Jan. 28, 1958 T. B. MORGAN, JR 2,821,337

GUSSET BOTTOM BAG

Original Filed June 3, 1952 3 Sheets-Sheet 1

Fig. 1

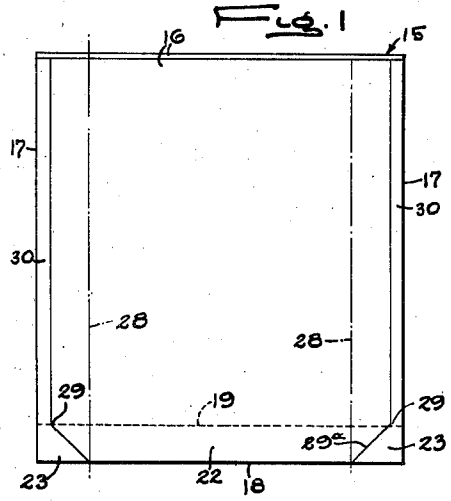


Fig. 2

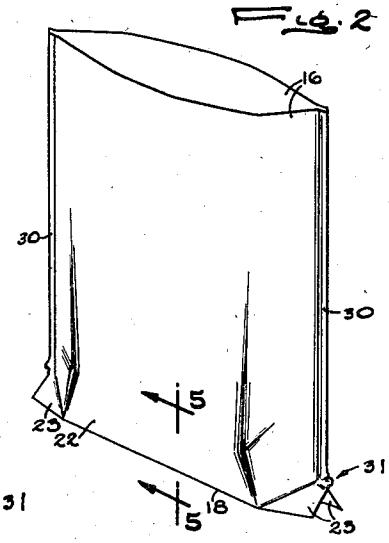


Fig. 3

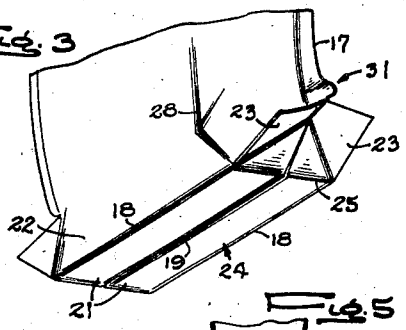


Fig. 4

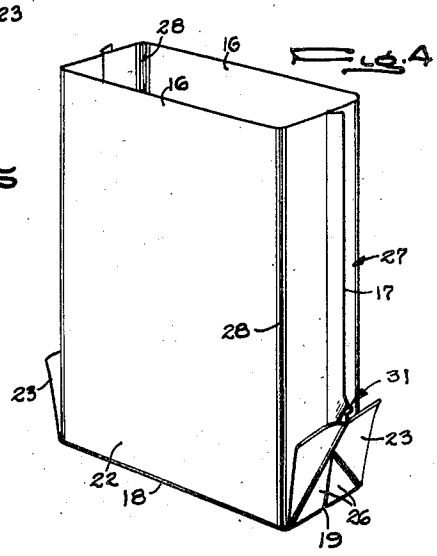
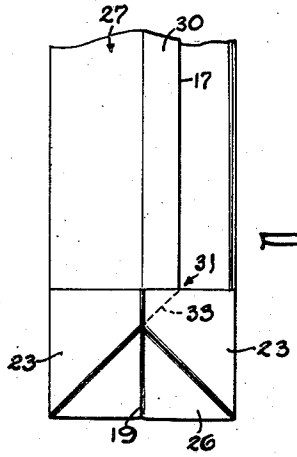


