Sept. 29, 1953 C. W. VOGT 2,653,751

CHAIN OF BAGS

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Fig. 1.

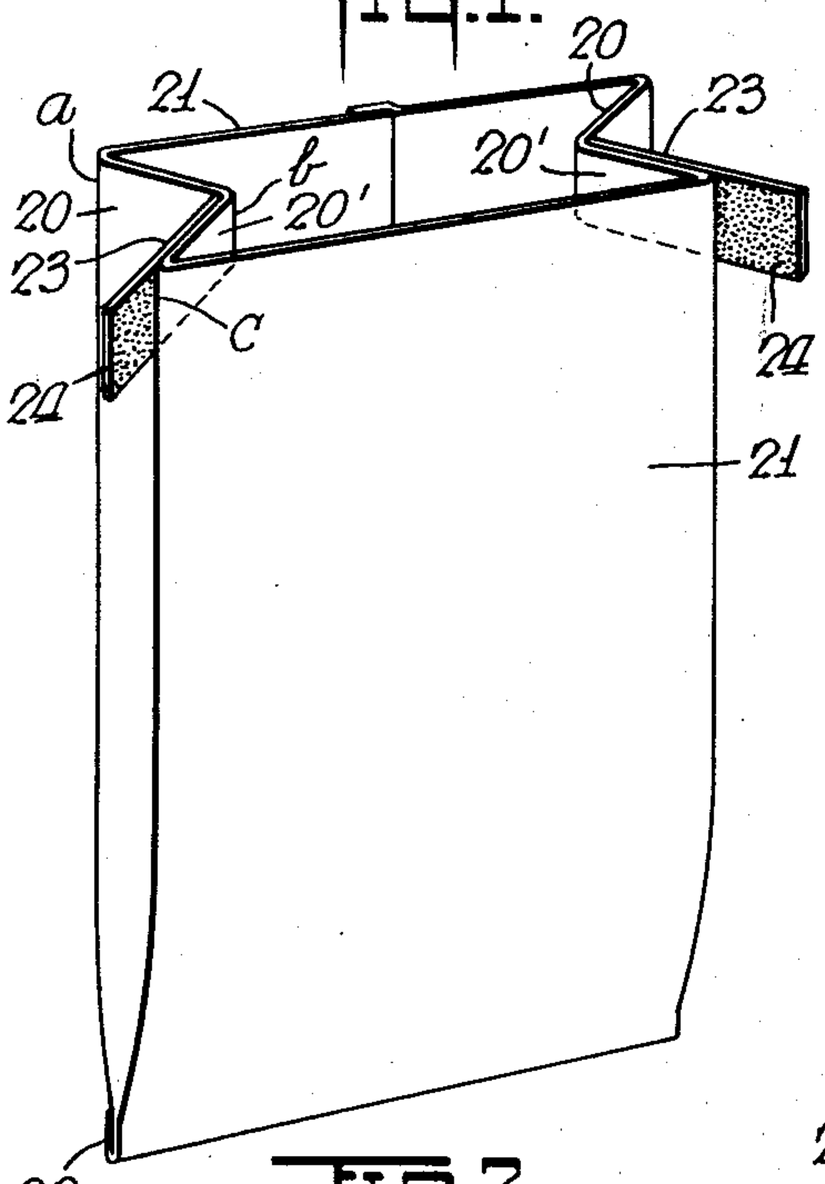

Fig. 7.

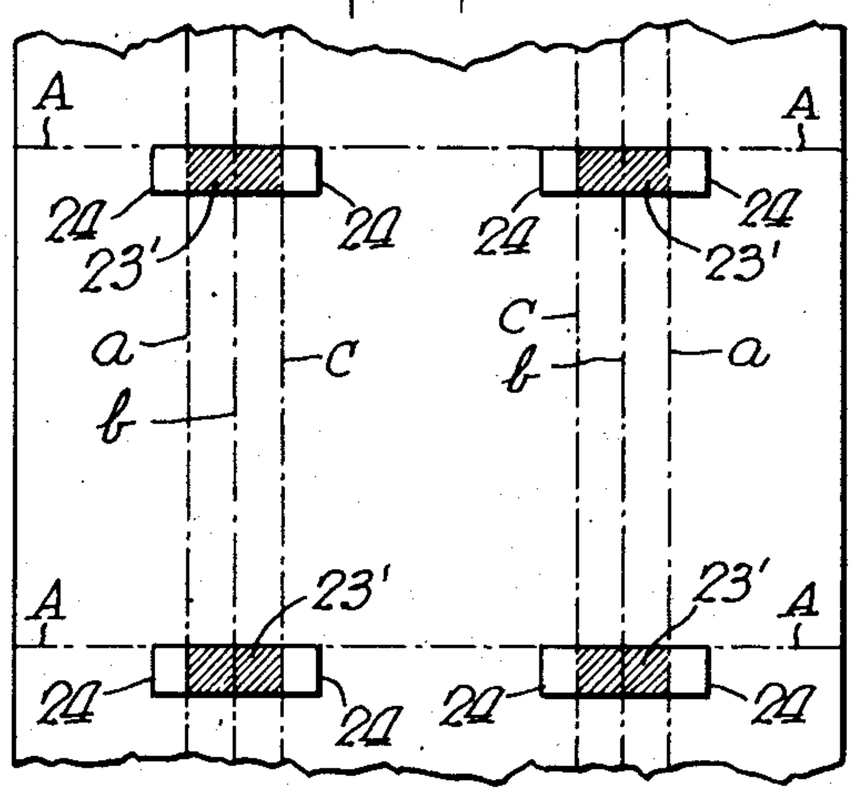

Fig. 6.

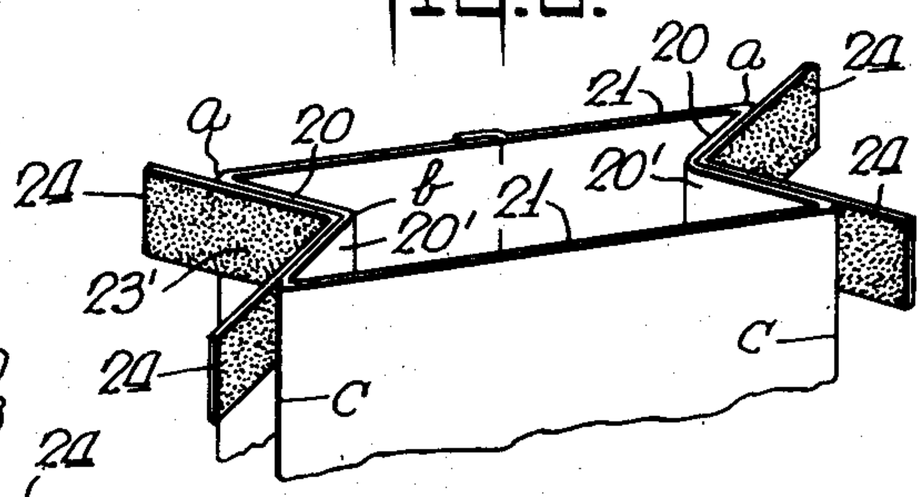

Fig. 2.

