FLEXIBLE STORAGE BAG WITH VENT BETWEEN TWO ZIPPER

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ABSTRACT
A bag comprising a receptacle and first and second reclosable structures installed inside and across a mouth of the receptacle, the first and second reclosable structures being parallel and spaced apart from each other. At least portions of the first and second reclosable structures bound a passageway within the mouth of the receptacle when the first and second reclosable structures are in fully closed states. The receptacle comprises a vent that is in flow communication with an interior volume of the receptacle via the passageway when both the first and second reclosable structures are in at least partially open states. If, while the first and second reclosable structures are in fully closed states, the pressure inside the interior volume is increased sufficiently, the first reclosable structure will open at least partly to allow gas from the interior volume to escape into the passageway while the second reclosable structure remains in a fully closed state.
FLEXIBLE STORAGE BAG WITH VENT BETWEEN TWO ZIPPERS

RELATED PATENT APPLICATION

[0001] This application claims the benefit, under Title 35, United States Code, §119(e), of U.S. Provisional Application No. 61/044,541 filed on Apr. 14, 2008.

BACKGROUND

[0002] This invention relates to a flexible bag for use in the microwaving of cookable items, and more specifically pertains to the controlled venting of any pressure or steam generated within the bag during microwaving to assure that such is effectively released to the atmosphere, preferably without substantially opening of the structured bag, for maintaining the freshly cooked and heated texture for the food product, until the bag is physically opened for consumption or use by the consumer.

[0003] Historically, reclosable bags having press-to-close or slide-to-close reclosable feature were designed for food storage applications such as non-refrigerated and refrigerated storage. These bag products were manufactured from a combination of polyethylene resins with a reclosable feature. More recently, such reclosable bag products have been designed for high-temperature applications; for example, they are microwavable.

[0004] The uses and applications for reclosable bag technology are continually expanding. There is a need for improvements in reclosable bags or pouches designed for high-temperature applications.

BRIEF SUMMARY

[0005] Disclosed herein are flexible storage bags having two zippers and one or more vents located therebetween. The inner zipper is designed to open when the pressure inside the bag increases a sufficient amount during cooking of the bag contents. When the inner zipper opens, steam from inside the bag can then escape through the vent or vents while the outer zipper remains closed. Preferably the bag has a bottom gusset so that it can stand upright in a microwave oven. When the bag contents are fully cooked, the bag can be removed from the oven and the outer zipper can be opened, allowing the user to access the bag contents. If the user wishes to store any portion of the bag contents not used, the user can simply close both zippers and then place the reseal bag inside a refrigerator. The remaining contents of the bag are not exposed to ambient air via the vent or vents once the inner zipper has been resealed. The bag can again be placed in a microwave oven for re-use.

[0006] One aspect of the invention is a bag comprising a receptacle and first and second reclosable structures installed inside the receptacle, the first reclosable structure bounding an interior volume for product inside the receptacle when the first reclosable structure is in a fully closed state, and at least portions of the first and second reclosable structures bounding a passageway inside the receptacle when the first and second reclosable structures are in fully closed states, the receptacle comprising a vent that is in flow communication with the interior volume via the passageway when both the vent and the first reclosable structure are in at least partially open states, wherein if, while the first and second reclosable structures are in fully closed states, the pressure inside the interior volume is increased sufficiently, the first reclosable structure will open at least partly to allow gas from the interior volume to escape into the passageway while the second reclosable structure remains in a fully closed state.

[0007] Another aspect of the invention is a bag comprising a receptacle and first, second and third reclosable structures installed inside the receptacle, the first reclosable structure bounding a first interior volume inside the receptacle when the first reclosable structure is in a fully closed state, the first and second reclosable structure bounding a second interior volume inside the receptacle when the first and second reclosable structures are in fully closed states, and at least portions of the second and third reclosable structures bounding a passageway inside the receptacle when the second and third reclosable structures are in fully closed states, the receptacle comprising a vent that is in flow communication with the second interior volume via the passageway when both the vent and the second reclosable structure are in at least partially open states, wherein if, while the first reclosable structure is in a fully closed state, the pressure inside the first interior volume is increased sufficiently, the first reclosable structure will open at least partly to allow mixing of the contents of the first and second interior volumes, and wherein if, while the first reclosable structure is in a partially open state and the second and third reclosable structures are in fully closed states, the pressure inside the interior volume is further increased sufficiently, the second reclosable structure will open at least partly to allow gas from the second interior volume to escape into the passageway while the third reclosable structure remains in a fully closed state.

