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Su

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(54) **METHOD FOR MANUFACTURING A THERMOPLASTIC BAG**

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B65D 33/08 (2006.01)

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CPC ***B31B 19/64*** (2013.01); ***B65D 33/08*** (2013.01); *B31B 2219/148* (2013.01); *B31B 2219/269* (2013.01); *B31B 2219/6038* (2013.01); *B31B 2219/9093* (2013.01); *B31B 2237/20* (2013.01); *B31B 2237/403* (2013.01); *B31B 2237/406* (2013.01); *B31B 2237/60* (2013.01)

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USPC 493/189, 218, 186, 936, 201, 934, 193, 493/86, 195, 202, 223
See application file for complete search history.

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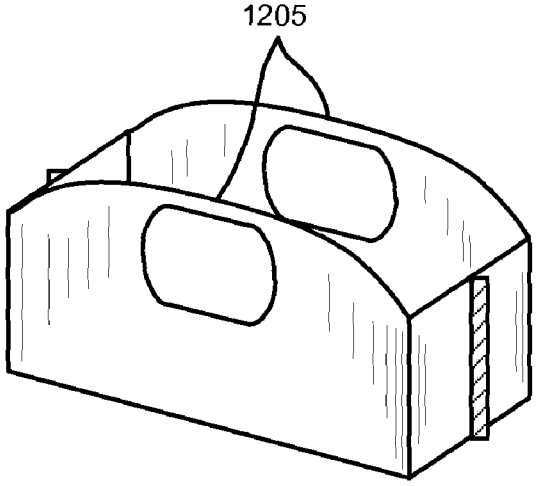
(57) **ABSTRACT**

The invention relates to a method for manufacturing a thermoplastic bag with a substantially flat and rectangular bottom. The bag may also include a carrying handle and/or a tab with a mounting hole.

