# United States Patent

[11] **3,534,666**


[72] Inventor **Lawrence Salvatore Maccherone**
**Emerson, New Jersey**



[21] Appl. No. **750,962**
[22] Filed **Aug. 7, 1968**
[45] Patented **Oct. 20, 1970**
[73] Assignee **American Can Company**
**New York, New York**
**a corporation of New Jersey**


[54] **PLASTIC BAG MANUFACTURE**
**10 Claims, 4 Drawing Figs.**


[52] **U.S. Cl.** ..... **93/35,**
93/8, 156/344
[51] **Int. Cl.** ..... **B31b 49/04**
[50] **Field of Search** ..... 93/35(RB),
8; 156/344; 53/(Inquired)



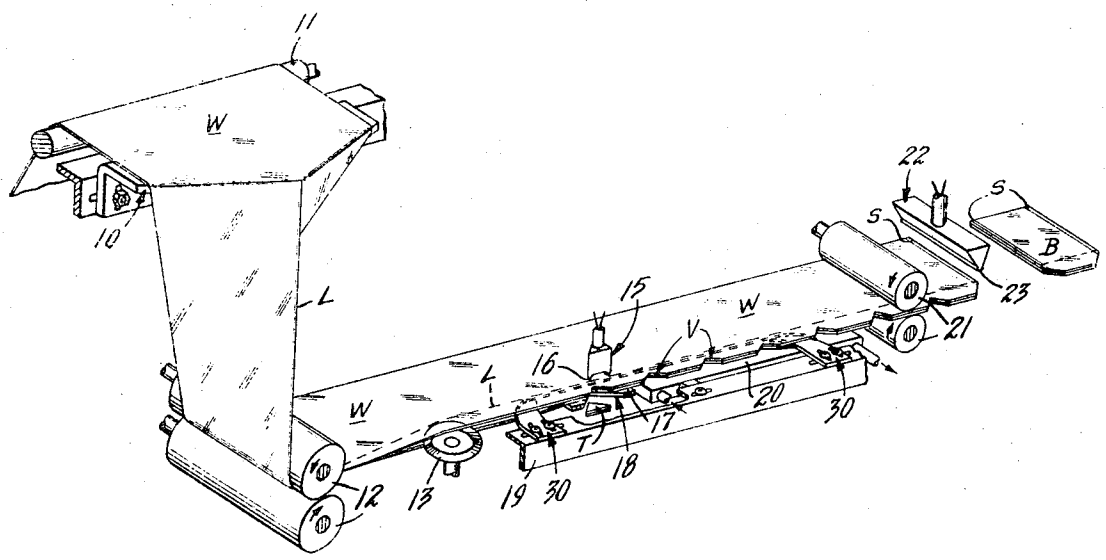
[56] **References Cited**
UNITED STATES PATENTS
3,395,622 8/1968 Kugler ..... 93/35



*Primary Examiner*—Bernard Stickney
*Attorneys*—Kenneth H. Murray, George P. Ziehmer, Robert P. Auber and Louis F. Heeb



**ABSTRACT:** There is described a method of and apparatus for making plastic bags having pleated bottom ends capable of squaring up when the bags are filled, wherein novel ways and means are provided in association with the forming and sealing of the bottom pleats to separate the individual folds.