[0008] A further aspect of the invention is a bag comprising a receptacle and first and second reclosable structures installed inside and across a mouth of the receptacle, the first and second reclosable structures being parallel and spaced apart from each other, and at least portions of the first and second reclosable structures bounding a passageway within the mouth of the receptacle when the first and second reclosable structures are in fully closed states, the receptacle comprising a vent that is in flow communication with an interior volume of the receptacle via the passageway when both the vent and the first reclosable structure are in at least partially open states, wherein if, while the first and second reclosable structures are in fully closed states, the pressure inside the interior volume is increased sufficiently, the first reclosable structure will open at least partly to allow gas from the interior volume to escape into the passageway while the second reclosable structure remains in a fully closed state.

[0009] Other aspects of the invention are disclosed and claimed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a drawing showing an isometric view of a vented reclosable storage bag in accordance with one embodiment.

[0011] FIG. 2 is a drawing showing a plan view of the storage bag depicted in FIG. 1.

[0012] FIGS. 3-6 are drawings showing sectional view of vented reclosable storage bags in accordance with alternative embodiments.

[0013] FIG. 7 is a drawing showing a plan view of a vented reclosable storage bag having serpentine passageways between a pair of zippers.

[0014] FIG. 8 is a drawing showing a plan view of a vented reclosable storage bag having multiple product compartments.
DETAILED DESCRIPTION

The vented reclosable storage bags disclosed herein are designed to withstand the particular temperature and pressure conditions attending microwave cooking. Each reclosable bag is made of flexible material, such as polypropylene, plastic lamination films or other high-melting-temperature flexible material. Each reclosable bag has a pair of reclosable structures, e.g., a pair of plastic zippers, each zipper comprising a pair of zipper strips having mutually interlockable closure profiles. The reclosable structures may be arranged in mutually parallel and spaced-apart relationship with at least one passageway therebetween. Also each reclosable bag has one or more vents for pressure relief. The vents are located between the reclosable structures, preferably at or near the side edges of the storage bag. Each vent may take the form of a slit or a small opening. The vent can also be made to be forced open during initial exposure to pressure. Optionally, the storage bag may be constructed with a bottom gusset that enables the bag to stand upright inside a microwave oven. For each embodiment disclosed hereinafter, the plastic film used to construct the bag may be thin for single-use bags or thick for multiple-use bags.

The inner reclosable structure is designed to partially open when the pressure inside the bag increases sufficiently (e.g., to a pressure in the range greater than 1 and less than 4 pounds per square inch) during cooking. For example, the bag and its contents may be placed inside a microwave oven, which oven is then set to cook the bag contents. During this process, the pressure buildup inside the bag is relieved by the partial opening of the inner reclosable structure and the release of steam through the one or more vents formed in the reclosable bag. The pressure relief prevents the bag from bursting or otherwise having its integrity compromised. The outer reclosable structure remains closed during cooking. After cooking, the outer reclosable structure can be opened and a desired portion of the cooked contents can be removed by the consumer. After cooling, the inner reclosable structure can be resealed and the cooked contents that remain inside the intact bag can be stored for future use without the need to transfer the remaining bag contents to some other airtight container.