9 Claims, 6 Drawing Sheets



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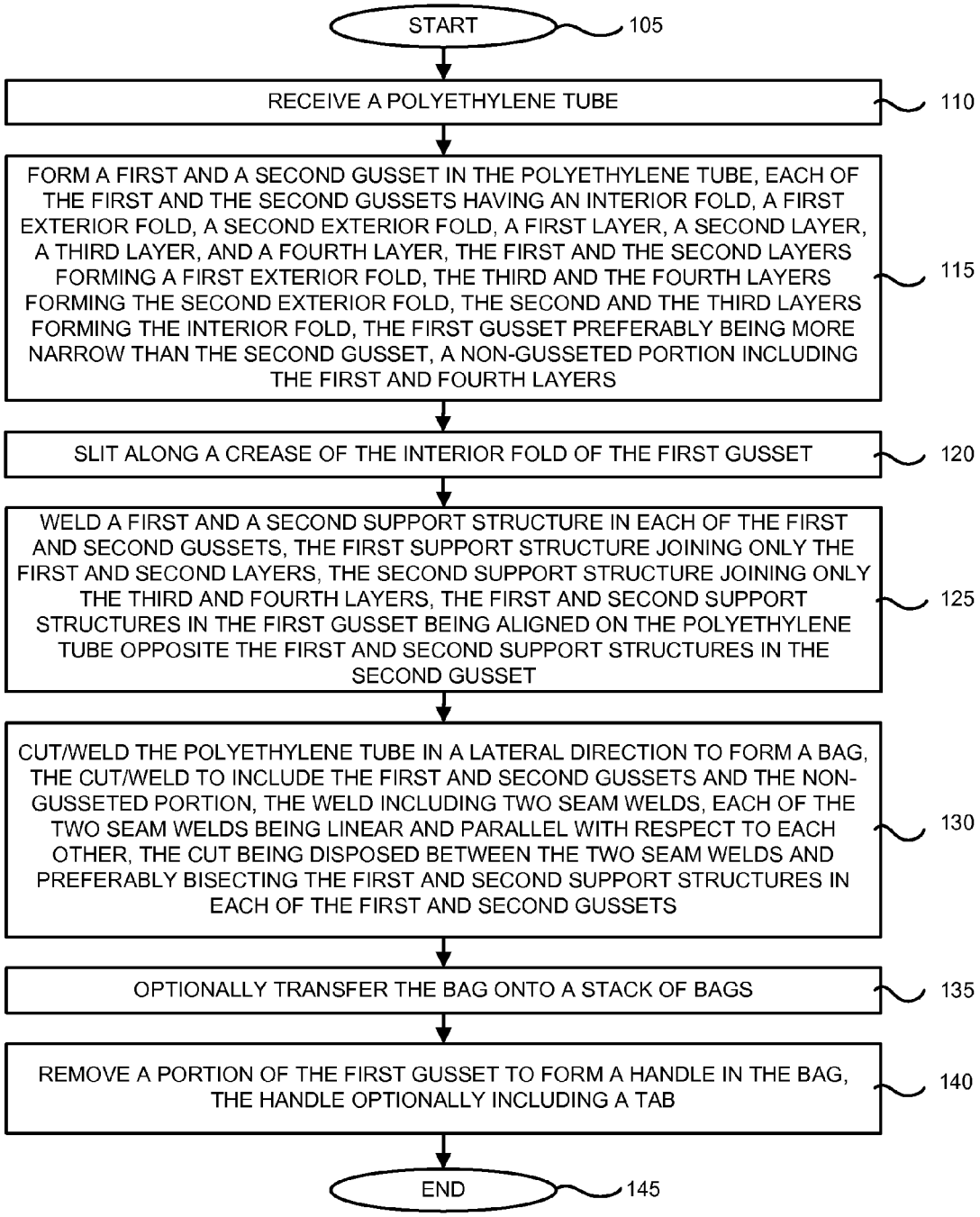
START
105
RECEIVE A POLYETHYLENE TUBE
110
FORM A FIRST AND A SECOND GUSSET IN THE POLYETHYLENE TUBE, EACH OF THE FIRST AND THE SECOND GUSSETS HAVING AN INTERIOR FOLD, A FIRST EXTERIOR FOLD, A SECOND EXTERIOR FOLD, A FIRST LAYER, A SECOND LAYER, A THIRD LAYER, AND A FOURTH LAYER, THE FIRST AND THE SECOND LAYERS FORMING A FIRST EXTERIOR FOLD, THE THIRD AND THE FOURTH LAYERS FORMING THE SECOND EXTERIOR FOLD, THE SECOND AND THE THIRD LAYERS FORMING THE INTERIOR FOLD, THE FIRST GUSSET PREFERABLY BEING MORE NARROW THAN THE SECOND GUSSET, A NON-GUSSETED PORTION INCLUDING THE FIRST AND FOURTH LAYERS
115
SLIT ALONG A CREASE OF THE INTERIOR FOLD OF THE FIRST GUSSET
120
WELD A FIRST AND A SECOND SUPPORT STRUCTURE IN EACH OF THE FIRST AND SECOND GUSSETS, THE FIRST SUPPORT STRUCTURE JOINING ONLY THE FIRST AND SECOND LAYERS, THE SECOND SUPPORT STRUCTURE JOINING ONLY THE THIRD AND FOURTH LAYERS, THE FIRST AND SECOND SUPPORT STRUCTURES IN THE FIRST GUSSET BEING ALIGNED ON THE POLYETHYLENE TUBE OPPOSITE THE FIRST AND SECOND SUPPORT STRUCTURES IN THE SECOND GUSSET
125
CUT/WELD THE POLYETHYLENE TUBE IN A LATERAL DIRECTION TO FORM A BAG, THE CUT/WELD TO INCLUDE THE FIRST AND SECOND GUSSETS AND THE NON-GUSSETED PORTION, THE WELD INCLUDING TWO SEAM WELDS, EACH OF THE TWO SEAM WELDS BEING LINEAR AND PARALLEL WITH RESPECT TO EACH OTHER, THE CUT BEING DISPOSED BETWEEN THE TWO SEAM WELDS AND PREFERABLY BISECTING THE FIRST AND SECOND SUPPORT STRUCTURES IN EACH OF THE FIRST AND SECOND GUSSETS
130
OPTIONALLY TRANSFER THE BAG ONTO A STACK OF BAGS
135
REMOVE A PORTION OF THE FIRST GUSSET TO FORM A HANDLE IN THE BAG, THE HANDLE OPTIONALLY INCLUDING A TAB
140
END
145

