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(54) **RECLOSEABLE BAG**

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(57) **ABSTRACT**

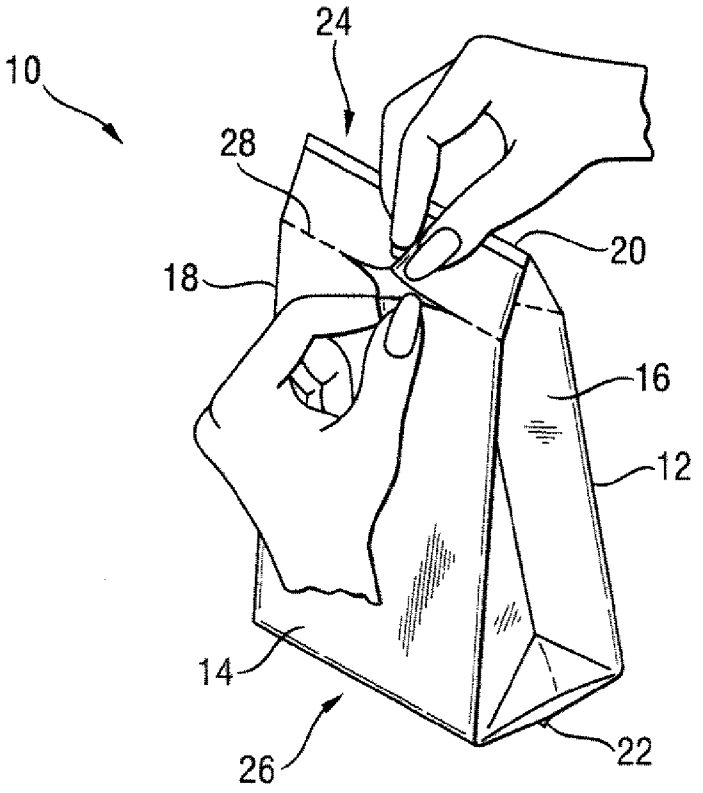
The invention relates to bag (**10**) comprising a line of weakness (**28**) for ease of opening, and a reclosing means (**32**), wherein the bag (**10**) comprises a front panel (**12**), back panel (**14**) and opposing side panels (**16**, **18**), the panels being sealed together to provide a top section (**24**) and a bottom section (**26**), and wherein the line of weakness (**28**) extends around all of the front (**12**), back (**14**) and side (**16**, **18**) panels so that the top section (**24**) is completely removable from the rest of the bag, and wherein the reclosing means (**32**) is attached to the front (**12**), back (**14**) and side (**16**, **18**) panels adjacent to the line of weakness (**28**).

The invention also relates to process for forming bags (**10**) from a web of film (**30**), wherein the web of film (**30**) is transported along one or more machines, the process comprising the steps of:

(a) providing a line of weakness (**28**) across substantially the whole width of the film substantially in the cross-machine direction,

(b) affixing reclosing means (**32**) adjacent to the line of weakness;

(c) cutting and sealing the film to form a bag (**10**) comprising the line of weakness (**28**) and the reclosing means (**32**).