FIG. 1 depicts one embodiment of a high-temperature vented reclosable storage bag suitable for use in cooking food. The bag shown in FIG. 1 comprises a receptacle 2 made of flexible material, such as polypropylene film, plastic lamination film, other higher-melting-temperature material, or a combination of two or more of the foregoing types of flexible material. A web of flexible high-temperature is folded and then heat sealed (or ultrasonically welded) in marginal regions adjacent the side edges to form a front panel 4, a rear panel 6 and a bottom gusset 8. The receptacle 2 has an interior volume (not shown) for food product and a mouth in which inner and outer reclosable plastic zippers 10 and 12 are installed. The top and bottom edges of the receptacle are indicated by reference numerals 14 and 16 respectively in FIG. 1. In this embodiment, each zipper comprises a string (i.e., flangeless) zipper consisting of two zipper strips having mutually interlockable closure profiles respectively. These zipper strips are joined to the bag walls by heat sealing or ultrasonic welding and extend across the mouth of the receptacle. Preferably they are mutually parallel and spaced apart. The upper portions of the front and rear panels of the receptacle are provided with respective pluralities of mutually parallel gripping ribs 18 (the ribs on the rear panel are not visible in FIG. 1) which facilitate gripping of those upper portions during opening of the outer zipper 10 by the user.

The space between the zippers 10 and 12 may include a passageway 11 that allows flow communication between a pair of vents 20 and 20' respectively located at the side edges of the bag. More specifically, that passageway is bounded by the zippers 10 and 12 and by those confronting portions of the front and rear panels 4 and 6 that extend between the zippers 10 and 12. The vent 20 is formed by confronting marginal portions of the front and rear panels 4 and 6 that are disposed adjacent the left-hand side edge of the receptacle 2; the vent 20' is formed by confronting marginal portions of the front and rear panels 4 and 6 that are disposed adjacent the right-hand side edge of the receptacle 2. The vents 20 and 20' may be closed until such time that the inner zipper 12 partially opens, allowing steam to flow into the passageway 11 and then out through the vents. Alternatively, the vents 20 and 20' may already be open prior to the escape of steam into the passageway.

FIG. 2 shows a plan view of the storage bag depicted in FIG. 1. The side seals 22 and 24 are indicated by hatching. Above the horizontal dashed line (which indicates the bottom gusset 8), respective confronting marginal portions of the front and rear panels of the receptacle are sealed together except where the ends of the zippers 10 and 12 intervene and where the vents 20 and 20' are located. As shown, vents 20 and 20' are formed by confronting marginal portions of the front and rear panels of the receptacle that are not sealed together. The vents can be formed by providing gaps in the heated side sealing bars typically used to form side seals 22 and 24. The ends of the zippers 10 and 12 are also joined together in the side seals 22 and 24, with the adjoining marginal portions of the front and rear panels being joined to the fused zipper ends. Below the horizontal dashed line (8), respective marginal portions of the front panel and rear panels of the receptacle and intervening marginal portions of the two gusset panels are all sealed together in the side seals 22 and 24.

FIG. 2 shows a vented reclosable storage bag that is empty and flat. A person skilled in the art will appreciate that when the central portion of the bottom gusset 8 is unfolded and the receptacle is filled with food product, the portions of the bottom edges of the front and rear panels disposed between the side seals 22 and 24 will move apart and, in combination with the unfolded portion of the bottom gusset, will form a base that enables the filled bag to stand upright during cooking.

FIG. 3 is a sectional view of a vented reclosable storage bag having a bottom gusset in accordance with an alternative embodiment. The bottom gusset 8 comprises two gusset panels 26 and 28 formed by folding a web. As previously described, in the side seal regions the marginal portions of the gusset panels 26 and 28 and the front and rear panels 4 and 6 of the receptacle are all joined together by heat sealing. The embodiment shown in FIG. 3 includes three zippers. The outer zipper comprises a female element 30 and a double hook element 32 that interlocks with the female element 30 in a conventional manner to form a closure. The intermediate zipper comprises a female element 34 and a monohook element 36 that interlocks with the female element 34 in a conventional manner to form a closure. The inner zipper
comprises a female element 38 and a monohook element 40 that interlocks with the female element 38 in a conventional manner to form a closure. The passageway 11 is disposed between the female elements 34 and 38. In this embodiment, a vent 42 is formed in the front panel 4 and a vent 42' is formed in the rear panel 6. Each of these vents may be a slit or an opening. The vents 42 and 42' allow the escape of steam from the interior volume of the receptacle when the inner zipper is partially open (not shown), which steam flows through the opening in the inner zipper, into the passageway 11, and then out the vents 42 and 42'. Alternatively, the person skilled in the art will readily understand that the vents can be placed at the side edges in the manner previously described with reference to FIG. 1.