FIG. 1

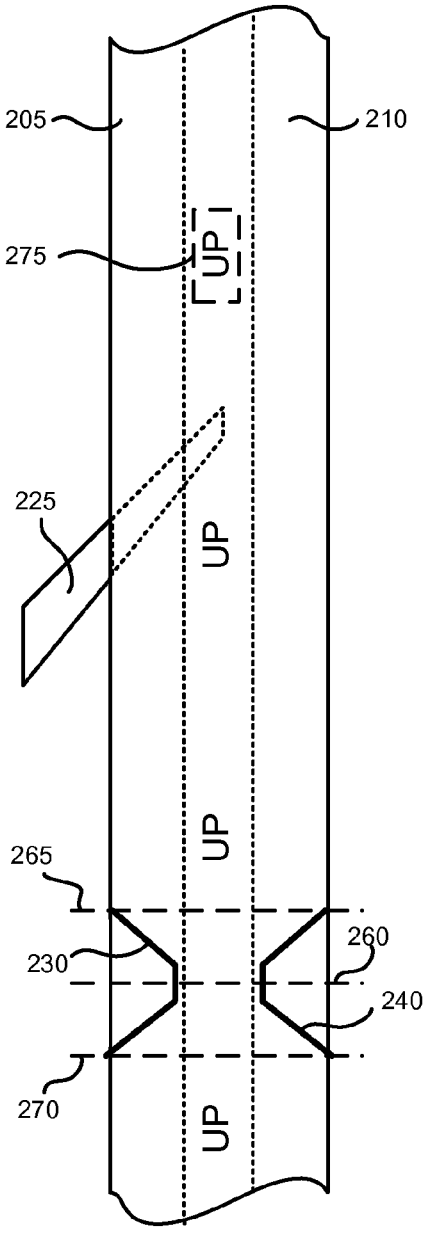
205
210
275
UP
225
UP
UP
265
260
230
240
270
UP

FIG. 2A

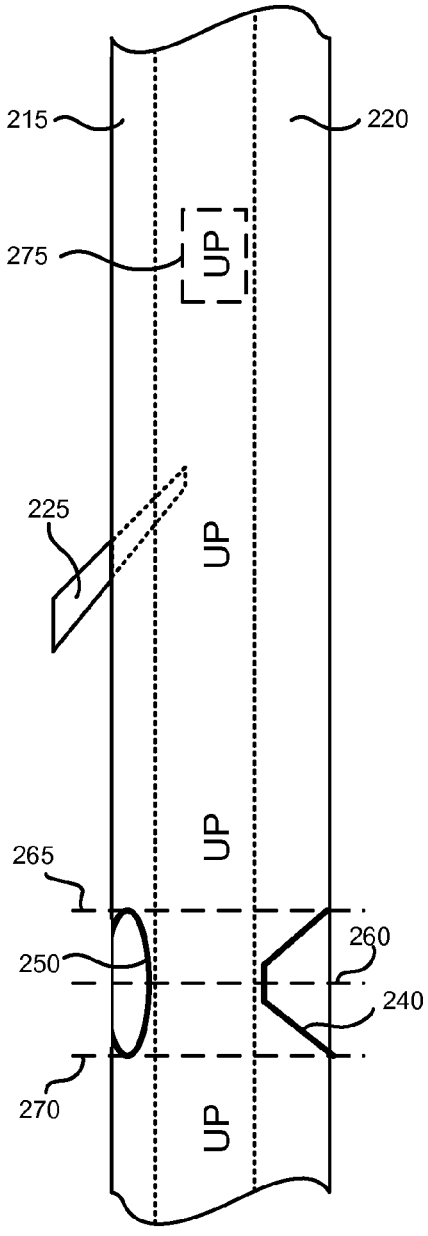
215
220
275
UP
225
UP
UP
265
260
250
240
270
UP