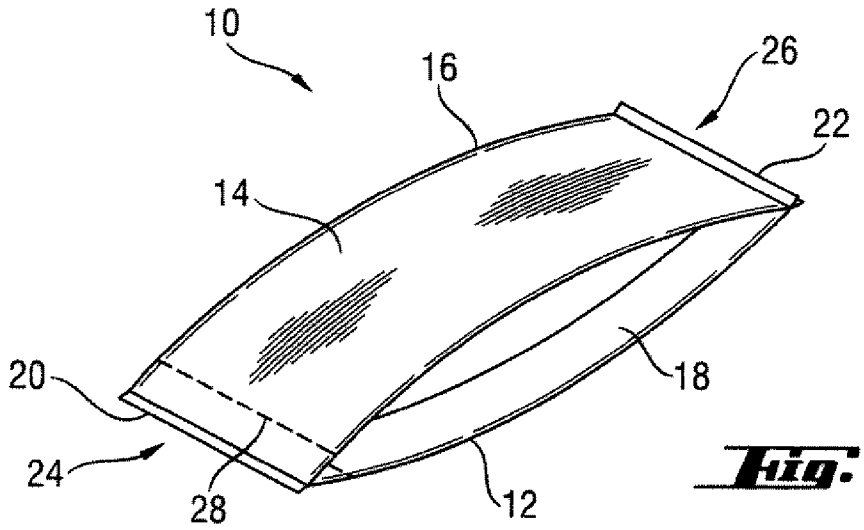


Fig. 1

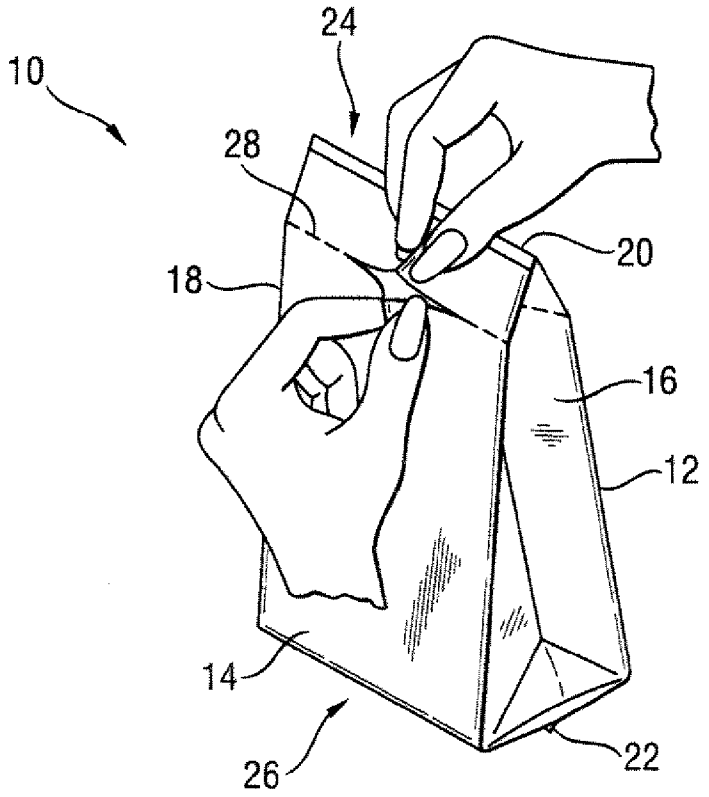


Fig. 2

Fig. 3