Fig. 5

Fig. 6



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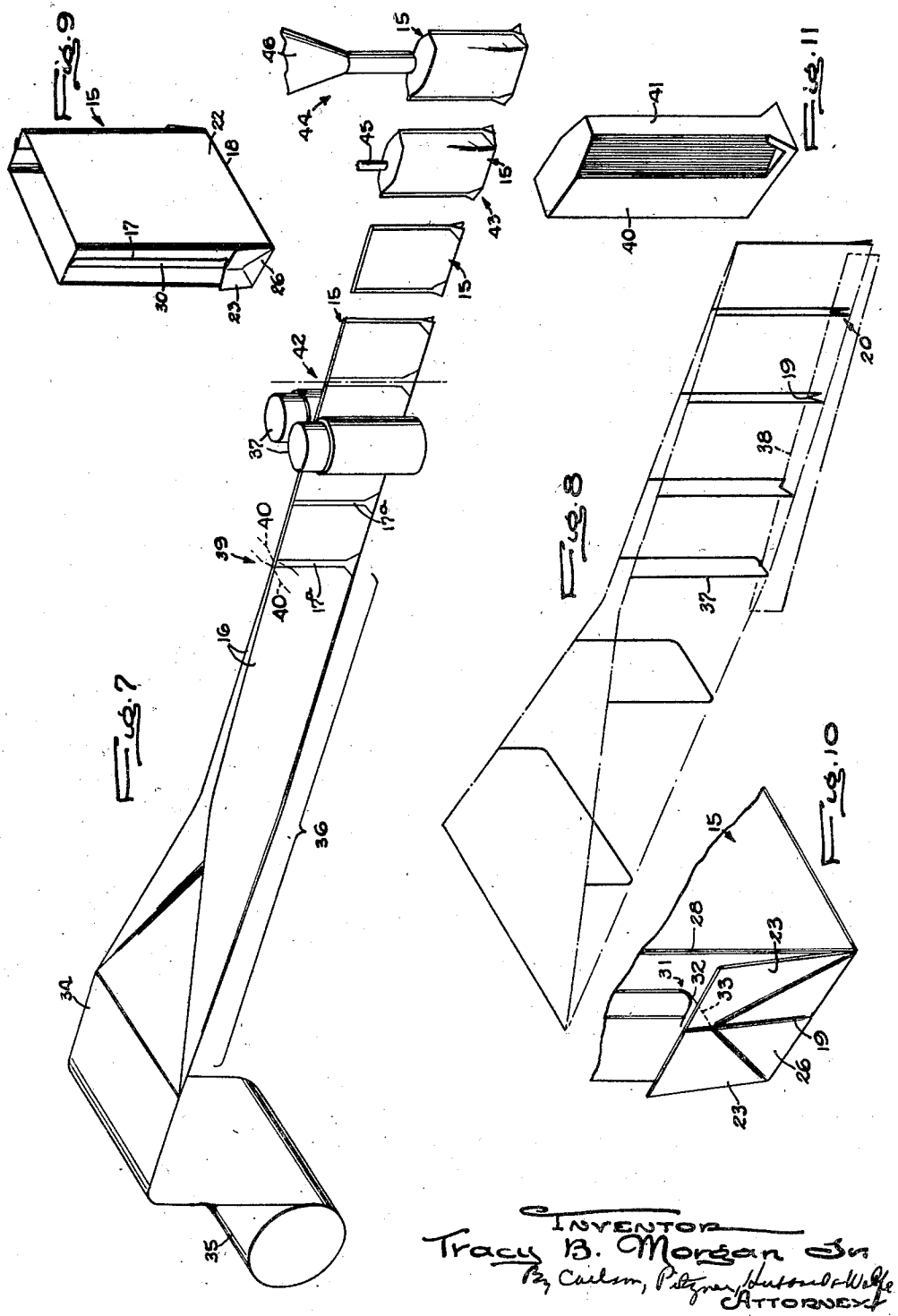
GUSSET BOTTOM BAG