Patented Oct. 20, 1970

3,534,666

Sheet 1 of 2

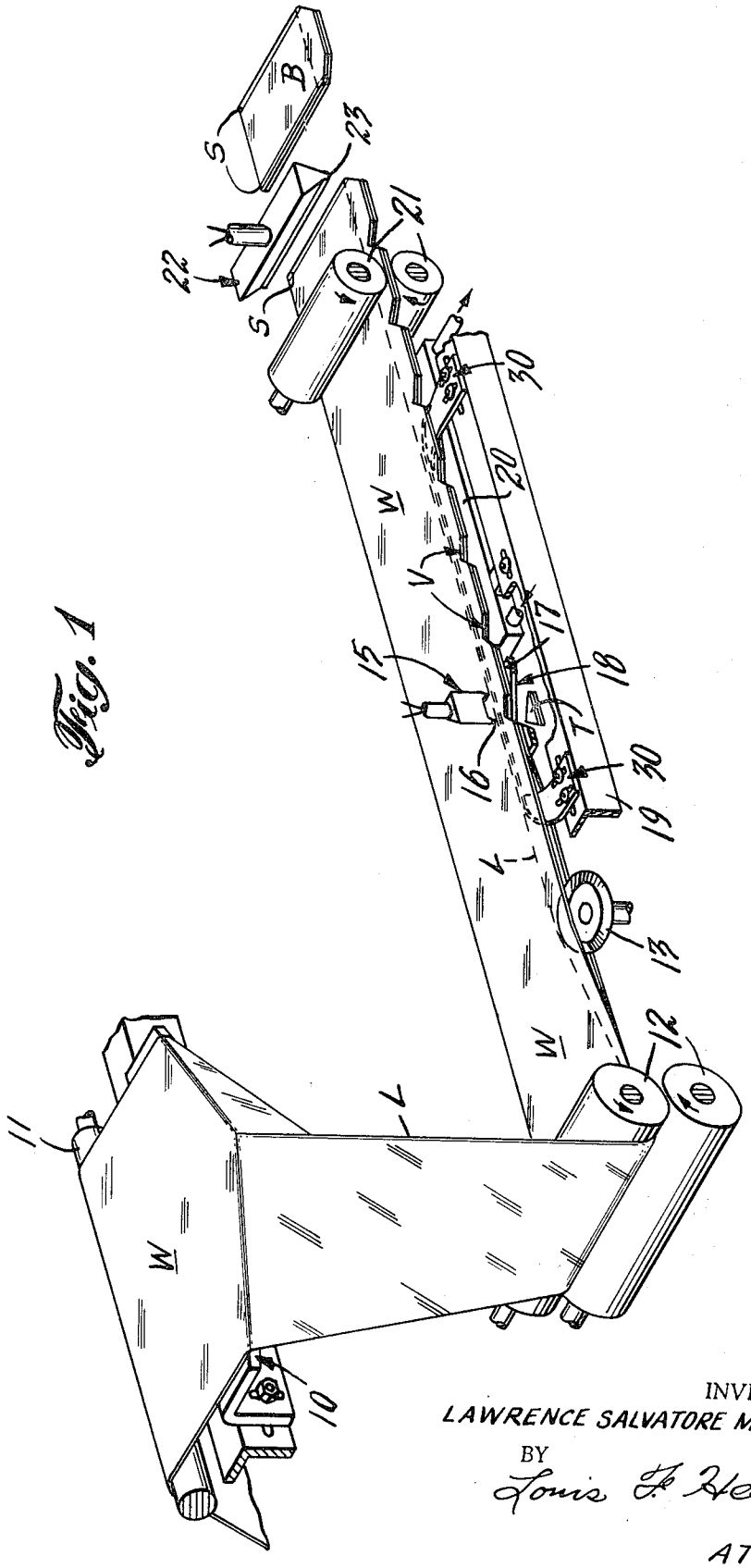



Fig. 1

INVENTOR.
LAWRENCE SALVATORE MACCHERONE
BY
Louis L. Heeb
ATTORNEY

Patented Oct. 20, 1970 3,534,666

Sheet 2 of 2

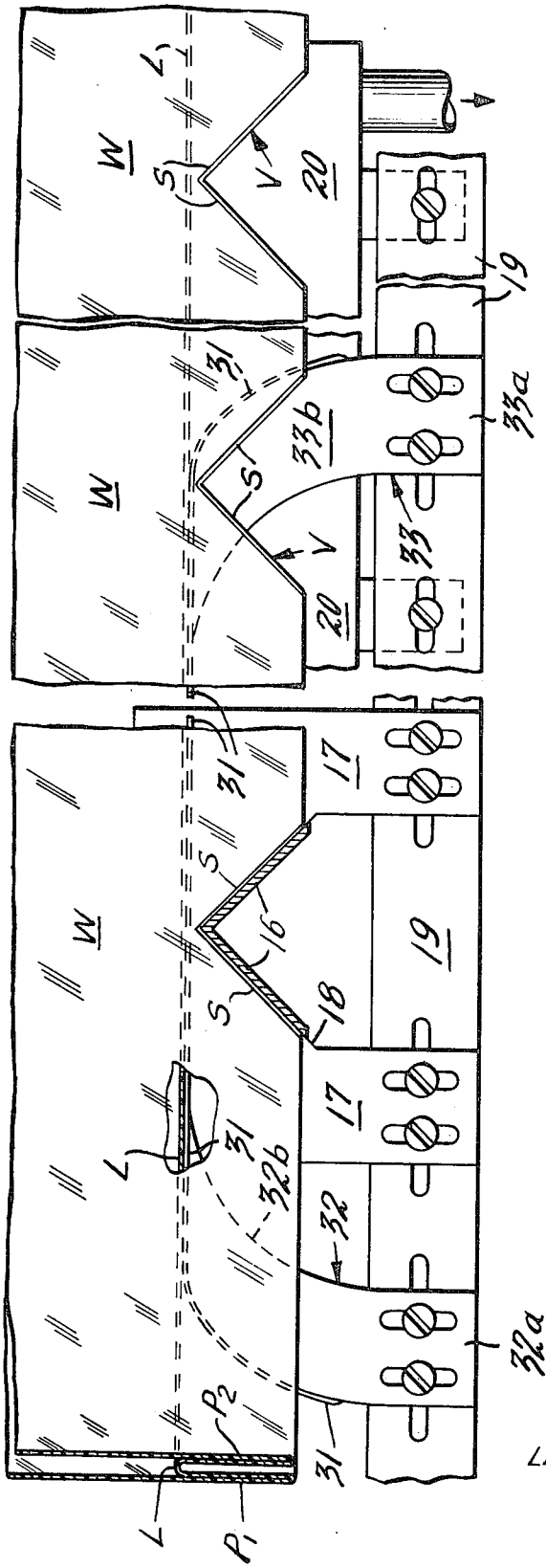



Fig. 2

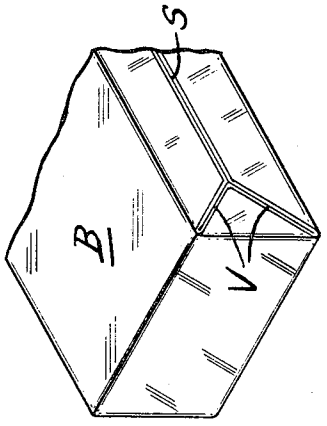



Fig. 4

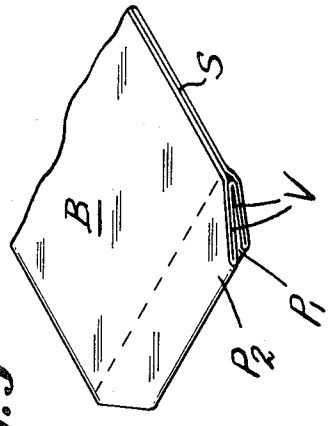



Fig. 3

INVENTOR.
LAWRENCE SALVATORE MACCHERONE
BY
Louis F. Heeb
ATTORNEY

# PLASTIC BAG MANUFACTURE

## BACKGROUND OF THE INVENTION

This invention is an improvement in the art of manufacture of pleated or gusset bottom plastic bags. Flat formed plastic bags provide a relatively inexpensive package form and are used for a wide variety of merchandise. The gusset bottom construction, usually with an interconnecting triangular formation at each end of the W-shaped pleats, is becoming increasingly popular because it enables the bag when filled to assume a squared off configuration at its bottom end, thereby providing a package of pleasing appearance and one which enables end stacking in situations where this feature is desirable. Examples of square bottom bags are described in U.S. Pat. Nos. 2,771,010; 2,815,063; 2,821,337; 3,023,679; and 3,136,475.