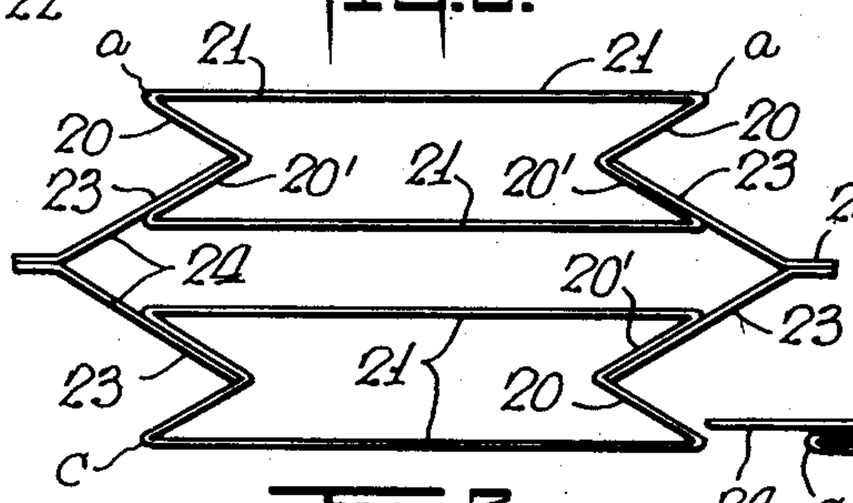

Fig. 8.

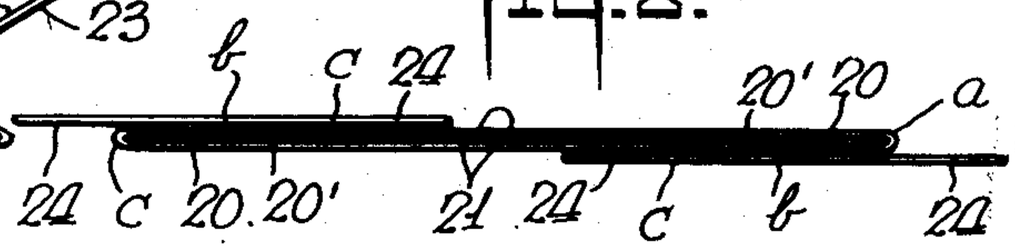

Fig. 3.

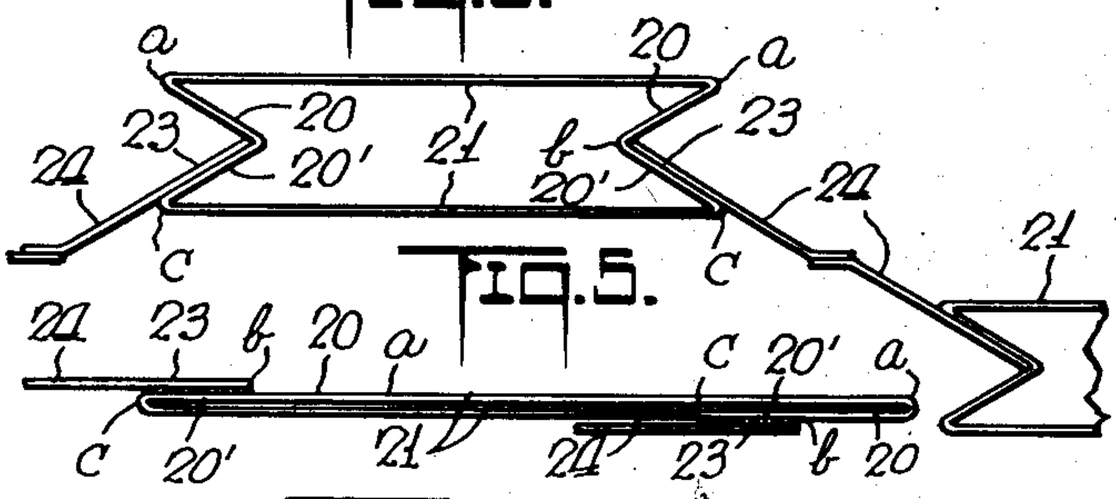

Fig. 5.

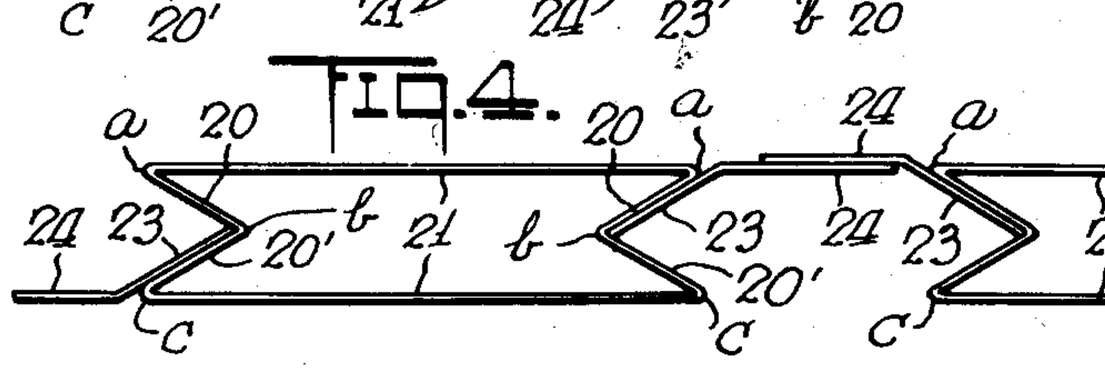

Fig. 9.

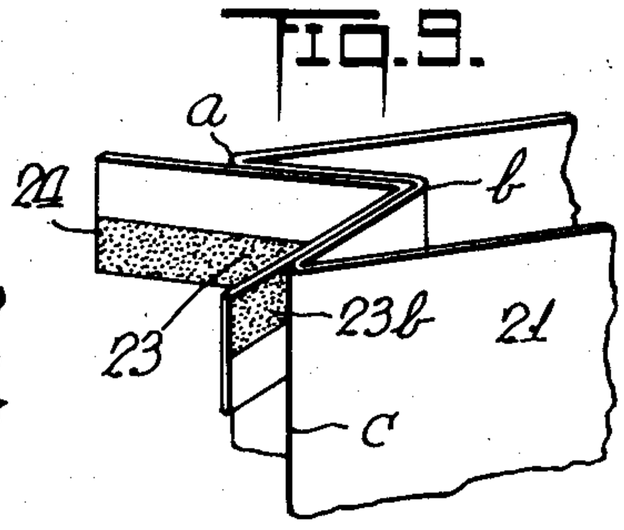

Fig. 4.

