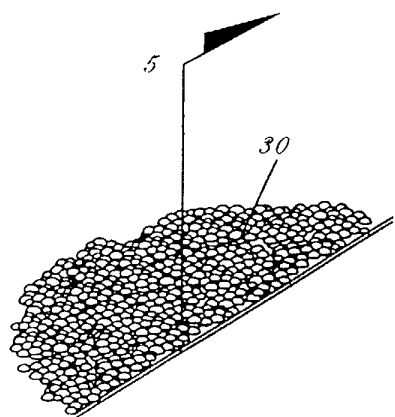
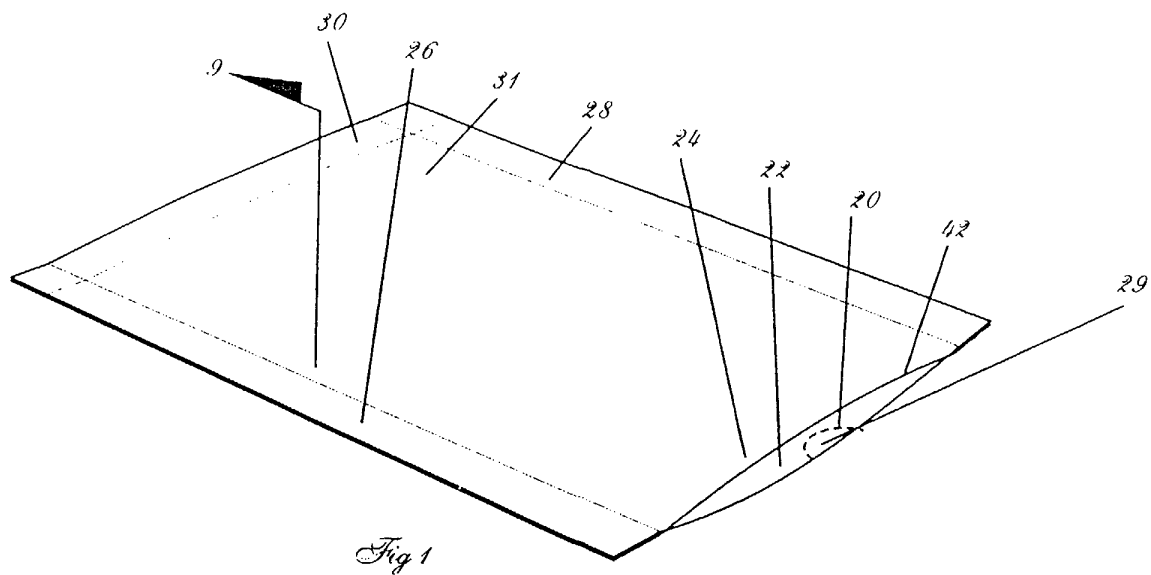


Fig 2

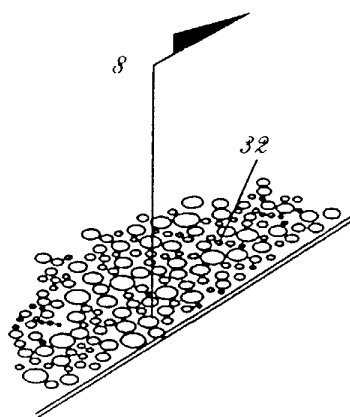


Fig 3

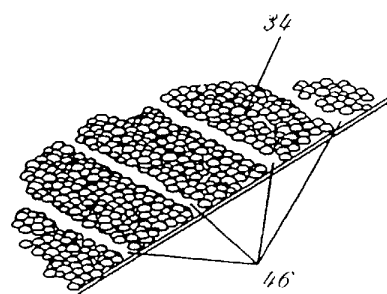


Fig 4



Fig 5



Fig 6



Fig 7



Fig 8

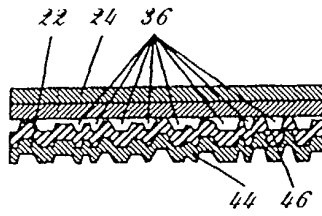


Fig 9

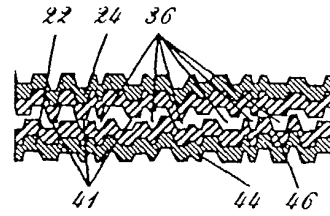


Fig 10

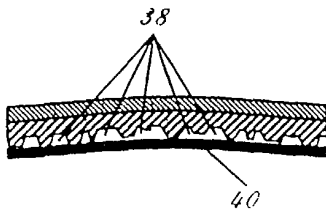


Fig 11



Fig 12



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EUROPEAN SEARCH REPORT

Application Number
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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			

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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