The particular construction of square bottom bags for which the present invention is intended is the type wherein the triangular formations at the ends of the gusset result from the pleats being cut through and heat sealed along converging lines extending from the side seams which define the width of the bag. In the manufacturing sequence contemplated, the tapered ends of the contiguous pleats are cut through and heat sealed at the same time by a cutting-sealing tool. This operation has the disadvantage of causing a degree of sticking or fusing between the gusset end seals, which makes it difficult for the bag to properly assume its expanded, squared bottom configuration when filled with product. It is this problem which the present invention aims to overcome.

## SUMMARY OF THE INVENTION

The invention comprises a mechanism and the operative steps for breaking apart or separating the pleats in the gusset fold of an article of manufacture produced from longitudinally folded heat sealable web. In the contemplated environment of use, the gusset pleats are cut and heat sealed at spaced increments along lines extending across the pleats at an angle to the path of feed of the web. The pleat seals are formed by means of a heat sealing tool which cuts through and seals the ends of the adjacent pleats in one pass. This operation tends to cause local points of sticking or fusing between the seals of the adjacent pleats, which makes it difficult for the pleats to open and expand properly in their intended function. By this invention, these points of fusion between the pleat seals are physically broken apart by means of an elongate separator member which includes a thin filament or wire positioned at its upstream end to lie between the pleats adjacent the fold line connecting the pleats and at its downstream end to a connection to the outside of the pleats. The pleat heat seals are formed at a station near the upstream end of the filament and extend outwardly from the filament to the free edge of the pleats. When the heat sealed pleats pass over the downstream end of the filament, any points of fusion between the pleats are broken.

## DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagrammatic perspective view of a bag making system utilizing the invention;

FIG. **2** is an enlarged diagrammatic plan view of a portion of the system of FIG. **1**, illustrating the novel means and its function in the practice of this invention; and

FIGS. **3** and **4** are perspective bottom end views of a bag formed by the practice of this invention, before and after the bag is expanded by filling with a product.

## DESCRIPTION OF A PREFERRED EMBODIMENT

The bag making system diagrammatically illustrated in FIG. **1** comprises a conventional folder guide **10** which receives a web W of plastic sheet from a supply reel (not shown) over a guide roll **11**, and a pair of driven pull rolls **12,12** which pull the web W over the folder guide **10** and advance it toward a series of work stations.



As it is drawn off the guide **10**, the web W is folded along a longitudinal line L intermediate its edges, thus bringing the adjacent halves of the web into flat superimposed relation as they pass through rolls, **12,12** toward the other work stations. Immediately downstream of the pull rolls is a device, in the form of a pleating disc **13** rotatable in the plane of the moving web, which engages the web along the fold line L and reversely tucks the marginal portions on each side of fold line L in between the flat halves of the web, thus forming a W-shaped fold having two adjacent pleats, designated $P_1$ and $P_2$, (See FIG. **2**).

The folded and pleated web next moves past a station where the folded pleats $P_1$ and $P_2$ are incrementally subjected to a cutting-and-sealing operation. At this station, a triangularly shaped cutting-sealing tool **15** reciprocates to and from engagement with the pleats to form therein at spaced intervals, triangular V-shaped cutouts V which are simultaneously sealed along the cut lines.

The triangular cutting tool **15**, illustrated in FIG. **1** as a vertically reciprocatable member having an electrically heated cutting and sealing blade **16** at its lower end, engages the folded pleats $P_1$ and $P_2$ at spaced intervals against a backing plate **17**, whereby a triangular wedge T is cut from the pleats and the superimposed legs of each pleat are sealed along the triangular cut lines. The backing plate **17** is provided with a triangular space **18** underlying the triangular tool **15**, whereby the severed wedges T are allowed to fall free as the cut-seal is made. The backing plate **17** is appropriately mounted for longitudinal and lateral adjustment on a frame section **19** which forms a part of the machine frame.