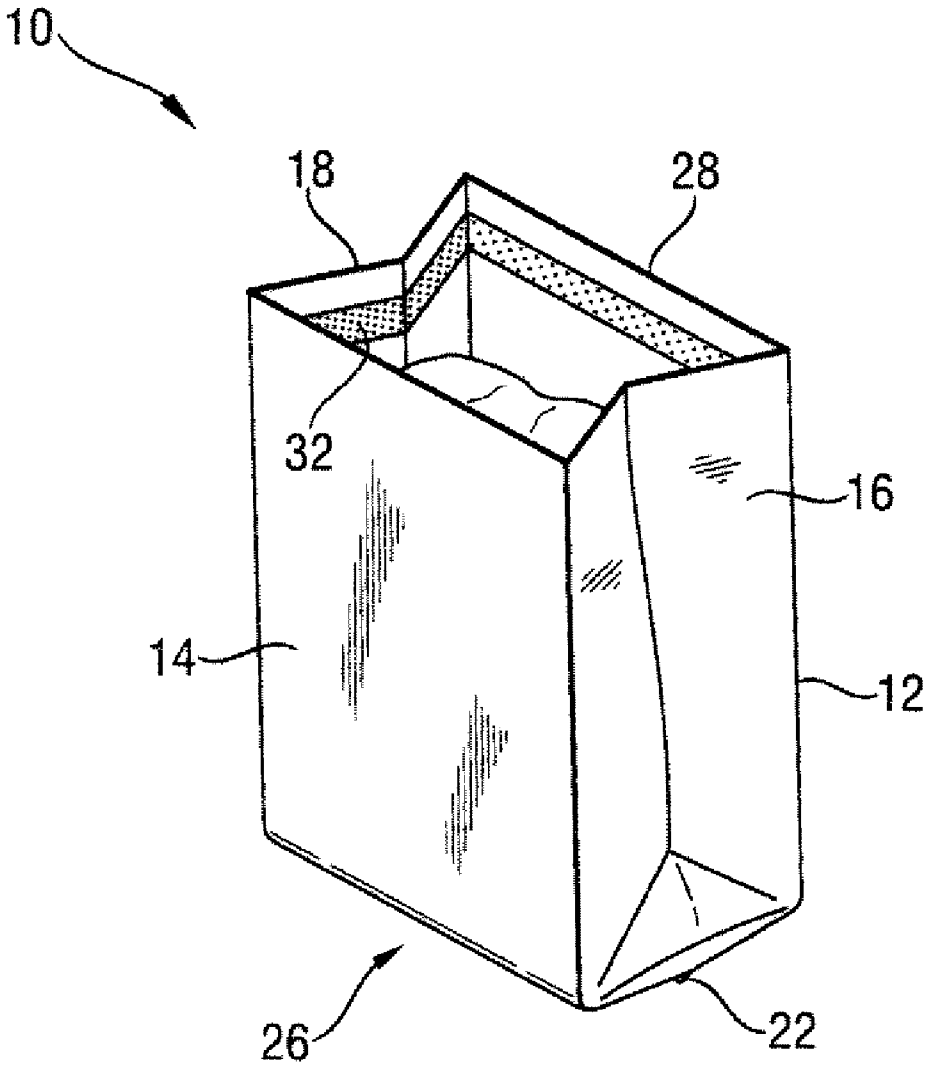


Fig. 4

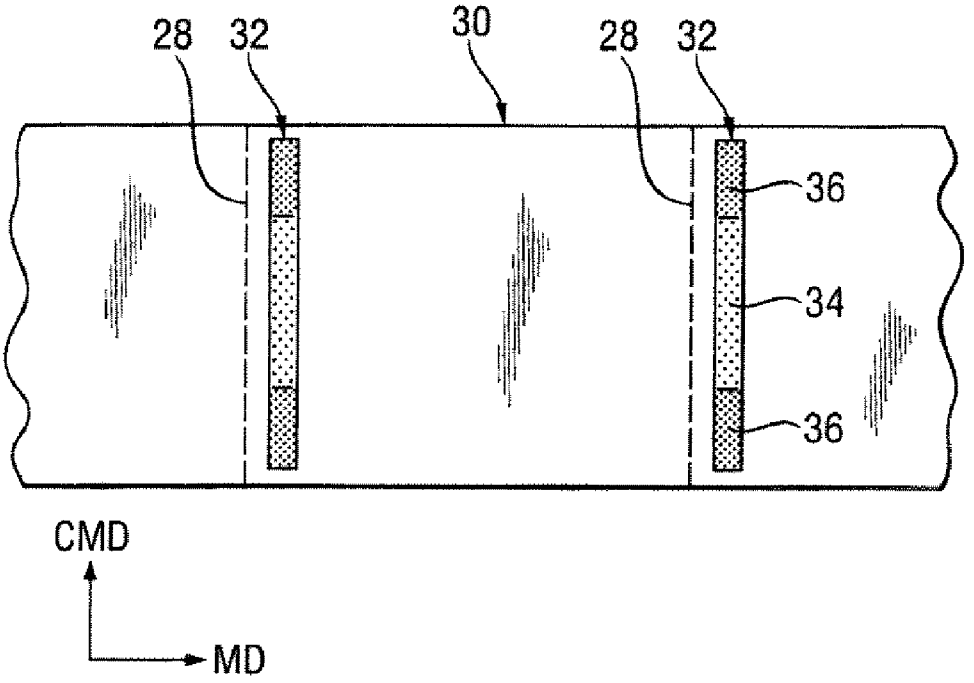
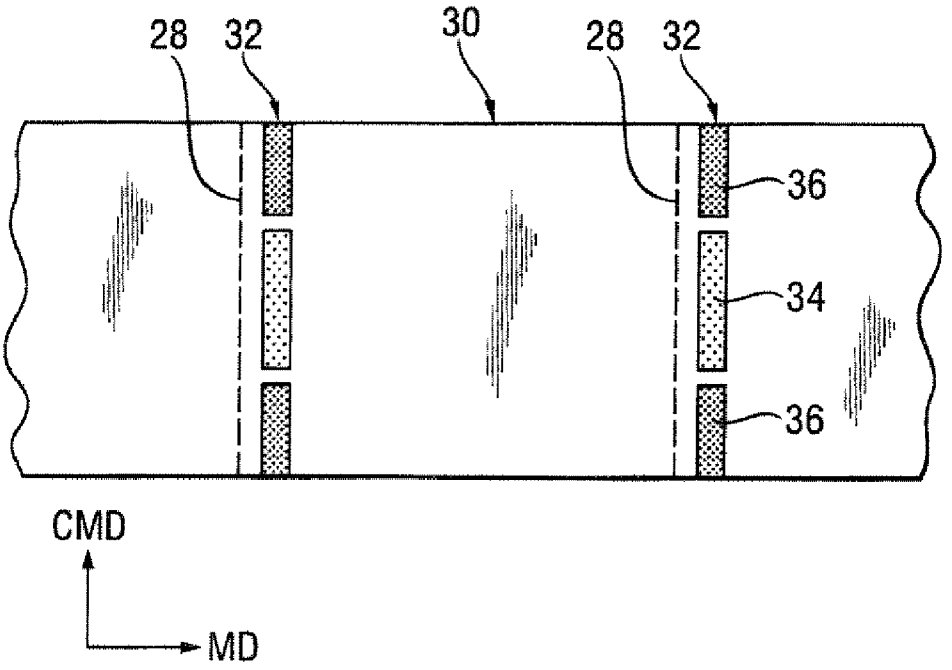