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CHAIN OF BAGS

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FIG. 10.

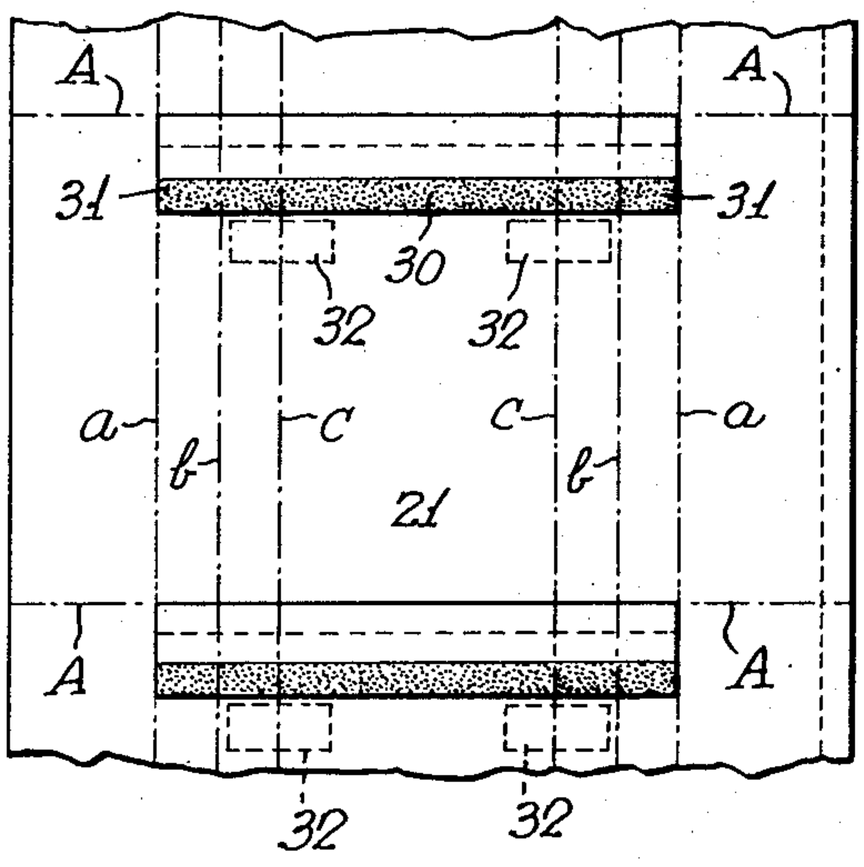


FIG. 11.

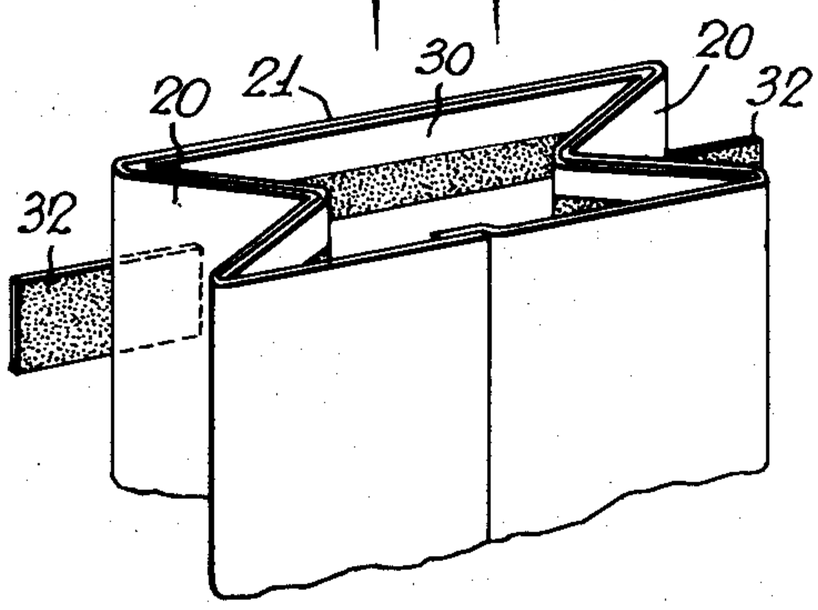


FIG. 12.

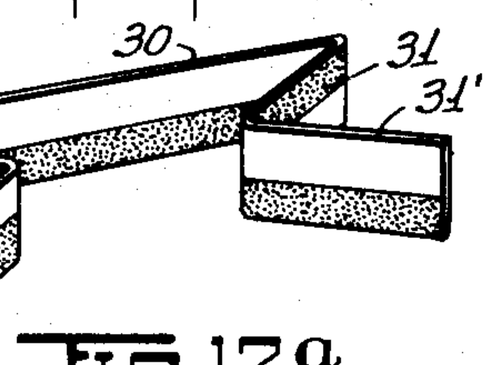


FIG. 13.