Original Filed June 3, 1952 3 Sheets-Sheet 2



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GUSSET BOTTOM BAG

Original Filed June 3, 1952 3 Sheets-Sheet 3

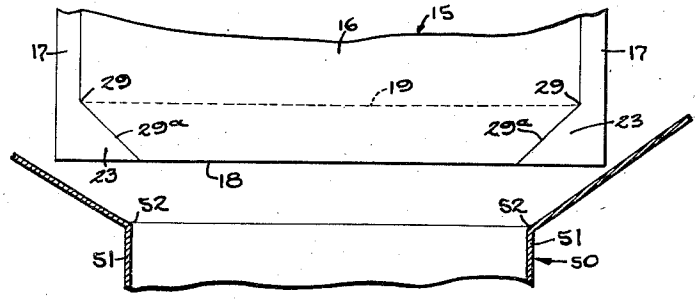

Fig. 12

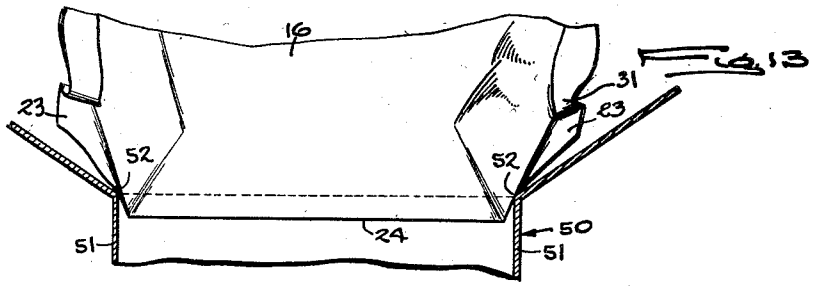

Fig. 13

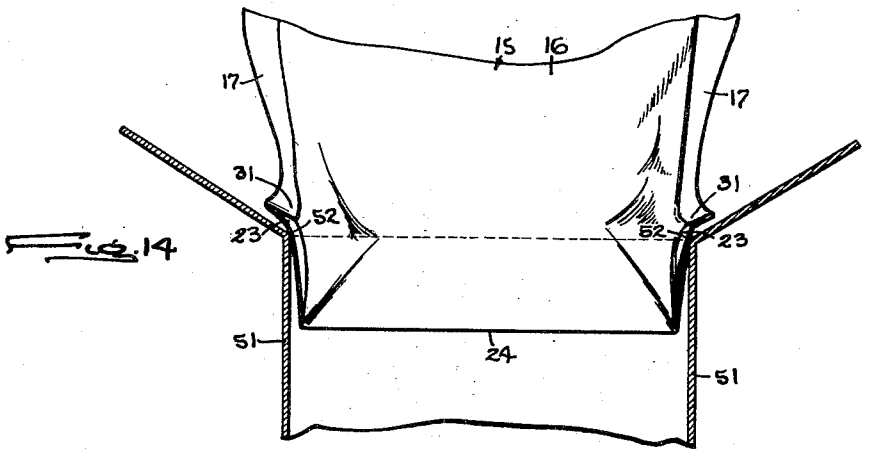

Fig. 14

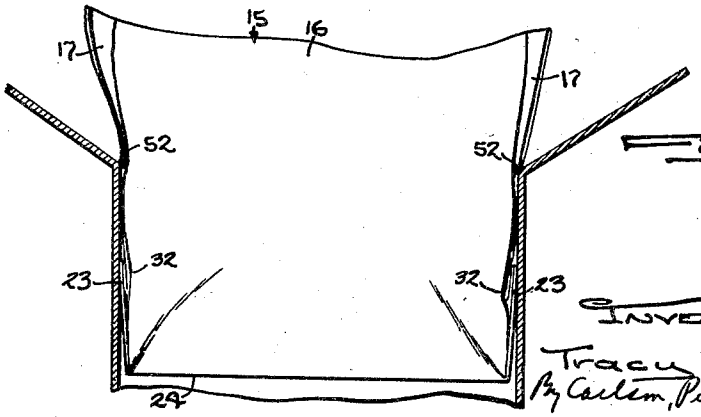

Fig. 15

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2,821,337

GUSSET BOTTOM BAG

Tracy B. Morgan, Jr., Rockford, Ill., assignor, by mesne assignments, to Harold L. Bartelt and Donald E. Bartelt, both of Rockford, Ill.

Continuation of application Serial No. 291,406, June 3, 1952. This application December 6, 1954, Serial No. 473,191

1 Claim. (Cl. 229—57)

This invention relates to a bag comprising two panels sealed together along opposite side margins and formed across the bottom of the bag with a gusset of generally W cross section adapted to be expanded by the material delivered into the open top of the bag.