Fig. 5



RECLOSEABLE BAG

FIELD OF THE INVENTION

[0001] This invention relates to bags for use in storing products such as but not limited to powdered or granular detergent, pet food, coffee, cereal etc., wherein the bag has a line of weakness, which provides for easy opening of the bag, and a re-closing means.

BACKGROUND OF THE INVENTION

[0002] Flexible bags are used today to package a wide variety of consumer products including granular detergents. In order to be useful as a package these bags must be resistant to opening during shipping and handling at the store. Currently marketed detergent bags have several disadvantages. First, current bags are difficult to open without the aid of scissors, a knife or other utensil. Often times the consumer attempts to rip open the bag, with the end result being that the contents are spilled out. Additionally, the bag and any text printed on the bag, can become distorted by the pulling and stretching of the opening action.

[0003] Second, once opened, current detergent bags offer no efficient and effective means of re-closing the bag. The ability to re-close the bag is desired by many consumers. This is especially true for bulk size packages. Until now methods for re-closing such bags have been unsatisfactory. These methods include zippers and adhesive tapes as well as simple folding mechanisms. The main drawback of the aforementioned methods is that contamination of the re-closing means with the contents of the bag prevents the means from forming a reliable, re-usable seal. Additionally, simple folding mechanisms provide no protection from product leakage.

[0004] Accordingly the need remains for a flexible bag for packaging consumer products that is easy to open i.e. without the aid of a knife, scissors or other utensil. There remains an additional need for a mechanism by which the bag can be securely re-closed after opening by the consumer. The re-closing mechanism preferably should be unaffected by any contamination.

SUMMARY OF THE INVENTION

[0005] The present invention meets the aforementioned needs by providing a bag comprising a line of weakness for ease of opening, and a reclosing means, wherein the bag comprises a front panel, back panel and opposing side panels, the panels being sealed together to provide a top section and a bottom section, and wherein the line of weakness extends around all of the front, back and side panels so that the top section is completely removable from the rest of the bag, and wherein the reclosing means is attached to the front, back and side panels adjacent to the line of weakness.

[0006] The present invention further provides a process for forming bags from a web of film wherein the web of film is transported along one or more machines in a machine direction, the perpendicular direction in the plane of the film being the cross-machine direction, the process comprising the steps of:

[0007] (a) providing a line of weakness across substantially the whole width of the film substantially in the cross-machine direction;

[0008] (b) affixing reclosing means adjacent to the line of weakness;

[0009] (c) cutting and sealing the film to form a bag comprising the line of weakness and the reclosing means;

wherein steps (a), (b) and (c) are carried out in any order, on the same or separate machines, preferably steps (a) and (b) being completed before step (c); and repeating steps (a), (b) and (c) at regular intervals along the web so as to form multiple bags.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIGS. **1** and **2** are perspective views of a bag of the present invention.

[0011] FIG. **3** is a perspective view of a bag of the present invention after the top section has been completely removed.

[0012] FIG. **4** is a diagrammatic view of a section of web of film illustrating the process embodiment of the present invention.

[0013] FIG. **5** is a diagrammatic view of a section of web of film illustrating an alternative process embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying figures. As will be understood, the terms front and back as used herein to describe panels of the bag are for orientation purposes only and are otherwise interchangeable. As discussed more fully hereafter, the present invention is directed to a flexible bag for containing granular, powdered or other contents, preferably granular detergent, provided with a line of weakness to facilitate opening. A particularly preferred bag **10** made in accordance with the present invention is illustrated in FIGS. **1** and **2**. The bag **10** is illustrated having front panel **12**, back panel **14**, and side panels **16** and **18** with each panel having an upper edge **20** and a lower edge **22**. The bag **10** also has a top section **24** and a bottom section **26**, which are sealed by joining front panel **12** to back panel **14** along upper edges **20** and lower edges **22**. The bag **10** is provided with a line of weakness **28** in each of the front, back and side panels **12**, **14**, **16**, **18**. FIG. **3** illustrates the bag after the top section **24** has been completely removed, and shows the reclosing means **32**.