As the pleated web advances beyond the aforementioned cutting-sealing station, the cut-and-sealed pleats pass over an elongate cooling device **20** through which a suitable refrigerant is circulated. The cooling plate **20** is bracketed to frame section **19**. The V-shaped heat-seals are thus cooled to a permanent set.

The folded web with the now cooled V-shaped gusset seals next passes through the nip of a second pair of feed rolls **21,21**, and then beneath an elongate cutting-sealing shoe **22** which extends transversely of the folded web. Elongate shoe **22**, also electrically energized and having a narrow elongate cutting-sealing edge **23**, reciprocates to and from engagement with the folded web to cut the web and form spaced transverse seals S extending across the folded web from the apex of the triangular seals V at intervals corresponding to the desired width of the bag being formed. A conventional backing member, not shown, underlies the web beneath elongate cutting-sealing shoe **22**, and the finished bag B is detached from the web at the seal line S by conventional off-feed belts, also not shown, which move at a faster linear speed than that of web W, thus facilitating the detachment of the finished bag from the side seal of the next succeeding bag.

From the preceding description, it will occur to the reader that the two pleats $P_1$ and $P_2$ are likely to be fused together at their edges as a consequence of the cutting and sealing operation performed by triangular blade **16**. A novel means is provided for solving this problem, as will now be described.

Mounted on frame section **19** and extending between a point just before the location of cutting-sealing tool **15** to a point just before the location of feed rolls **21,21** is an elongate seal breaker, generally designated **30**. As best illustrated in FIG. **2**, the seal breaker comprises a thin, elongate filament **31**, preferable of durable material such as piano wire, connected at each end and stretched between a spaced pair of thin plates **32** and **33** which bolt to frame section **19** at the aforementioned locations. Plate **32** includes a bracket portion **32*a*** with bolt slots for adjustable mounting to frame section **19**, and a crescent-shaped blade portion **32*b*** which projects into the folded gusset between pleats $P_1$ and $P_2$ and curves in the downstream direction toward plate **17**. Similarly, plate **33** includes bracket portion **33*a*** and blade portion **33*b*** which curves upstream toward plate **17** between the gusset pleats. The two plates preferably are constructed from sheet metal,

and the blade portions 32*b* and 33*b* are quite thin, having a thickness substantially equal to the diameter of wire 31. The upstream end of wire 31 is secured to the leading edge of blade 32*b*, and the other end to the trailing edge of blade 33*b*, with permanent connections, as, for example, soldering.

It will be observed on examination of FIG. 2 that the apex of the V-shaped blade 16 falls close to but just outside (transversely of the path of web W) of wire 31 at this location. Consequently, the triangular cut and seal V terminates to the outside of the wire, which means that wire 31 is "trapped" between the pleats $P_1$ and $P_2$ when the seal is made, in a narrow channel between the apex of the seal and fold line L.

As the web is advanced downstream toward the next work station, the two pleats $P_1$ and $P_2$ pass over the downstream end of wire 31 and blade 33*b* to which it is secured, thus breaking apart any points of fusion between the pleats that may have occurred during the formation of seal V. This completely separates the pleats from each other so that they remain free, as illustrated in FIG. 3, and capable of ready expansion into the squared-up configuration shown in FIG. 4 when the bag is filled.

The narrow channel in which wire 31 moves is subsequently sealed over and cut through by transverse shoe 22 in the formation of the side seal S. This produces an uninterrupted seal extending across the tapered ends of the pleats $P_1$ and $P_2$ and up the opposite sides of the bag B, as best shown in FIG. 4.