The primary object of the invention is to provide a novel construction of the bag corners at the junction of the side seals and the gusset or bellows bottom which construction, upon receiving the material to be packaged, is expanded in a novel manner to a squared cross section.

Another object is to provide at the bag corners flaps of novel construction which, as an incident to filling the bag, turn outwardly and upwardly automaticaly and form guides which facilitate insertion of the bag in a carton of minimum size and at the same time control the bending over of the side seams to prevent the latter from interfering with such insertion.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a front elevation of the bag constructed in accordance with the present invention.

Fig. 2 is a perspective view showing the bag partially open.

Fig. 3 is a fragmentary perspective view of the bottom of the bag.

Fig. 4 is a perspective view of the bag fully opened.

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 2.

Fig. 6 is a fragmentary side view.

Fig. 7 is a schematic perspective view illustrating the manner in which the bags are made.

Fig. 8 is a schematic perspective view showing the manner in which the bags are folded.

Fig. 9 is a perspective view of the completed bag.

Fig. 10 is a fragmentary perspective view of a corner of the bag.

Fig. 11 is a perspective view of one of the sealing elements.

Fig. 12 is a fragmentary view showing the relative sizes of a box and a flattened bag.

Figs. 13, 14 and 15 are fragmentary views illustrating successive steps in inserting the bag when filled in a carton or box.

The bag **15** shown in the drawings for the purposes of illustration comprises front and back panels **16** joined together along their side edges to form a narrow band-like seam indicated at **17**. Along the bottom, the bag material is folded or tucked in across its full width to form two outer folds **18** (Fig. 5) and a reverse fold **19** between the outer folds. Thus the folded portion of the bag is of W cross section forming a bellows-like fold as shown in Fig. 5 and the adjacent pairs of legs of the W constitute double-walled flaps **20**. At each end of each flap, the inner and outer walls **21** and **22** of each flap are joined together over a generally triangular area including the

flap corner and terminating at an inner edge **29a** which starts at the point **29** of intersection of the inner end of the fold **19** and the inner edge of the side seam **17** and extends diagonally inwardly at an angle of about 45 degrees to the flap edge **18**.

When the bag is opened, the bellows or W-shaped gusset is flattened out by unfolding of the flaps **20** so that the inner walls **21** of the two flaps lie substantially in the same plane to form a generally flat and rectangular bottom wall **24** as shown in Fig. 3, the outer walls **22** becoming part of the sides of the bag. Due to the trinagular shape of the seals **23**, the joined end portions of the flaps **20** turn up about a fold line **25** as the bag is being opened, and the unsealed triangular portions **26** of the flaps between the seals **23** are bent upwardly and eventually become part of side walls **27** (Fig. 4).

I have discovered that, by using a particular type of seal to make the side seams **17**, the latter may be made before the bag is opened and may be extended throughout the entire length of the bag without interfering with the unfolding and the action of the flaps **20** in bending upwardly automatically as an incident to expanding the bellows fold. This seam is formed by joining together the opposed side margins of the front and back panels **16** in face to face relation, that is, the inner surface of the narrow elongated portion along the edge of the front panel is sealed to the corresponding inner surface of the back panel. As shown in Fig. 1, the side seams **17** extend all along the edges from the top to the bottom of the bag but do not join together the adjacent end portions of the two folds **20** which are thus left free from each other all along their lengths from one edge of the bag to the other.

While the side seal **17** leaves a narrow band **30** projecting outwardly from the side edges of the bag **15**, this band does not prevent the end portions of the flaps **20** from turning upwardly as an incident to expansion of the bag. Since the band **30** is narrow and flexible, it buckles at a point **31** just above the diagonal seals **23** when the flattening of the infold is begun as shown in Fig. 3. As the upward bending of the flaps is continued, this buckling causes the bands **30** to turn over and lie substantially flat against the side walls **27** of the filled bag as illustrated in Fig. 10. At the same time, the portion **32** of the band **30** below the point **31** turns back upon itself along a line **33** and forms a triangular fold permitting the diagonal seal **23** to be drawn up close to the side wall so that the triangle portion **26** of the flaps **20** may eventually lie substantially in the plane of the side wall **27** as shown in Fig. 4.