FIG. 2B

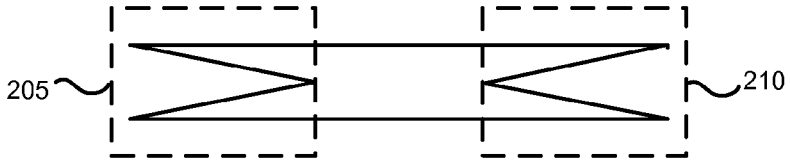

FIG. 3A

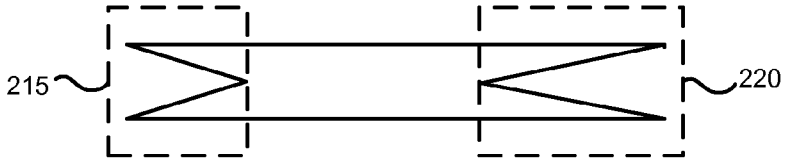

FIG. 3B

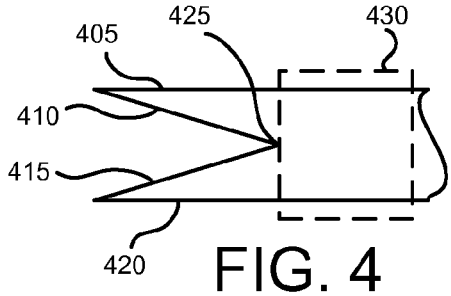

FIG. 4

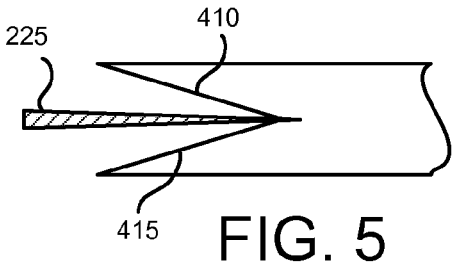

FIG. 5

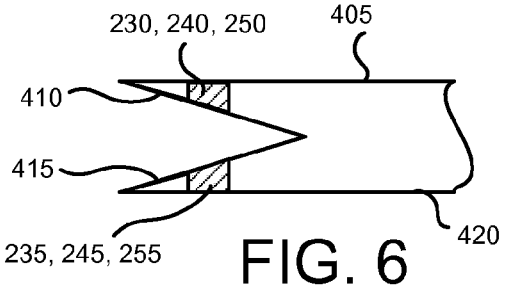

FIG. 6

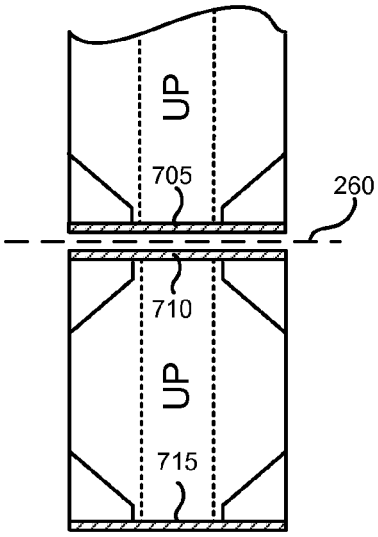

FIG. 7A

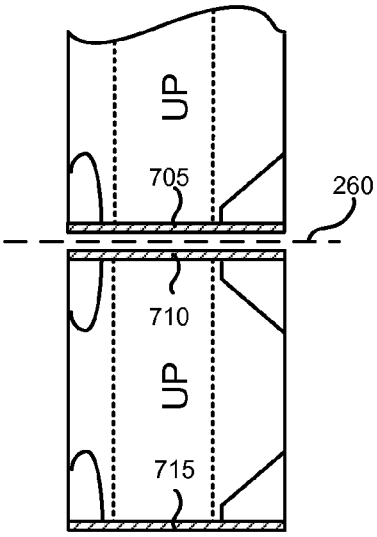

FIG. 7B

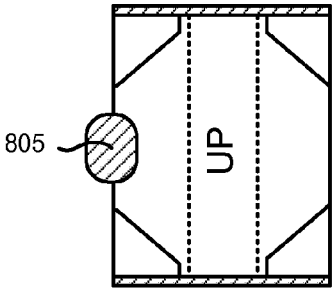

FIG. 8A

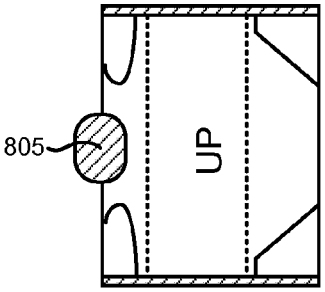

FIG. 8B

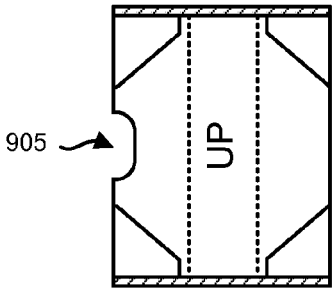

FIG. 9A

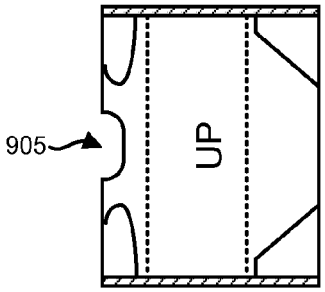

FIG. 9B

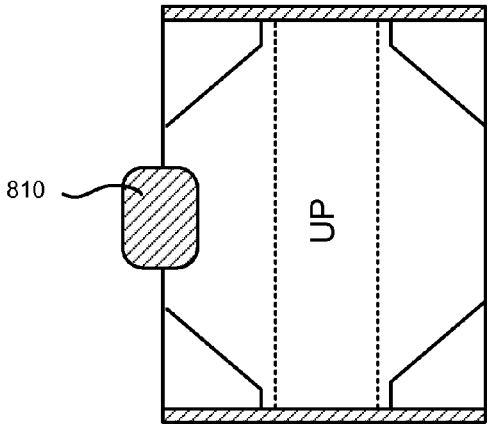

FIG. 8C

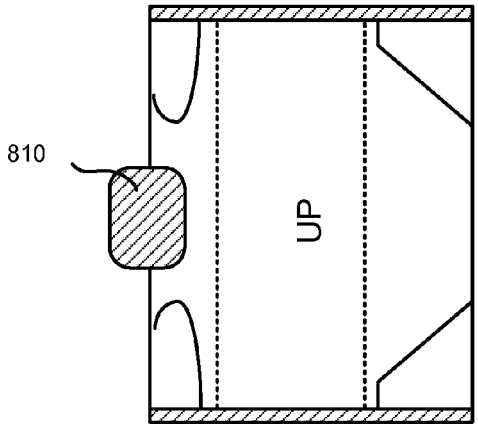

FIG. 8D

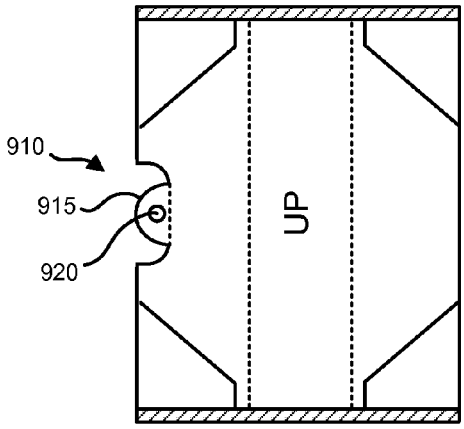

FIG. 9C

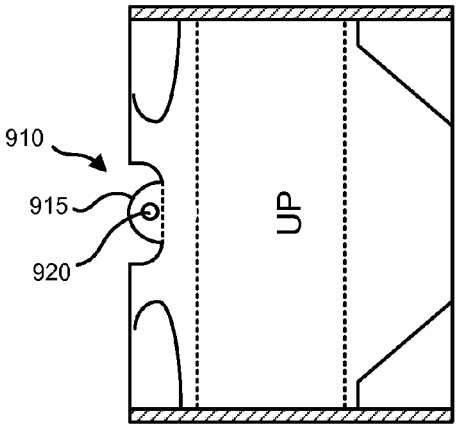

FIG. 9D

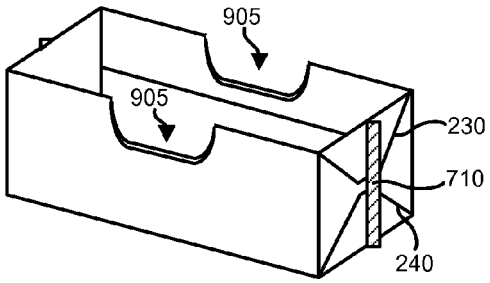

FIG. 10A

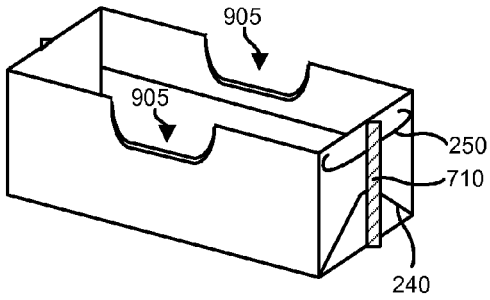

FIG. 10B

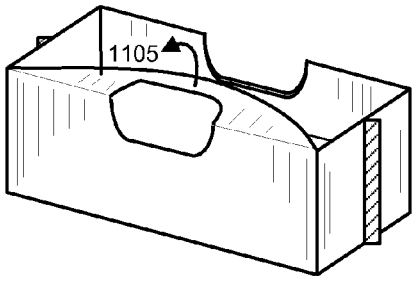

FIG. 11

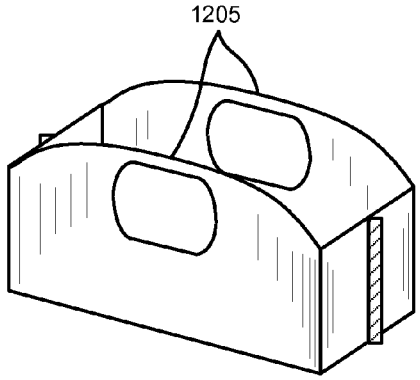

FIG. 12

METHOD FOR MANUFACTURING A THERMOPLASTIC BAG

BACKGROUND

1. Field of Invention

The invention relates generally to the field of thermoplastic manufacturing. In particular, but not by way of limitation, the invention relates to a method for manufacturing thermoplastic bags having a substantially flat and rectangular bottom.

2. Description of the Related Art

Many types of bags are known and used in commerce. For example, clothing, food, and other retailers commonly use bags at the point-of-sale (POS) to facilitate the transport of goods by the customer. Bag features vary according to intended use. For many applications, a flat-bottomed bag with carrying handles is desirable. Typically, such bags are constructed of paper. Paper bags have many shortcomings, however. For instance paper bags are not waterproof. In addition, paper bags are often more expensive to manufacture than thermoplastic bags.

SUMMARY OF THE INVENTION