The above described structure of the seal breaker 30 and its mounting to frame section 19 is a preferred embodiment, but it is contemplated that variations of the principle will readily occur to those skilled in the art. For example, the downstream end of wire 31 may be differently supported and still achieve the pleat separating function, so long as it is held sufficiently taut to break through the points of fusion between the two pleats as they move along.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction, and arrangement of parts of the apparatus mentioned herein and in the steps and their order of accomplishment of the method described herein, without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the apparatus and method hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a method of producing an article of manufacture from a web of heat sealable material wherein the web is longitudinally folded with a gusset of multiple pleats and heat seals are formed in the pleats at spaced intervals along the fold, the improvement comprising the steps of:
   a. passing the folded pleats over a thin elongate filament fixed at its upstream end to lie between and adjacent the line of fold connecting the pleats and fixed at its downstream end to a connection to the outside of said pleats;
   b. forming at an upstream position along said filament a heat seal in said pleats extending outwardly from said filament at an angle to the path of web travel to fuse together the respective legs of the folded pleats; and
   c. advancing said heat sealed pleats over the downstream end of said filament to break apart any points of fusion occurring between said pleats during the forming of said heat seal.

2. The method of claim 1 wherein said heat seal is formed in each of said pleats at once.

3. The method of claim 1 wherein said heat seal is V-shaped, the apex of which is adjacent said line of fold.

4. The method of claim 1 and including the step of forming beyond the downstream end of said filament another heat seal extending transversely of said folded web from the first said heat seal in said pleats.

5. A method of forming flat gusset bottom bags from a web of heat sealable material, comprising the steps of:
   a. longitudinally folding said web and forming at the line of fold a gusset of multiple pleats;
   b. inserting between the adjacent one of said pleats an elongate member fixed at its upstream end to lie adjacent the line of fold connecting said adjacent pleats and fixed at its downstream end to a connection lying outside the free edge of said pleats;
   c. forming at spaced intervals along said gusset heat seals extending from said filament across said pleats at an angle to the path of feed of said web;
   d. passing said heat seals over the downstream end of said elongate member to break apart any points of fusion between said adjacent pleats occurring during the forming of said seals; and
   e. forming transverse heat seals across said fold web from said heat seals in said pleats and separating the resulting bag from the web at said transverse heat seal.

6. In an apparatus for fabricating from heat sealable web an article of manufacture having a gusset of multiple pleats along a longitudinal line of fold and heat seals across the pleats at an angle to the line of fold at spaced intervals thereon, the improvement comprising:
   a. a heat sealing tool operable at a station along said line of fold and positioned to form said heat seals extending across said pleats from the free edge thereof to adjacent the line of fold connecting said pleats; and
   b. an elongate separator means extending both directions from said station for breaking apart any points of fusion between said pleats occurring during the forming of said seals, said means including a thin filament positioned at its upstream end to lie between said pleats adjacent their connecting line of fold and fixed at its downstream end to a connection lying outside of the free edge of said pleats, said filament at said station being positioned with respect to said tool to lie between said connecting line of fold and the inner terminus of said heat seals.

7. The apparatus of claim 6 wherein said tool is operable to form said seals in the adjacent pleats of said gusset in one pass.

8. The apparatus of claim 6 wherein said tool forms said seals in a V-shape, the apex of which is adjacent said connecting line of fold.

9. The apparatus of claim 6 wherein said elongate separator means includes blade-shaped members secured to the opposite ends of said filament and extending between said pleats of said gusset.

10. An apparatus for forming flat gusset bottom bags from a web of heat sealable material, comprising:
   a. means for longitudinally folding said web to bring its halves into close superimposed relation and forming a gusset of multiple pleats at the line of fold;
   b. heat seal means for forming heat seals in said pleats extending at an angle to the path of feed from the free edge of said pleats to adjacent the fold line connecting said pleats;
   c. means for breaking apart any points of fusion occurring between said pleats during the forming of said seals, said means including a thin elongate filament fixed at its upstream end to lie between said pleats adjacent said connecting line of fold and fixed at its downstream end to a connection outside the free edge of said pleats; and
   d. heat seal means positioned downstream of said filament for forming transverse seals extending across said folded web from the inner terminus of said pleat seals.