The buckling and folding of the bands **30** and the partial turning up of the sealed parts **23** of the flaps **20** occur automatically in the opening of the bag. One way of opening the bag preparatory to filling is by directing a jet of air into the interior of the bag. The air spreads the front and back panels **16** apart and forces the flap walls **21** down to expand the infold **19** and form the flat bottom **24**. Due to the diagonal corner seals **23**, the portions of the flaps **20** forming the triangular piece **26** cannot unfold completely until the end portions of the flaps have been turned up through a right angle. Since the air unfolds the ends of the flaps as well as the central portion, the end portions of the flaps are forced to fold upwardly as shown in Fig. 3.

Since the band **30** does not interfere with the opening of the bag, the triangular sealed areas **23** and the side seals **17** may be formed while the bag is in the flattened condition shown in Fig. 1. For this reason, the bag is capable of being made on a high-speed automatic machine. The latter, for example, may be of the type in which the bags are made by unwinding a strip **34** (Fig. 7) of bag material from a supply roll **35** and advancing

the strip endwise along a rectilinear path. During a portion of the advance indicated at **36**, the strip is folded longitudinally as it advances through the machine and feed rollers **37** engage the opposite sides of the folded strip to move it along its path. The folding operation, illustrated in Fig. 8, includes drawing the strip **34** over a former (not shown) to give the strip a narrow U-shaped cross section indicated at **37**. In the continued advance of the strip, a blade **38** engages and folds in the bottom of the U giving the lower portion of the strip the W cross section and forming the flaps **20**.

After the folding operation, the diagonal and side seals **23** and **17** are made at a station **39**. Preferably, the seals are formed through the application of heat and pressure and, for this purpose, the inside of the strip **34** is coated with a thermoplastic substance which will soften when heated above a predetermined temperature and enable selected areas of one side of the folded strip, when pressure is applied, to fuse with and become integrally joined to the corresponding areas of the other side of the strip. At the station **39**, a pair of shoes **40** heated above the temperature at which the thermoplastic substance softens press against opposite sides of the folded strip **34**.

As shown in Fig. 11, the surface **41** of each shoe **40** is rectangular from the upper edge of the folded strip **34** down to the fold **19** and is twice as wide as the seal **17**. Below the fold **19**, the surface flares outwardly and downwardly on each side at a 45 degree angle. When the strip **34** is pressed between the shoes, the thermoplastic material between the shoes softens and opposed portions of the strip become united. Since only the inner surface of the strip is coated, the separate flaps or V-shaped folds **20** of the bellows bottom are not joined together but remain separated and of W shape in cross section. Thus the shoes form a single seal **17a** which constitutes the edge and diagonal seals **17** and **23** on the trailing edge of one bag and also the corresponding seals on the leading edge of the succeeding bag.

At a subsequent station **42**, the strip is severed intermediate the edges and along the longitudinal center line of the seal **17a** which was made by the shoes **40**. The bags thus formed then are advanced first to a station **43** where they are opened preparatory to filling and then to a filling station **44**. Disposed above the bag at the station **43** is a nozzle **45** which directs a stream of air downwardly toward the mouth of the bag. As described above, the air spreads the panels **16** apart and expands the bellows bottom **18** to give the bag a generally squared cross section. The bag then is advanced to the filling station **44** where a charge of material to be packaged is delivered to the bag from a dispenser **46**. If desired, the bag may then be closed by collapsing the open end of the bag and sealing the upper ends of the panels **16** together.

It will be observed that the improved bag as described above may be formed completely before it is opened, that is, both of the band-like side seals **17** and the triangular seals **23** with the diagonal inner edge **29a** are formed while the panels **16** are still flat against each other. It is not necessary, therefore, to open and close the bag and to fold and unfold the flaps **20** in the process of making the bag. Instead, all of the seals are made by the single operation of pressing the bag between the shoes **40**. This is a simple operation which is capable of being performed automatically making it possible to produce the bags rapidly on a high-speed machine.