The invention seeks to overcome one or more of the limitations described above by providing a method for manufacturing a flat-bottomed bag with carrying handles from thermoplastic film. In an embodiment of the invention, the method includes receiving a thermoplastic film tube, forming a first and second gusset in the tube, slitting along a crease of an interior fold of the first gusset, welding support structures in the first and second gussets, seam welding and cutting the tube to form a bag, and punching a portion of the first gusset to form a handle. The invention also provides a bag that is manufactured by the process.

These and other features are more fully described in the detailed description section.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are described with reference to the following drawings, wherein:

FIG. **1** is a flow diagram of a bag-manufacturing process, according to a first and second embodiment of the invention;

FIG. **2**A is a plan view schematic of a slitting process and a welding process, according to a first embodiment of the invention;

FIG. **2**B is a plan view schematic of a slitting process and a welding process, according to a second embodiment of the invention;

FIG. **3**A is a sectional view of a gusseted polyethylene tube, according to the first embodiment of the invention;

FIG. **3**B is a sectional view of a gusseted polyethylene tube, according to the second embodiment of the invention;

FIG. **4** is a sectional view of a gusseted polyethylene tube, according to the first and second embodiments of the invention;

FIG. **5** is a sectional view of a gusseted polyethylene tube during a slitting process, according to the first and second embodiments of the invention;

FIG. **6** is a sectional view of a gusseted polyethylene tube during a welding process, according to the first and second embodiments of the invention;

FIG. **7**A is a plan view schematic of a cutting/welding process, according to the first embodiment of the invention;

FIG. **7**B is a plan view schematic of a cutting/welding process, according to the second embodiment of the invention;