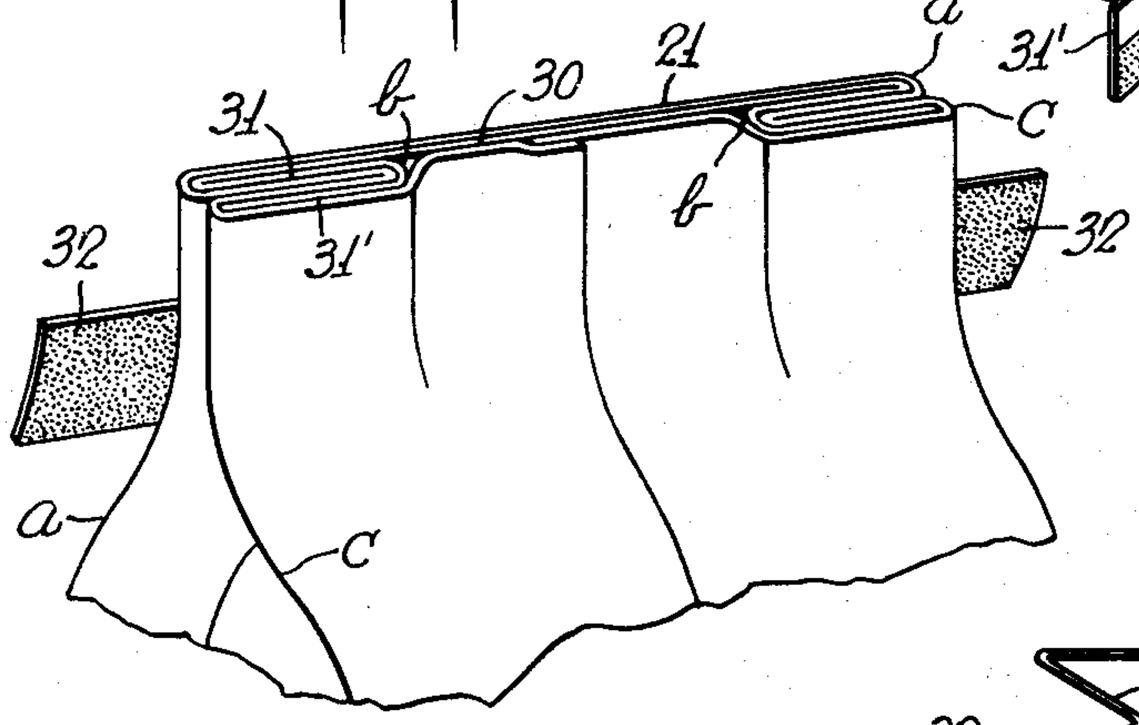


FIG. 12.a

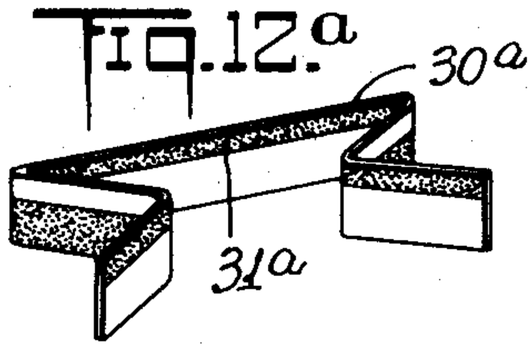


FIG. 15.

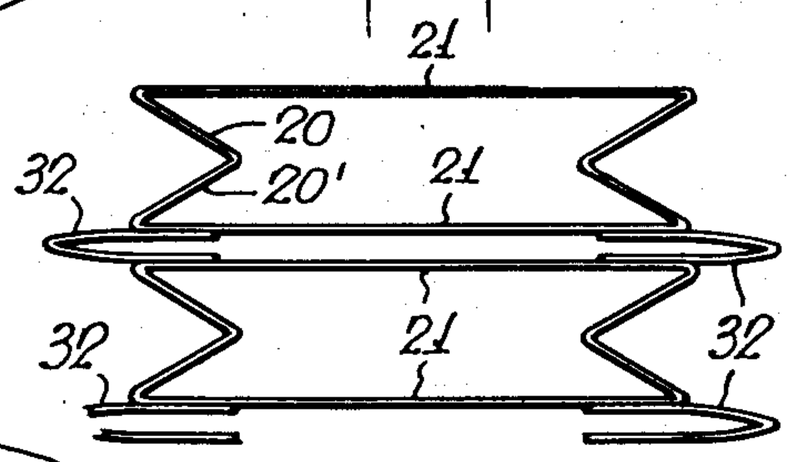
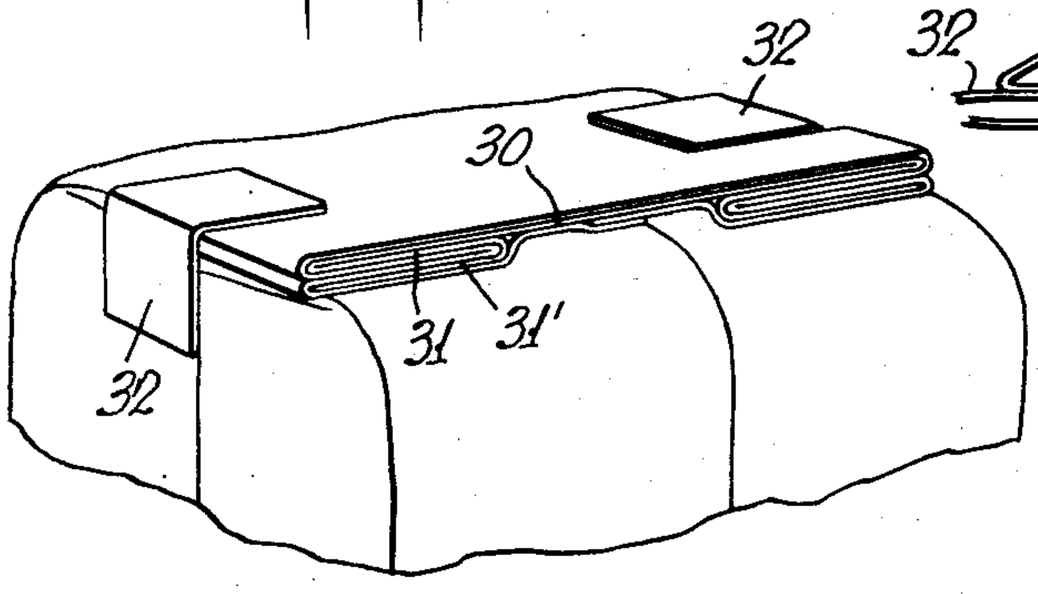


FIG. 14.



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CHAIN OF BAGS

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Fig. 16.

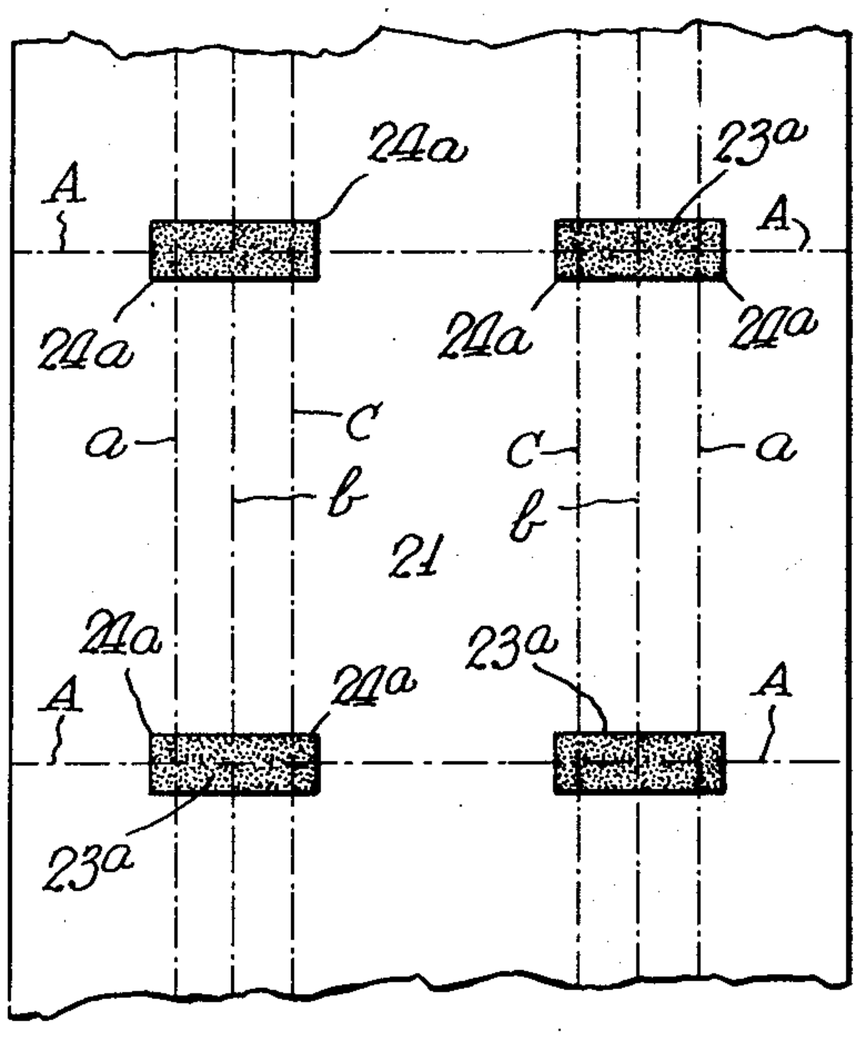


Fig. 17.