By virtue of the gusset bottom, the extension of the corner seals **23** inwardly to the diagonal line **29**, and the separation of the folds **20** from each other throughout the full length of the gusset, the improved bag possesses numerous advantages over prior constructions. In the first place, the gusset bottom expands automatically first as shown in Fig. 2 and then to a generally flat rectangular shape (Fig. 3) as an incident to regular machine opening and filling operations. Such squaring off of the bag bottom induces bending of the side panels along longitudinal lines **28** (Figs. 1 and 3) near the panel margins thereby assisting in shaping the upper portions of the bag and the contents thereof into a generally rectangular cross-section. As a result of the filling and tapping or settling operations normally performed in high speed packaging machinery, the filled bag may easily be worked substantially into the squared shape shown in Fig. 4.

A second and most important advantage of the gusset bottom construction above described is that it enables a bag filled with a given volume of material to be handled and inserted by machine handling in a rigid walled carton **50** (Fig. 12) of smaller size than is possible with prior bag constructions. This advantage results from the novel shaping of the bag corners and the upward bending of the separated flaps that occurs as a natural incident to the delivery of the material charge into the bag during machine filling thereof.

This action is illustrated in Figs. 12 to 15 from which it will be observed that the edge walls **51** are spaced apart a distance substantially less than the width of the flattened or unfilled bag shown above the open end of the carton in Fig. 12. As above described and shown in Fig. 3, the delivery of a charge of material downwardly into the bag results not only in a squaring off of the bag bottom but also in bending of the triangular seals **23** at the ends of the separated folds **20** upwardly through a substantial angle, at the same time initiating upward bending of the bottom parts along the lines **25**.

By such shaping and bending as a natural incident to machine filling, the bag bottom may be inserted into the carton by a single endwise movement without interference or danger of rupture. As the squared bottom **24** enters the open end of the carton as shown in Fig. 13, the upturned flaps **23** at points spaced outwardly from the lines **25** encounter the upper edges **52** of the carton walls **51**. These flaps are cammed inwardly as the lowering of the bag continues (see Fig. 14) with the result that the material in the bag is shifted slightly to cause further squaring of the bag edges as the flaps **23** are cammed inwardly.

Next, the carton edges **52** encounter the lower ends of the side seams **17** but, since a lateral bending or buckling thereof as indicated at **31** has already taken place, the edges act as cams to continue the bending as indicated at **32** (Fig. 10) and then turn the entire seam over against the edge **27** of the squared bag as shown in Fig. 15. Such bending of the side seams continues progressively as the bag is advanced into the carton and the entire seam is eventually brought flat against the bag edge **27**. In this way, completion of the squaring off of the bag and its contents and shaping thereof to conform to the desired minimum internal dimensions of the carton is achieved automatically during a simple cartoning operation. It will thus be seen that no auxiliary guides for a bag are needed and there is no danger of rupturing the filled bag during cartoning thereof which may be effected at minimum cost with automatic machinery.

It will be seen that, even though the opening and filling operations do not bend the corners up fully to the position shown in Fig. 4 but leave the bag in shape shown in Fig. 3, the bag nevertheless may be inserted into a carton of minimum size. Such inserting completes the folding up of the corners and the buckling and folding over of the side seals **30**. Thus, in all cases, the opening and filling operations at least condition the bag so that the final squaring and shaping occurs as an incident to the insertion of the bag into the carton.

This application is a continuation of my prior application Serial No. 291,406 filed June 3, 1952, now abandoned.

I claim as my invention:

A gusset bottom bag comprising front and back panels integrally joined together across the bag bottom and heat

sealed together along their side margins to form band-like seams, said bottom being tucked inwardly to form a W cross section between said seams composed of two outer V-shaped folds forming between them an intermediate reverse fold having side walls which are separated from each other throughout the full width of the bag, and four corner seals joining the opposed walls of said outer folds together at the ends thereof and to an inner edge extending diagonally and inwardly substantially from the intersections of the inner edge of said side seams and the apex of said reverse fold, said corner seals constituting

separated flaps which, as an incident to expansion of the gusset bottom of the bag, bend upwardly automatically and initiate lateral bending of the lower ends of said side seams.

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