FIG. 4 is a sectional view of a vented reclosable storage bag in accordance with a further embodiment. In this embodiment the receptacle is shown as not having a bottom gusset, but a person skilled in the art will readily appreciate that a bottom gusset could be provided. The embodiment shown in FIG. 4 includes two zippers. The outer zipper comprises a female element 44 and a double hook element 46 that interlocks with the female element 44 in a conventional manner to form a closure. The inner zipper comprises a female element 48 and a double hook element 50 that interlocks with the female element 48 in a conventional manner to form a closure. The passageway 11 is disposed between the female elements 44 and 48. In this embodiment, a vent 42 is formed in the front panel 4 and a vent 42' is formed in the rear panel 6. Each of these vents may be a slit or an opening. As previously described, the vents 42 and 42' allow the escape of steam from the interior volume of the receptacle when the inner zipper is partially open (not shown), which steam flows through the opening in the inner zipper, into the passageway 11, and then out the vents 42 and 42'. Alternatively, the vents can be placed at the side edges in the manner previously described with reference to FIG. 1.

FIG. 5 is a sectional view of a vented reclosable storage bag in accordance with yet another embodiment. Again the receptacle is shown as not having a bottom gusset, but optionally a bottom gusset could be provided. The embodiment shown in FIG. 4 includes two zippers. The outer zipper comprises a female element 44 and a double hook element 46 that interlocks with the female element 44 in a conventional manner to form a closure. The inner zipper comprises a female element 52 having a detent 78, a double hook element 54 that interlocks with the female element 52, and a backup element 56. The detent 78 bears against the backup element 56 when the female element 52 starts to open, thereby providing a resistance to opening. The passageway 11 is disposed between the female element 44 and the backup element 56. In this embodiment, a vent 42 is formed in the front panel 4 and a vent 42' is formed in the rear panel 6. Each of these vents may be a slit or an opening. As previously described, the vents 42 and 42' allow the escape of steam from the interior volume of the receptacle when the inner zipper is partially open (not shown), which steam flows through the opening in the inner zipper, into the passageway 11, and then out the vents 42 and 42'. Alternatively, the vents can be placed at the side edges in the manner previously described with reference to FIG. 1.

FIG. 6 is a sectional view of a vented reclosable storage bag in accordance with yet another embodiment. This embodiment is similar to the embodiment shown in FIG. 4, with the difference that instead of two string zippers, a double zipper with common base strips 74 and 76 is installed in the mouth of the receptacle. The outer zipper comprises a female element 44 and a double hook element 46 that interlocks with the female element 44 in a conventional manner to form a closure. The inner zipper comprises a female element 48 and a double hook element 50 that interlocks with the female element 48 in a conventional manner to form a closure. The passageway 11 is disposed between the female elements 44 and 48 and between the common base strips 74 and 76. In this embodiment, a vent 42 is formed in the joined portions of the front panel 4 and common base strip 74, and a vent 42' is formed in the joined portions of the rear panel 6 and common base strip 76. Each of these vents may be a slit or an opening. Alternatively, the vents can be formed by confronting marginal portions of the common base strips (i.e., marginal portions disposed between the closure profiles) that are not sealed together in the side seal regions.