Bag Materials

[0015] The bags of the present invention are formed from materials including but not limited to polymeric film, woven materials, non-woven materials, preferably polyethylene film, more preferably monolayers, coextrusions, two-layer laminations, three-layer laminations and metalized laminations, all materials with or without lacquer coatings. Bags according to the present invention can be formed by any method known in the art. One method for forming flexible bags from a continuous web of material is well known in the art and described in U.S. Pat. No. 5,054,619. issued to Muckenfuhs. According to a preferred embodiment of the present invention, described in further detail below, a continuous web of material **30** shown in FIG. **4** is transported in the machine direction, MD, and is provided with a line of weakness **28** across substantially the whole width of the web **30** substantially in the cross-machine direction, CMD, and reclosing means **32** are affixed adjacent to the line of weakness **28** substantially in the cross-machine direction, CMD. The

reclosing means **32** shown in FIG. **4** comprises one strip of loops **34** and two strips of hooks **36**.

Line of Weakness

[0016] The easy opening feature of bags according to the present invention results from the weakening of the film material in the desired trajectory of bag rupture or separation.

[0017] The line of weakness extends through each of the front, back and side panels of the bag. This enables the entire top of the bag to be separated upon opening.

[0018] The line of weakness will deteriorate the strength of the film in such a way that it can withstand normal filling, packing and handling operation and yet be easily opened by the consumer. This behavior is achieved by reducing the trapezoidal tear strength of the original film. Reduction of the trapezoidal tear strength is also most likely accompanied by loss of tensile strength.

[0019] The line of weakness is characterized by the following test methods: a) ASTM D-882 Standard Test Method for Tensile Properties on Thin Plastic Sheeting and b) ASTM D-5733 Standard Test Method for Tearing Strength of Nonwoven Fabrics by the Trapezoidal Procedure. In accordance with ASTM D-882 and ASTM D-5733, the line of weakness must be parallel to the shortest side of the sample (i.e. width). The line of weakness must cover the entire width of the sample and must be centered with respect to the sample length. The slot for initiating the cut of the trapezoidal tear sample must be on top of the line of weakness.

[0020] The line of weakness is characterized by three parameters obtained from the above-mentioned standard tests. The first parameter is yield stress value. Preferably the yield stress value of the weakened film in the ASTM D-882 tensile test should be no less than 90% of the yield stress value of the un-weakened film. Second, the final or rupture stress value of the weakened film preferably should be no lower than 90% of the yield stress value of the unweakened film Y_1.

[0021] Third, the average trapezoidal tearing force according to ASTM D-5733, of the weakened film preferably should be less than 4 Kgf.

[0022] Additionally, the line of weakness may possess a pattern. Those patterns may take the form of a continuous line, a dashed line, or a combination thereof. However the most preferred pattern is the dashed line, wherein the dashed line is comprised of a plurality of scored segments. The length of each scored segment varies from about 0.12 mm to 4.4 mm, preferably varies from about 0.3 mm to 2 mm, and most preferably varies from about 0.6 mm to 1 mm. The distance between adjacent scored segments varies from about 0.4 mm to 4 mm, preferably varies from about 1 mm to 3 mm, and most preferably varies from about 1.5 mm to 2 mm. The score depth will vary depending upon the thickness of the film.

[0023] A starting notch may be provided at some point along the line of weakness. The starting notch provides an area, which is easier to tear because the scoring is deeper. If the line of weakness spans the back panel wherein there is also a vertical seal, the starting notch provides easy tearing through the multiple plies of the vertical seal to the line of weakness.

Method of Producing the Line of Weakness

[0024] The line of weakness can be produced using methods including but not limited to scoring, perforating, chemical treatment, preferably laser scoring, laser perforation, mechanical scoring, mechanical perforation, embossing methods, or combinations of these methods. The line of weakness is preferably made in the film before it is formed into a bag.

[0025] One method of making a line of weakness in a flexible film uses at least one laser. First a laser beam with sufficient wattage to evaporate a portion of the film material is focused onto the film. The use of laser technology allows for very accurate control of the depth or penetration from very slight scoring to complete perforation of the film. A laser using any form of electromagnetic radiation can be used. Suitable lasers for use in the present invention include those based on CO_2 gas.