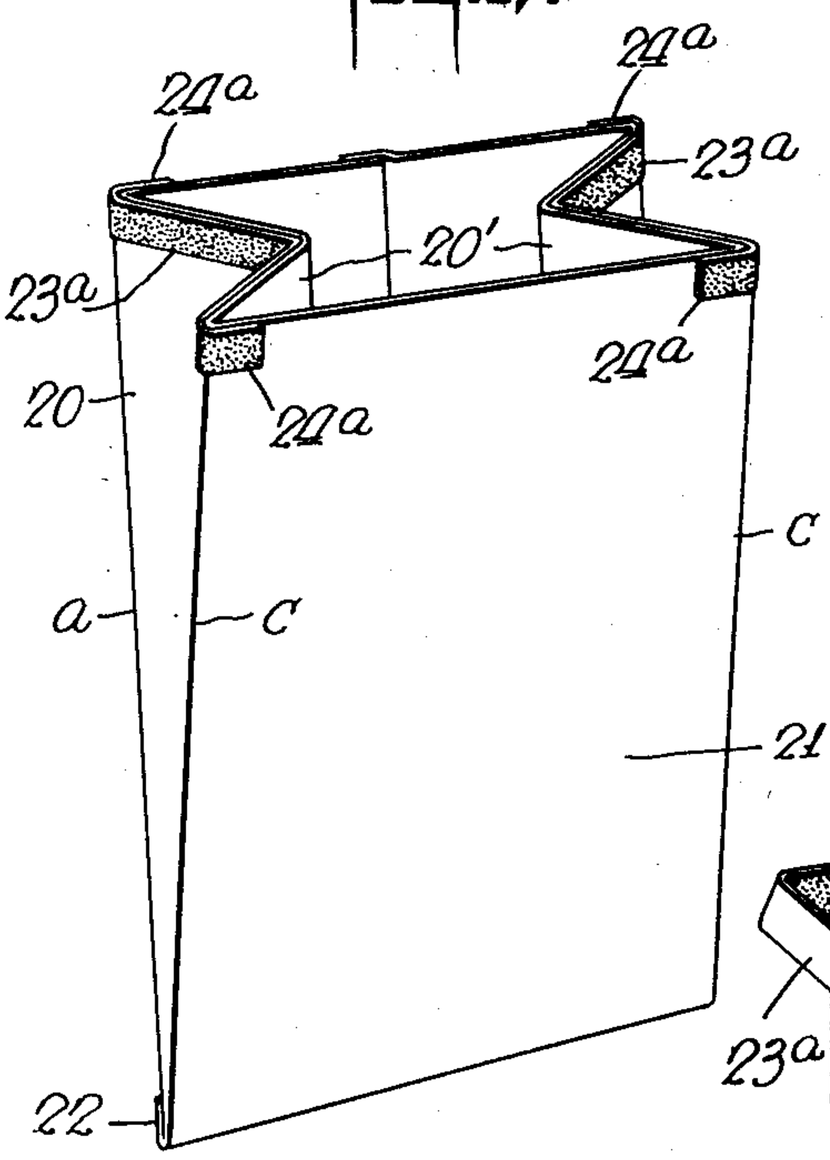


Fig. 18.

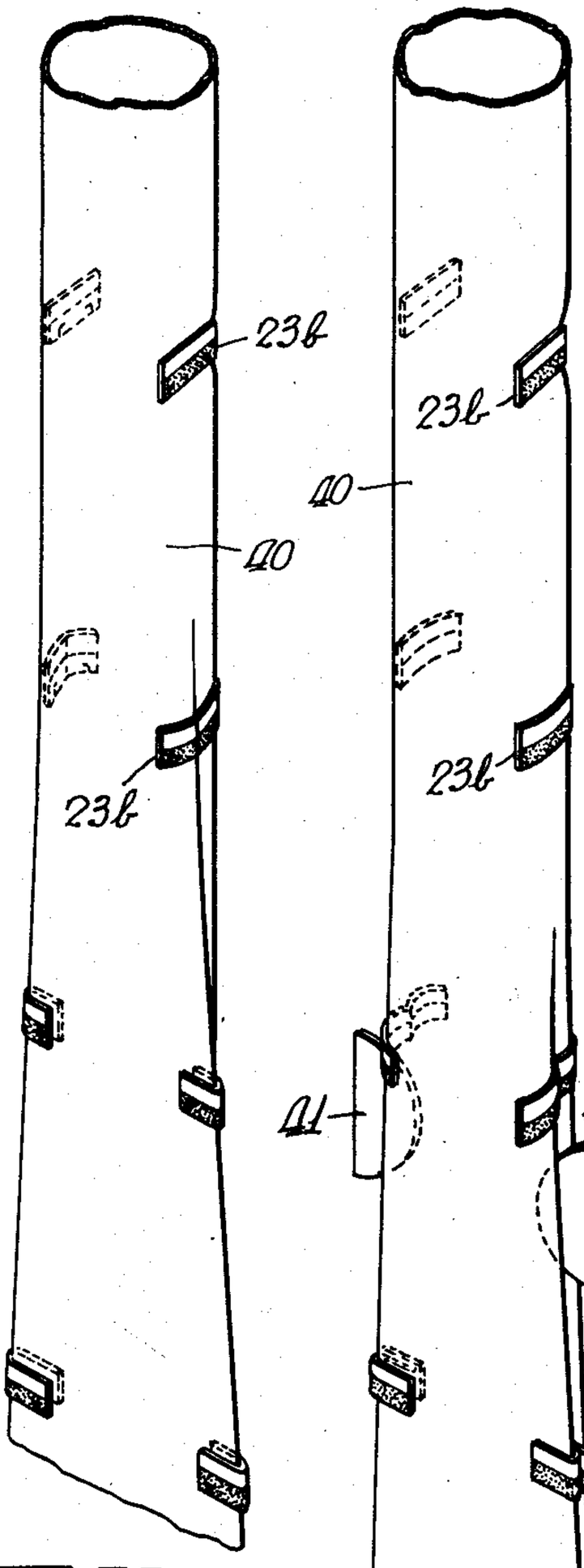
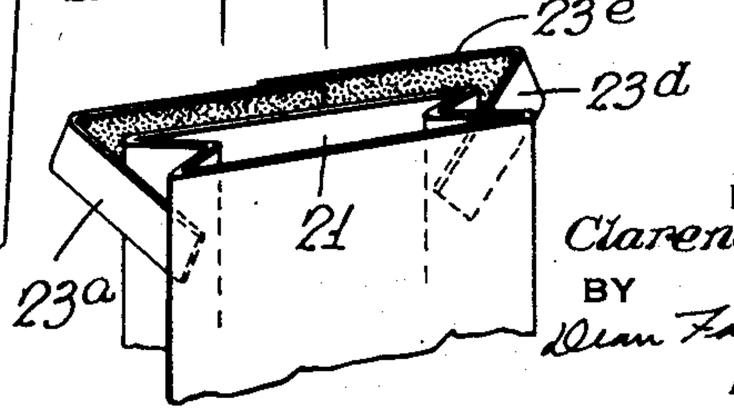