A vented reclosable storage bag in accordance with a further embodiment is shown in FIG. 7. The zippers 10 and 12 are mutually parallel and spaced apart to form a passageway 11 that communicates with a pair of vents 20 and 20' located between the zippers and at the side edges. The distance between the zippers can be varied to allow precise control of steam vent size and the rate at which steam can escape from the bag. In the example depicted in FIG. 7, means are provided to direct the flow of steam along serpentine paths 64 and 70 before exiting via the vents 20 and 20'; thereby better controlling the pressure inside the receptacle 2. The serpentine path 64 is formed by heat sealing the front and rear panels together in rectangular areas 60 and 62; the serpentine path 70 is formed by heat sealing the front and rear panels together in rectangular areas 66 and 68. When the pressure inside the receptacle 2 increases to a sufficient level, a central portion of the inner zipper 12 will open, allowing steam to escape into passageway 11. The pressure differential between the inside and outside of the bag will cause some steam to flow toward vent 20 via serpentine path 64 and other steam to flow toward vent 20' via serpentine path 70.

With respect to all embodiments disclosed above, a person skilled in the art will appreciate that the broad scope of the invention includes reclosable storage bags having only one vent as well as bags having two or more vents disposed between the inner and outer zippers.

In accordance with further embodiments of the invention, a vented reclosable storage bag may be provided with multiple compartments that open at different times during cooking based on what is in each compartment, the zipper designs, and the compartment sizes. For example, one could have a little water and brown sugar in a top compartment and carrots in a bottom compartment. A reclosable bag having a bottom compartment 80 and a top compartment 82 is shown in FIG. 8. The top and bottom compartments are separated by a seal 72 that opens when a first pressure level in the top or bottom compartment is reached. Seal 72 may be a reclosable structure such as a plastic zipper. The top compartment has a plastic zipper 12 that opens when a second pressure level is reached, the second pressure level being higher than the first pressure level. In this example, the seal 72 between the top and bottom compartments would open first, allowing the water and brown sugar in the top compartment 82 to fall into the bottom compartment 80 and be mixed with the carrots during cooking. As the temperature inside the bag rises further, the internal pressure increases until the second pressure level is reached, at which time the zipper 12 would partially
open, allowing steam from the top compartment 82 to escape into the passageway 11 and then out vents 20 and 20 in the manner previously described.

[0029] While the invention has been described with reference to preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for members thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation to the teachings of the invention without departing from the essential scope thereof. Therefore it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

1. A bag comprising a receptacle and first and second reclosable structures installed inside said receptacle, said first reclosable structure bounding an interior volume for product inside said receptacle when said first reclosable structure is in a fully closed state, and at least portions of said first and second reclosable structures bound a passageway inside said receptacle when said first and second reclosable structures are in fully closed states, said receptacle comprising a first vent that in flow communication with said interior volume via said first passageway when both said first vent and said first reclosable structure are in at least partially open states, wherein if, while said first and second reclosable structures are in fully closed states, the pressure inside said interior volume is increased sufficiently, said first reclosable structure will open at least partly to allow gas from said interior volume to escape into said first passageway while said second reclosable structure remains in a fully closed state.

2. The bag as recited in claim 1, wherein at least portions of said first and second reclosable structures are in fully closed states, said receptacle comprising a second vent that is in flow communication with said interior volume via said second passageway when both said second vent and said first reclosable structure are in at least partially open states.

3. The bag as recited in claim 1, wherein said receptacle comprises first and second walls, said first reclosable structure comprises first and second closure profiles, and said second reclosable structure comprises third and fourth closure profiles, said first and second closure profiles being mutually engageable to close said first reclosable structure, and said third and fourth closure profiles being mutually engageable to close said second reclosable structure.

4. The bag as recited in claim 3, wherein said first vent comprises an opening or slit located on said first wall at an elevation between said first and second reclosable structures.

5. The bag as recited in claim 3, wherein said first and second walls are joined to each other in first and second marginal portions disposed along a first side edge of said receptacle, said first and second marginal portions being separated by a gap where said first and second walls are not joined to each other, respective portions of said first and second walls at said gap forming said first vent.

6. The bag as recited in claim 3, wherein said first and third closure profiles project from a first base strip joined to said first wall, and said second and fourth closure profiles project from a second base strip joined to said second wall.

7. The bag as recited in claim 6, wherein respective portions of said first and second base strips, disposed adjacent a first side edge of said receptacle, are not joined to each other and form said first vent.