FIG. **8**A is a plan view schematic of a punching process, according to the first embodiment of the invention;

FIG. **8**B is a plan view schematic of a punching process, according to the second embodiment of the invention;

FIG. **8**C is a plan view schematic of a punching process, according to a variation of the first embodiment of the invention;

FIG. **8**D is a plan view schematic of a punching process, according to a variation of the second embodiment of the invention;

FIG. **9**A is a plan view schematic of a completed bag, according to the first embodiment of the invention;

FIG. **9**B is a plan view schematic of a completed bag, according to the second embodiment of the invention;

FIG. **9**C is a plan view schematic of a completed bag, according to a variation of the first embodiment of the invention;

FIG. **9**D is a plan view schematic of a completed bag, according to a variation of the second embodiment of the invention;

FIG. **10**A is a perspective view of an opened bag, according to the first embodiment of the invention;

FIG. **10**B is a perspective view of an opened bag, according to the second embodiment of the invention;

FIG. **11** is a perspective view of an opened bag illustrating handle extension, according to the first and second embodiments of the invention; and

FIG. **12** is a perspective view of an opened bag with both handles extended, according to the first and second embodiments of the invention.

DETAILED DESCRIPTION

Embodiments of the invention are described with reference to FIGS. **1**-**12**. Reference designators are reused for the same or similar features. The drawings are not to scale. Some features illustrated in the drawings have been exaggerated for descriptive clarity. Sub-headings are used in this section for organizational convenience but the disclosure of any particular feature(s) is/are not necessarily limited to any particular section or sub-section of this specification.