Fig. 19.

Fig. 20.



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CHAIN OF BAGS

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Fig. 21.

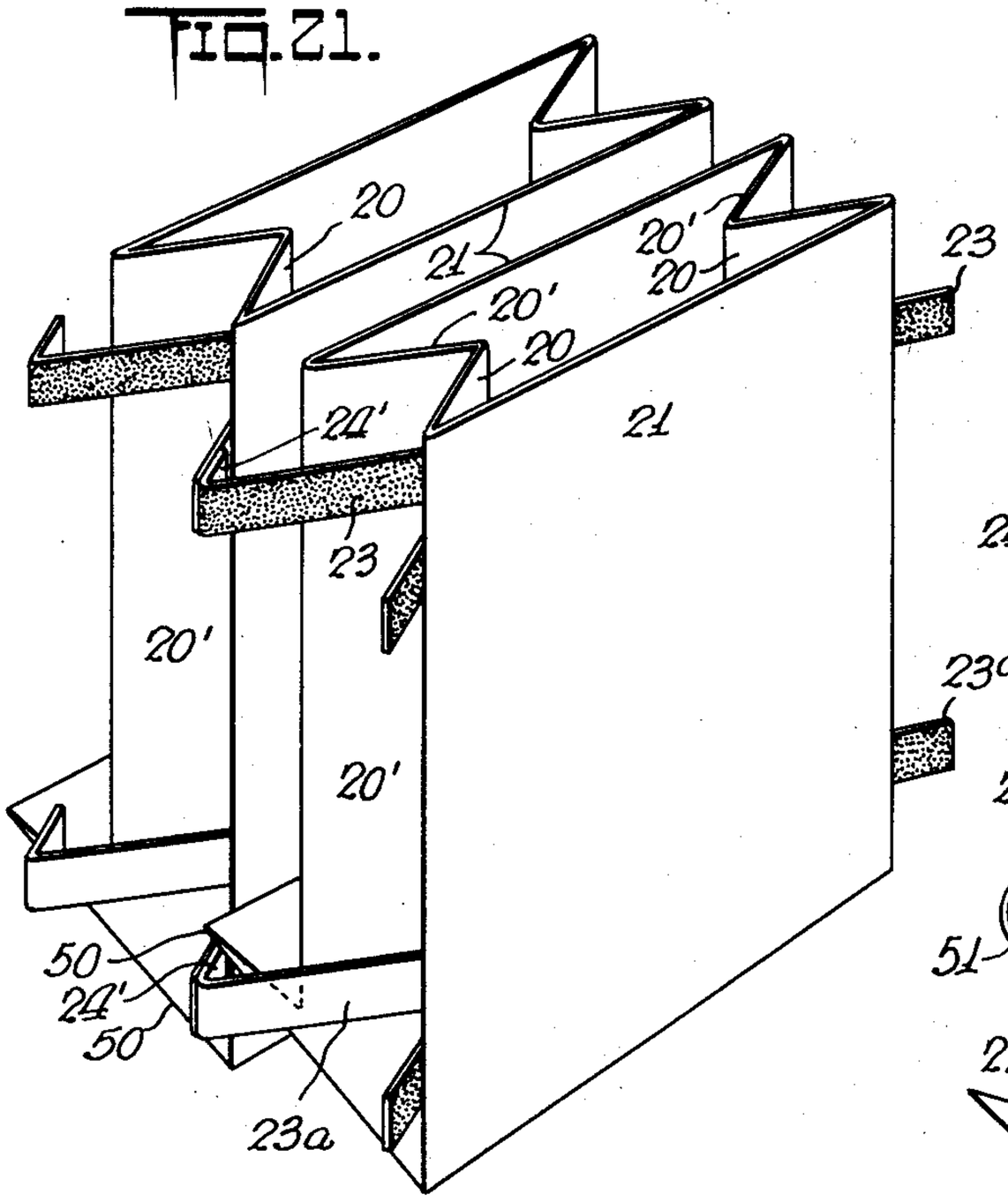


Fig. 22.

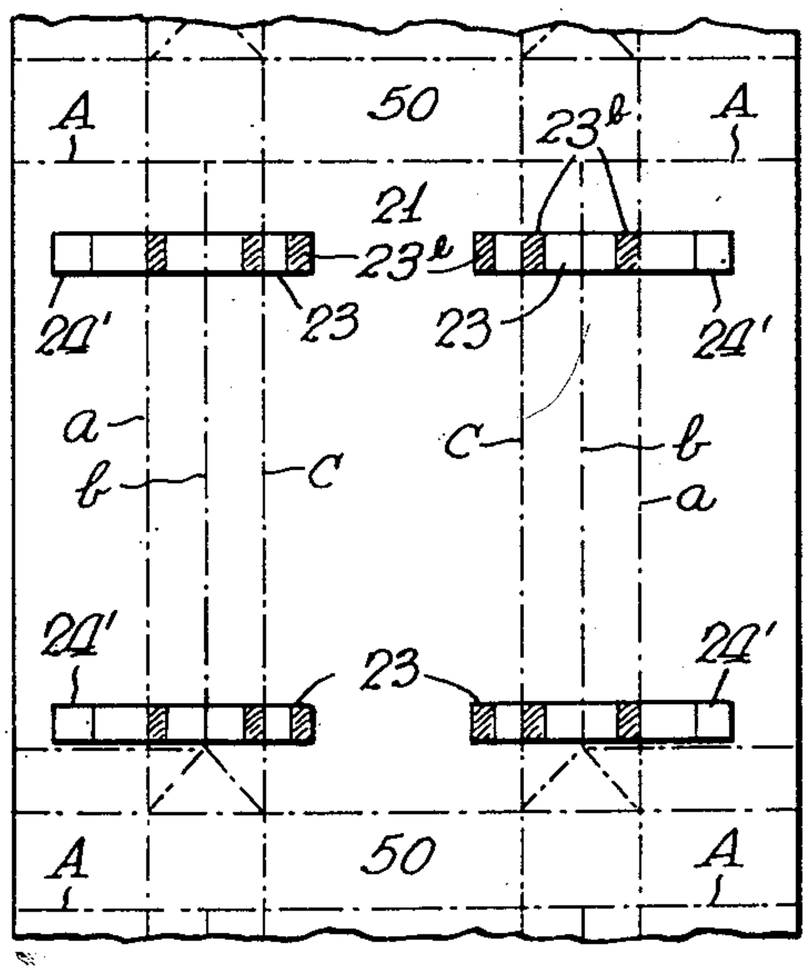


Fig. 23.