[0026] The speed of the film and the movement of the laser beam are dependent upon the pattern and depth of score desired as well as the type of film used. Suitable methods for laser scoring films are disclosed in U.S. Pat. Nos. 3,626,143, 3,790,744, 3,909,582 all to American Can Company and U.S. Pat. Nos. 5,158,499 and 5,229,180 to American National Can Company. U.S. Pat. No. 5,001,325 to LPF Verpakkingen B.V, U.S. Pat. No. 4,743,123 to Wavin B. V., Japanese Patents 09133018, 07008283 and 06103200 all to Dainippon Printing Company.

[0027] Another suitable method for producing the line of weakness is the use of blades. The blades are installed on an engraving cylinder, which is mounted directly on the film processing machinery so that the cuts are made prior to formation of the bag. Different blade patterns can be used to get different patterns in the line of weakness. The pressure applied to the blades is also varied during the process to control the dimensions and depth of the cuts to ensure the bag opens easily.

[0028] Embossing is another alternative method for production of the line of weakness. The embossing technology weakens the film in specific areas by means of pressure, temperature, time and a deforming profile. The desired results are achieved by changing the caliper and/or material structure at the embossed trajectory. The basic equipment used for embossing consists of a sealing jaw capable of pressing against a back plate. A deforming profile or pattern is fixed to the jaw and heated. The film is pressed between the deforming profile and the back plate. The main variables known to affect this process are: heating temperature, cooling temperature, pressure, heating time, cooling time, film tension while embossing, film tension after embossing, back plate material, back plate thickness, back plate temperature, jaw pattern and jaw thickness. The embossing unit would be installed alter an unwinding station of film, preferably incorporated into the packaging equipment line. Suitable examples of embossing are described in U.S. Pat. No. 5,878,549 to American National Can Company.

Re-Closing Means

[0029] The re-closing means is preferably resistant to contamination by the contents of the bag. Its main objective is to protect granule products contained in bags from spillage, humidity, and other external factors that might affect the integrity of the product. This re-closing means preferably comprises a mechanical fastener, more preferably hook and loop or hook and hook type, attached to a flexible bag that allows consumers to open and securely close the bags as many times as product uses in the bag.

[0030] The means consists of placing fastening materials on opposite panels of the bag. In a preferred embodiment, the

panels are the front and the back panel although other configurations are contemplated. The fasteners can be either disposable or industrial materials. It is desired to use disposable materials to optimize costs. The mechanical fasteners can be of any shape and size, and in any disposition. The particular configuration of the re-closing means components should be such that the bag can be sealed throughout the entire use of the product contained therein. By sealed is meant that no product spills out when the bag is tipped on its side. Specifically, the re-closing means is characterized by the energy required to peel off one component of the fastener from the other component. This energy preferably should not be less than 2.4 Kgfmm per each Kg of product contained in the bag.

[0031] In a preferred embodiment the loop materials have a basis weight of less than 40 grams per square metre and more preferably less than 30 gsm. Preferably the basis weight of the hook material is less than 200 gsm. In particular loop materials such N29 supplied by Aplix, France have been found to be particularly effective. For the hooks, low basis weight extruded polypropylene hooks such Aplix 963 supplied by Aplix, France are preferred.

[0032] The re-closing means is intended to work with the easy opening feature described above which facilitates the opening of the bag. At least one piece of the mechanical fastener is placed on one panel of the bag while a piece of the matching fastener is placed on the opposite panel of the bag. Preferably one piece of the mechanical fastener is a horizontal strip adhered to the inside of the bag, most preferably two interacting horizontal strips are adhered to the insides of the front panel and the back panel just below the line of weakness.

[0033] These mechanical fasteners can be adhered to the bag by the means of adhesives. The adhesive can be either a hot melt or pressure sensitive adhesive. A hot melt adhesive is applied to the mechanical fastener right before the piece is to be applied to the bag. The pressure sensitive adhesive is adhered to the fastener as one piece.

[0034] The application of these mechanical fasteners to the bag can be accomplished in different ways. One way is to adhere these fasteners to the film before the bag is produced. In this case, the pieces of mechanical fasteners are attached to the film either while the web of film is being prepared or while the web of film is being unwound from a roll at the machine. In an alternative embodiment of the present invention the bags may be preformed, and the mechanical fasteners may be adhered to the bag after it has been so formed.