Manufacturing Process

FIG. **1** is a flow diagram of a bag-manufacturing process, according to a first and a second embodiment of the invention. After beginning in step **105**, the process receives a polyethylene (PE) tube in step **110**. Next, in step **115**, the process forms a first and a second gusset in the polyethylene tube, for example using gusseting wheels. In a first embodiment, and with reference to FIGS. **2**A and **3**A, the first gusset **205** and the second gusset **210** are the same (or substantially the same) in width. In a second embodiment, and with reference to FIGS. **2**B and **3**B, the gusseting is asymmetrical: the first gusset **215** being more narrow than the second gusset **220**.

FIG. **4** is a sectional view of a gusseted polyethylene tube, according to the first and second embodiments of the invention. FIG. **4** illustrates that each of the gussets **205**, **210**, **215**, and **220** has a first layer **405**, a second layer **410**, a third layer **415**, and a fourth layer **420**. The first and the second layers **405**, **410** form a first exterior fold; the third and the fourth layers **415**, **420** form a second exterior fold; the second and the third layers **410**, **415** form an interior fold. FIG. **4** also illustrates a crease **425** of the interior fold and an un-gusseted portion **430** of the polyethylene tube.

In step **120**, the process slits along the crease **425** of the interior fold of the first gusset **205**, **215**. With reference to FIGS. **2**A, **2**B, and **5**, the slitting step **120** may be performed, for example, using a stationary knife **225** as the polyethylene tube is advanced (for example in web form on rollers) during manufacturing.

To provide reinforcement, the process welds a first and a second support structure in each of the first and second gussets in step **125**. FIG. **2**A illustrates a plan view of the first support structure **230** in the first gusset **205**, and first support structure **240** in the second gusset **210**, according to the first embodiment. A second support structure **235** (not visible in FIG. **2**A) in the first gusset **205** has a shape that is identical to the first support structure **230**. A second support structure **245** (not visible in FIG. **2**A) in the second gusset **210** has a shape that is identical to the first support structure **240**.

FIG. **2**B illustrates a plan view of an alternative first support structure **250** in the first gusset **215**, according to the second embodiment of the invention. A second support structure **255** (not visible in FIG. **2**B) in the first gusset **215** has a shape that is identical to the first support structure **250**.

FIG. **6** is a sectional view of a gusseted polyethylene tube during a welding process, according to the first and second embodiments of the invention. As shown therein, the first support structure **230**, **240**, or **250** joins only the first and second gusset layers **405**, **410**, and the corresponding second support structure **235**, **245**, or **255** joins only the third and fourth gusset layers **415**, **420**.

To achieve uniform shaping, the support structures in the first gusset are preferably aligned with the support structures in the second gusset. With respect to the first embodiment illustrated in FIG. **2**A, the first and second support structures **230**, **235** (not shown) of the first gusset **205** and the first and second support structures **240**, **245** (not shown) of the second gusset **210** are each centered about center line **260**. Preferably, center line **260** is disposed on the polyethylene tube to be equidistant from adjacent print registrations **275**. Also preferably, the width of support structures **230**, **235** (not shown) in the first gusset **205** is approximately equal to the width of the support structures **240**, **245** (not shown) in the second gusset **210**, as illustrated by width markers **265**, **270**. FIG. **2**B illustrates these same preferred alignment relationships for the second embodiment.

Cut/weld step **130** includes the formation of two seam welds to close bag sides. Cut/weld step **130** also includes cutting the bag from the polyethylene tube. These steps are preferably performed simultaneously to maximize production throughput. The seam welding and cutting in step **130** is performed in a lateral direction (i.e., across the polyethylene tube). With reference to FIGS. **7**A (first embodiment) and **7**B (second embodiment), step **130** produces parallel seam welds **705** and **710** on either side of center line **260**. The cutting in step **130** is performed at center line **260**. FIGS. **7**A and **7**B also illustrate a seam weld **715** created in a prior execution of the cut/weld step **130**.

In step **135**, the process preferably transfers the bag separated in step **135** to a stack of bags.