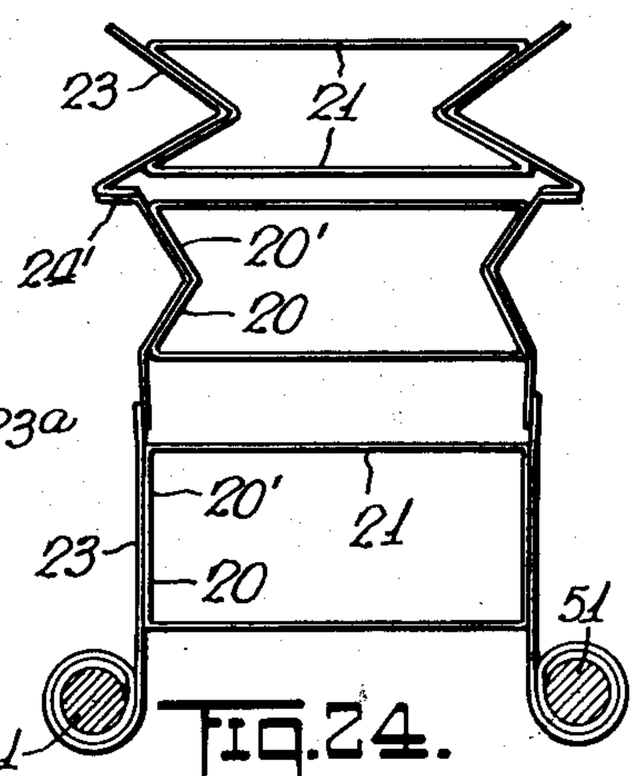


Fig. 24.

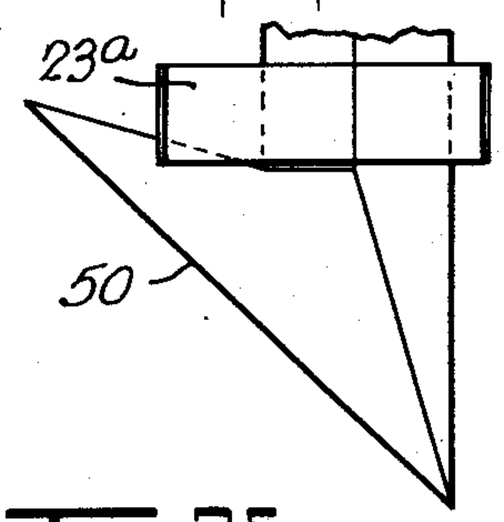
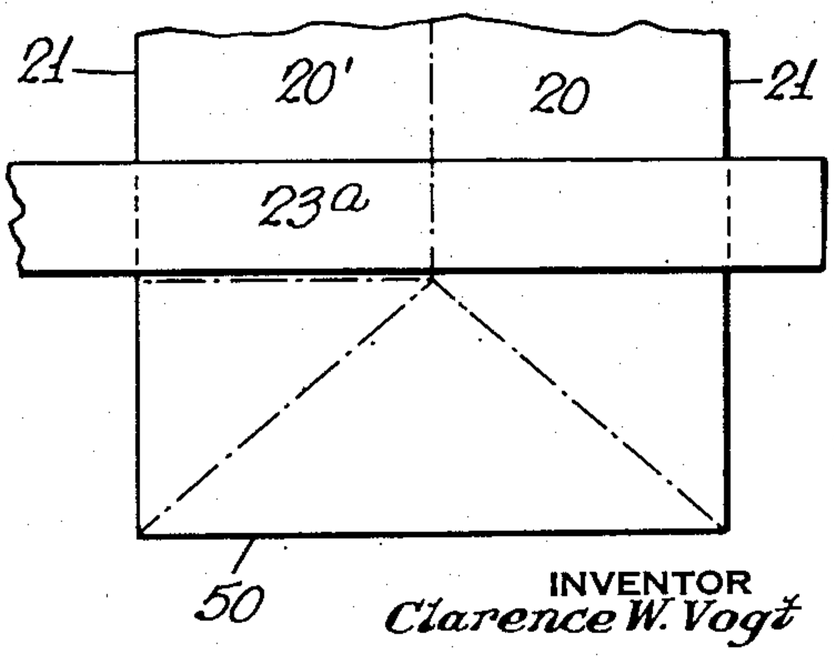


Fig. 25.



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Patented Sept. 29, 1953

2,653,751

UNITED STATES PATENT OFFICE

2,653,751

CHAIN OF BAGS

Clarence W. Vogt, Norwalk, Conn.

Application January 14, 1949, Serial No. 70,911

3 Claims. (Cl. 229—53)

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This invention relates to bags for the packaging, storage, shipment and sale of powdered, granular, plastic or fluid material, methods of making said bags, and prepared sheet material suitable for the making of said bags and carrying out said methods. It relates more particularly to bags of the type which when in flat or collapsed form have a pair of infolded side walls or gussets connecting a pair of side panels, and which open out as the panels separate to permit filling, and are again infolded at the mouth in closing and sealing the bag.

The invention relates more particularly to those types of bags which are formed of very thin impervious synthetic sheet material which is either inherently heat-sealable or is treated or coated to become sealable, at least at the mouth, so that the bags after filling and closing may be sealed by the application of heat and/or pressure. In order to insure hermetic sealing and rendering the bags sift-proof, it is important that the upper ends of the gussets be flush with the upper edges of the side panels, but this is difficult to effect, particularly if the bag walls be of very thin and very flexible material.

As one important feature of my invention I provide the sheet material from which the bag is to be formed with attached elements, preferably in the form of strips of stiffer thin sheet material, and so positioned and disposed on the sheet material that when the material is severed transversely into sections in the forming of the bags, said elements will be along at least one-half of each gusset at the upper edge thereof, and at the mouth of the bag. These elements facilitate the proper positioning of the gusset at the time of sealing, and the rendering of the bag sift-proof when closed and sealed, and in different forms, have various other functions and advantages which will be pointed out more fully hereinafter.