8. The bag as recited in claim 6, wherein said first passageway has a serpentine shape, a part of a boundary of said first passageway being formed by a seal, said seal being a zone where said first and second base strips are sealed together.

9. The bag as recited in claim 3, wherein said first passageway has a serpentine shape, a part of a boundary of said first passageway being formed by a seal, said seal being a zone where said first and second walls are sealed together.

10. The bag as recited in claim 1, further comprising a third reclosable structure installed inside said receptacle, wherein said third reclosable structure divides said interior volume into first and second chambers when said first and third reclosable structures are in fully closed states.

11. The bag as recited in claim 3, wherein said receptacle further comprises a bottom gusset.

12. A bag comprising a receptacle and first, second, and third reclosable structures installed inside said receptacle, said first reclosable structure bounding a first interior volume inside said receptacle when said first reclosable structure is in a fully closed state, said first and second reclosable structure bounding a second interior volume inside said receptacle when said first and second reclosable structures are in fully closed states, and at least portions of said second and third reclosable structures are in fully closed states, said receptacle comprising a first vent that is in flow communication with said second interior volume via said first passageway when both said first vent and said second reclosable structure are in at least partially open states, wherein if, while said first reclosable structure is in a fully closed state, the pressure inside said first interior volume is increased sufficiently, said first reclosable structure will open at least partly to allow gas from said first interior volume to escape into said first passageway while said second reclosable structure remains in a fully closed state.

13. The bag as recited in claim 12, wherein at least portions of said second and third reclosable structures are in fully closed states, said receptacle comprising a second vent that is in flow communication with said second interior volume via said second passageway when both said second vent and said second reclosable structure are in at least partially open states.

14. The bag as recited in claim 12, wherein said receptacle comprises first and second walls, said first reclosable structure comprises first and second closure profiles, and said second reclosable structure comprises third and fourth closure profiles, and said third reclosable structure comprises fifth and sixth closure profiles, said first and second closure profiles being mutually engageable to close said first reclosable structure, and said third and fourth closure profiles being mutually engageable to close said second reclosable structure, and said fifth and sixth closure profiles being mutually engageable to close said third reclosable structure.
15. The bag as recited in claim 14, wherein said first vent comprises an opening or slit located on said first wall at an elevation between said second and third reclosable structures.

16. The bag as recited in claim 14, wherein said first and second walls are joined to each in first and second marginal portions disposed along a first side edge of said receptacle, said first and second marginal portions being separated by a gap where said first and second walls are not joined to each other, respective portions of said first and second walls at said gap forming said first vent.

17. The bag as recited in claim 14, wherein said first passageway has a serpentine shape, a part of a boundary of said first passageway being formed by a seal, said seal being a zone where said first and second walls are sealed together.

18. The bag as recited in claim 12, wherein said first reclosable structure partly opens in response to a first pressure level inside said first interior volume, and said second reclosable structure partly opens in response to a second pressure level inside said second interior volume, said second pressure level being greater than said first pressure level.

19. A bag comprising a receptacle and first and second reclosable structures installed inside and across a mouth of said receptacle, said first and second reclosable structures being parallel and spaced apart from each other, and at least portions of said first and second reclosable structures bounding a passageway within said mouth of said receptacle when said first and second reclosable structures are in fully closed states, said receptacle comprising a vent that is in flow communication with an interior volume of said receptacle via said passageway when both said vent and said first reclosable structure are in at least partially open states, wherein if, while said first and second reclosable structures are in fully closed states, the pressure inside said interior volume is increased to a first pressure level, said first reclosable structure will open at least partly to allow gas from said interior volume to escape into said passageway while said second reclosable structure remains in a fully closed state.

20. The bag as recited in claim 19, further comprising compartmentalizing means for dividing said interior volume into first and second compartments, wherein if the pressure inside one of said first and second compartments is increased to a second pressure level less than said first pressure level, said compartmentalizing means will open at least partly to allow mixing of the contents of said first and second compartments while said first reclosable structure remains in a fully closed state.

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