In step **140**, the process removes a portion of the first gusset **205**, **215** to form a handle in the bag. Step **140** may include, for instance, using a punch **805** as illustrated in FIGS. **8**A (first embodiment) and **8**B (second embodiment) to produce void **905** shown in FIGS. **9**A (first embodiment) and **9**B (second embodiment). In a variation of step **140**, the process could use a punch **810** illustrated in FIG. **8**C (a variation of the first embodiment) and **8**D (a variation of the second embodiment) to form a void **910** that includes a tab **915** with a hole **920** as shown in FIGS. **9**C (the variation of the first embodiment) and **9**D (the variation of the second embodiment). The process terminates in step **145**.

Other variations to the process illustrated in FIG. **1** and described with reference to other figures herein are possible. For instance, the thermoplastic tube received in step **110** could be or include polypropylene (PP), a combination of PE and PP, or other thermoplastic composition, according to application requirements. Alternative embodiments may not include the un-gusseted portion **430** in the tube. Step **125** could produce support structures having shapes that are not consistent with those illustrated in FIGS. **2**A and **2**B. Although seam welding and cutting are preferably performed simultaneously in cut/weld step **130** to maximize production throughput, these operations could be performed serially. Laser, water jet, or another cutting process could be used to remove a portion of the first gusset in step **140**.

Manufactured Bags

FIGS. **9**A, **9**B, **9**C, and **9**D illustrate manufactured bags laying in a flat and unexpanded condition that can be produced by the process described with reference to FIG. **1**. FIGS. **10**A, **10**B, **11**, and **12** illustrate opened bags where an expanded second gusset **210**, **220** forms a floor of the bag. FIG. **10**A shows supporting structures **230**, **240** and seam weld **710** on one end of the bag, according to the first embodiment of the invention. FIG. **10**B likewise illustrates supporting structures **250**, **240** and seam weld **710** on one end of the bag, according to the second embodiment of the invention. Voids **905** are also visible in both FIGS. **10**A and **10**B. FIG. **11** illustrates how the first gusset **205**, **215** is extended in a direction **1105** to convert the void **905** to a useable handle. FIG. **12** shows a bag with both handles **1205** fully extended.

SUMMARY

Embodiments of the invention thus provide a method for manufacturing a thermoplastic bag having a flat bottom and handles. The resulting bag is waterproof and may be less expensive to manufacture than a paper bag alternative. Those skilled in the art can readily recognize that numerous variations and substitutions may be made in the invention, its use and its configuration to achieve substantially the same results as achieved by the embodiments described herein. Accordingly, there is no intention to limit the invention to the disclosed exemplary forms. Many variations, modifications and alternative constructions fall within the scope and spirit of the disclosed invention.

I claim:

1. A method for manufacturing a thermoplastic bag, comprising:

a) receiving a thermoplastic tube;

b) forming a first and a second gusset in the thermoplastic tube, each of the first and the second gussets having an interior fold, a first exterior fold, a second exterior fold, a first layer, a second layer, a third layer, and a fourth layer, the first and the second layers forming a first exterior fold, the third and the fourth layers forming the second exterior fold, the second and the third layers forming the interior fold;

c) slitting along a crease of the interior fold of the first gusset;

d) welding a first and a second support structure in each of the first and second gussets, the first support structure joining only the first and second layers, the second support structure joining only the third and fourth layers, the first and second support structures in the first gusset being aligned on the thermoplastic tube opposite the first and second support structures in the second gusset;

e) seam welding the thermoplastic tube in a lateral direction, the seam welding to include the first and second gussets, the seam welding producing two seam welds, each of the two seam welds being linear and parallel with respect to each other;

f) cutting the thermoplastic tube in a lateral direction to form a bag, the cutting being directed between the two seam welds and bisecting the first and second support structures in each of the first and second gussets; and

g) removing a portion of the first gusset to form a handle in the bag.

2. The method of claim **1**, wherein the thermoplastic tube includes polyethylene.

3. The method of claim **1**, wherein the first gusset is narrower than the second gusset.

4. The method of claim **3**, wherein the first and second support structures in the first gusset are curved, and each of the first and second support structures in the second gusset is formed with one or more straight weld lines.

5. The method of claim **1**, wherein the first and fourth layers form a non-gusseted portion disposed between the first gusset and the second gusset.

6. The method of claim **1**, wherein the seam welding and the cutting are performed simultaneously.

7. The method of claim **1**, further including transferring the bag onto a stack of bags after the cutting and before the removing.

8. The method of claim **1**, wherein the removing includes punching.

9. The method of claim **1**, wherein the handle includes a tab and the tab includes a mounting hole.

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