[0035] However, in a preferred embodiment of the present invention the hook and loops are adhered to the flat film. Most preferably one strip of loops and two strips of hooks or one strip of hooks and two strips of loops are applied onto the flat film adjacent to the line of weakness. This allows the reclosing means to be kept out of the bag length seal while positioning the reclosing means substantially completely around the bag opening to allow the consumer to completely close the bag. This provides significant advantage in terms of roll stability prior to converting the film into a bag if the application process of the reclosing means is separate from the bag forming process, and carried out on different machines.

[0036] According to this embodiment of the present invention, a process is provided for forming bags from a web of film wherein the web of film is transported along one or more forming machines in a machine direction, the perpendicular direction in the plane of the film being the cross-machine direction, the process comprising the steps of:

[0037] (a) providing a line of weakness across substantially the whole width of the film substantially in the cross-machine direction;

[0038] (b) affixing reclosing means adjacent to the line of weakness;

[0039] (c) cutting and sealing the film to form a bag comprising the line of weakness and the reclosing means; and

wherein steps (a), (b) and (c) are carried out in any order, on the same or separate machines, preferably steps (a) and (b) being completed before step (c); and repeating steps (a), (b) and (c) at regular intervals along the web so as to form multiple bags.

[0040] In a first embodiment, the hooks are applied in substantially the cross machine direction of the web of film, while the loop strips are applied in substantially the machine direction of the web of film.

[0041] In FIG. **5** an second, preferred, embodiment, is shown. A series of patches of either hooks **36** and/or loops **34** are applied onto the web of film **30** adjacent to the line of weakness **28**. This has the advantage of allowing gaps to be created between adjacent patches to reduce the usage of the hooks or loops to reduce cost while still allowing effective bag closure.

[0042] Alternatively, the use of patches allows the application of hooks to be carried out as a series of applications in the machine direction of the web of film. This is generally easier to perform compared to the application in the cross-machine direction as described hereinabove, and also enables the orientation of hooks and loops to be matched with respect to each other in the bag to optimize closure performance. Indeed, patches could be applied onto the web of film at any angle between the cross machine and machine directions to control closure performance.

[0043] In one preferred process, one machine is used to carry out steps (a) and (b), and a separate machine in a different location is used to perform step (c).

[0044] In another preferred process, three separate machines are used to independently perform steps (a), (b) and (c) in three separate locations. In both cases, machines performing steps (a) and (b) will unwind the film at the beginning of the step and then rewind the film into a roll at the end of the step such that the film can be easily transported to the next machine to perform the next process step. These two preferred processes have the advantage of separating the different process steps to make the final bag. This separation allows the use of a smaller number of high speed machines to carry out steps (a) and (b) producing film pre-labeled with reclose materials and with lines of weakness that can then be processed on multiple bag making machines which typically run at slower speeds than machinery to performs steps (a) and (b). This results in lower capital investment since only a small number of machines are required to perform steps (a) and (b). It also results in better process efficiency since steps (a) and (b) do not interfere with the complex bag making process of step (c). It also allows the option to build an off-line inventory of film pre-labeled with reclose materials to insure film is always available for step (c). Also, this allows steps (a), (b) and (c) to be carried out independently allowing bags to be easily made without any line of weakness or reclose materials, or bags with just a line of weakness or reclose materials, or bags with both the line of weakness and the reclose materials without major changes to machine or process set up.

[0045] Preferably bag forming step (c) comprises the steps of folding the film to form a front panel, back panel and opposing side panels, sealing adjacent to opposing edges of the film to form a back seal, and cutting and sealing the film to form top and bottom seals.

[0046] In a preferred embodiment of the present invention the process steps (b) and (c) are carried out in such a way that the reclosing means extends around substantially all of the front, hack and side panels on the inside of the bag.

[0047] The dimensions and valued disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm".

[0048] All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

[0049] While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed is:

1. A bag (**10**) comprising a line of weakness (**28**) for ease of opening, and a reclosing means (**32**), wherein the bag (**10**) comprises a front panel (**12**), back panel (**14**) and opposing side panels (**16**, **18**), the panels being sealed together to provide a top section (**24**) and a bottom section (**26**), and wherein the line of weakness (**28**) extends around all of the front (**12**), back (**14**) and side (**16**, **18**) panels so that the top section (**24**) is completely removable from the rest of the bag, wherein the reclosing means (**32**) is attached to the front (**12**), back (**14**) and side (**16**, **18**) panels adjacent to the line of weakness (**28**).

2. A bag according to claim **1** wherein the bag (**10**) comprises front panel (**12**), back panel (**14**) and opposing side panels (**16**, **18**), the side panels (**16**, **18**) forming gussets between the front (**12**) and back (**14**) panels, and wherein the front (**12**), back (**14**) and gusset-forming side panels (**16**, **18**) are sealed together at opposite ends (**20**, **22**) to form a top seal and a bottom seal, and wherein the line of weakness (**28**) extends around all of the front (**12**), back (**14**) and gusset-forming side (**16**, **18**) panels so that the top seal is completely removable from the rest of the bag.

3. A bag (**10**) according to claim **1** wherein the reclosing means (**32**) extends around substantially all of the front (**12**), back (**14**) and side (**16**, **18**) panels on the inside of the bag (**10**), the reclosing means (**32**) being attached to the front (**12**), back (**14**) and side (**16**, **18**) panels adjacent to the line of weakness (**28**) so that the bag (**10**) is recloseable after the top section (**24**) has been completely removed from the rest of the bag.

4. A bag (**10**) according to claim **1** wherein the reclosing means (**32**) comprises a mechanical fastener, the mechanical fastener comprising interoperating hooks and/or loops.

5. A bag (**10**) according to claim **4** wherein the loop materials have a basis weight of less than 40 grams per square metre and the basis weight of the hook material is less than 200 grams per square metre.

6. A bag according comprising a line of weakness (**28**) for ease of opening, and a reclosing means (**32**), wherein the bag (**10**) comprises front panel (**12**), back panel (**14**) and opposing side panels (**16**, **18**), the side panels (**16**, **18**) forming gussets between the front (**12**) and back (**14**) panels, and wherein the front (**12**), back (**14**) and gusset-forming side panels (**16**, **18**) are sealed together at opposite ends (**20**, **22**) to form a top seal and a bottom seal, and wherein the line of weakness (**28**) extends around all of the front (**12**), back (**14**) and gusset-forming side (**16**, **18**) panels so that the top seal is completely removable from the rest of the bag, wherein the reclosing means (**32**) comprises a mechanical fastener, the mechanical fastener comprising interoperating hooks and/or loops attached to the front (**12**), back (**14**) and side (**16**, **18**) panels adjacent to the line of weakness (**28**).

7. A bag (**10**) according to claim **6** wherein the loop material has a basis weight of less than 40 grams per square metre.

8. A bag (**10**) according to claim **6** wherein the hook material has a basis weight of less than 200 grams per square metre.

9. A process for forming bags (**10**) from a web of film (**30**), wherein the web of film (**30**) is transported along one or more machines in a machine direction, the perpendicular direction in the plane of the film being the cross-machine direction, the process comprising the steps of:

(a) providing a line of weakness (**28**) across substantially the whole width of the film substantially in the cross-machine direction,

(b) affixing reclosing means (**32**) adjacent to the line of weakness;

(c) cutting and sealing the film to form a bag (**10**) comprising the line of weakness (**28**) and the reclosing means (**32**); and

wherein steps (a), (b) and (c) are carried out in any order, on the same or separate machines; and repeating steps (a), (b) and (c) at regular intervals along the web of film so as to form multiple bags.

10. A process for forming bags (**10**) according to claim **9** wherein steps (a) and (b) are completed before step (c).

11. A process for forming a bag (**10**) according to claim **9** wherein step (c) comprises the steps of folding the film to form a front panel (**12**), back panel (**14**) and opposing side panels (**16**, **18**), sealing adjacent to opposing edges of the film to form a back seal, and cutting and sealing the film to form top and bottom seals.

12. A process for forming a bag (**10**) according to claim **9** wherein the film is folded so that the reclosing means (**32**) extends around substantially all of the front (**12**), back (**14**) and side (**16**, **18**) panels on the inside of the bag (**10**).

13. A process for forming a bag (**10**) according to claim **12** wherein the reclosing means (**32**) comprises a mechanical fastener, the mechanical fastener comprising interoperating hooks and/or loops.

14. A process for forming a bag (**10**) according to claim **13** wherein the loop material has a basis weight of less than 40 grams per square metre.

15. A process for forming a bag (**10**) according to claim **13** wherein the hook material has a basis weight of less than 200 grams per square metre.

16. A process for forming a bag (**10**) according to claim **9** wherein the line of weakness (**28**) is formed by scoring, perforating, chemical treatment, or embossing methods.

17. A process for forming a bag (**10**) according to claim **16** wherein the line of weakness (**28**) is formed by laser scoring, laser perforation, mechanical scoring, or mechanical perforation.

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