If the attached elements extend along both walls of the gusset it is important, or at least highly desirable, that the strips or other elements be applied before the gusset is formed, and while the sheet material is free of wrinkles or creases. This insures a tight seal at the fold line, because if there be crease lines in such thin synthetic sheets or tubes, for instance in forming the gusset and before the strips are attached, it is difficult, if not impossible to apply the strips across the fold line or up exactly to the fold line, and obtain a tight and uniform contact at or across the crease, and leakage from the bag may occur.

Although in most of the embodiments of the present invention the attached strips are on the

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outer surfaces of the walls forming the gussets, they may extend along at least one of the side panels of the bag, and in some embodiments the attached elements may be disposed on the inner surface rather than the outer surface of the gussets and/or the side wall at the mouth portion.

When the strips are of stiffer sheet material than that forming the walls of the bag, they act to reinforce and stiffen the infolded gussets at the mouth of the bag and prevent the center fold line of the gusset in the very thin and flexible material from sagging below the plane of the upper edges of the side panels of the bag when closing and sealing the bag, and during shipment or handling of the filled and sealed bags, and thereby render the bags sift-proof.

As a further feature, the strip is of a greater length than the width of a gusset wall, so that the strip extends beyond the side panels and may serve as a tab whereby two or more of the bags may be connected together in pairs or as a chain or chains, to facilitate the feeding of the bags in succession to a filling machine or to filling position. The strip may also serve to support the bags or bag pairs or chains during filling. After bag filling each strip may be pulled loose from one bag of the chain or pair while held attached to the adjacent one, and serve for reinforcing and sealing the mouth and/or the gussets of the latter. Such a strip may extend across both of the walls of the gusset, or it may terminate at the center fold line, and the extension may be at one or both ends of the strip.

The strip preferably has adhesive on both surfaces thereof, and of different types. Both may be thermoplastic, but activated at different temperatures. One may be pressure-sensitive and the other thermoplastic, or one may be thermoplastic and the other a glue such as a water-soluble glue or other suitable adhesive. Various other combinations of different kinds or varieties of adhesive may be employed. For instance, the surface of the strip which is initially attached to the sheet, tube or bag, may be coated with an adhesive which is normally non-tacky, and which is activated by wetting, and the surface which is attached to the bag after filling and closing may be coated with an adhesive which is non-tacky when cold, but is activated by heat applied during the pressing of the walls together and sealing the bag after filling. In some cases the adhesive may be of a type which will permit the strip to be peeled from one part and re-applied at a different position or to another part, or for a different purpose.

As a further feature, the strip may be applied to the inner surface of the bag at the mouth thereof, and hereagain, two different types of adhesive may be employed, and heat applied only in the closing and sealing of the filled bag. The sealing area may be slightly below the upper edges of the side panels so that said edges may be slightly separated and the bag opened by pulling the edges apart and peeling along the adhesively connected surfaces.

The sealing in accordance with my invention may be at both ends of a tubular body, or only at the top end, the other end or bottom being closed and sealed by any conventional method. Also, strips may be provided adjacent to the bottom of a bag of the flat bottom type, to facilitate opening out from a collapsed condition, and may be removed after bag filling as hereinafter explained.

Other features and advantages of my improved construction will be pointed out hereinafter, or will be apparent from a consideration of the different embodiments illustrated as examples or types of construction and operation.

In the drawings:

Fig. 1 is a perspective view of a bag embodying my invention.

Fig. 2 is a top view showing a pair of bags of the type shown in Fig. 1, and connected by means of strips.

Fig. 3 is a top view of a part of a chain of bags of the type shown in Fig. 1, but connected in zigzag arrangement.

Fig. 4 is a view similar to Fig. 3, but showing the bags connected in alignment.

Fig. 5 is a top view of a collapsed tube with the strips attached, and which may be employed to form bags of the type shown in Fig. 1.

Fig. 6 is a view similar to a portion of Fig. 1, but with the strips extending across both walls of the gussets.

Fig. 7 is a view of a portion of a sheet from which the bag shown in Fig. 6 may be made.

Fig. 8 is a view of the end of collapsed tubing which may be employed to make the bag shown in Fig. 6.

Fig. 9 is a view of a portion of a bag similar to that shown in Fig. 6, but with no adhesive on the lower portion of one surface of the strip, and none on the upper portion of the other surface.

Fig. 10 is a view similar to Fig. 7, but showing a different arrangement of strips.

Fig. 11 is a perspective view of the upper portion of a bag made from a sheet such as shown in Fig. 10.

Fig. 12 is a perpective view of a strip of the type shown in Figs. 10 and 11, and which is disposed inside of the mouth of the bag.

Fig. 12*a* is a perspective view of a strip similar to that shown in Fig. 12, but for use on the outside of the mouth of the bag instead of the inside.

Fig. 13 is a perspective view of the upper portion of a filled bag having the type of strips shown in Figs. 10, 11 and 12, before the final folding over of the top part.

Fig. 14 is a view of the upper portion of the bag shown in Fig. 13, but with the top folded over and sealed down, but preferably it is also folded a second time.

Fig. 15 is a view similar to Fig. 2, but showing a portion of a chain of bags connected by means of the strips shown in Figs. 10, 11 and 13.

Fig. 16 is a view similar to Figs. 7 and 10, but showing the strips sealed to the sheet throughout their lengths.

Fig. 17 is a perspective view of a bag formed by means of the sheet shown in Fig. 16.

Figs. 18 and 19 are perspective views of tubing with strips attached, and showing how the gussets may be formed after attachment of the strips.

Fig. 20 is a view of an alternative form with the strips at an angle to instead of parallel with the bag mouth.

Fig. 21 is a perspective view of a chain of flat bottom bags with strips on the upper and lower portions of the gussets.

Fig. 22 is a plan view of a sheet with strips attached, for making the bag shown in Fig. 20.

Fig. 23 is a top view of a portion of a chain of bags with successive bags opened to different degrees.

Fig. 24 is an edge view of the lower portion of a bag partly opened as shown in Fig. 20, and

Fig. 25 is a view similar to Fig. 24, but with the lower portion fully expanded.

In Fig. 1 there is illustrated a type of bag formed of a section of tubing having infolded side walls **20**, **21'** constituting gussets connecting the side panels **21** and closed at the bottom by a transverse fold **22**. The gussets are connected to the side panels along fold lines *a* and *c*, and midway between the side edges of each gusset is a fold line *b*. The walls are preferably of thin synthetic heat-sealable sheet material such as a heat-sealing "cellophane" such as made and sold by Du Pont, "Pliofilm" such as made and sold by Goodyear, films of a polyvinylidene chloride made and sold by Dow Chemical Co. under the trade-mark "Saran," and/or polyethylene such as sold by Plax Corporation and Visking Corporation. The bodies of the bags may be made from sheets of the type shown in Fig. 7, with the edges heat-sealed together to form a tube, or they may be made of sections of seamless tubing of the type shown in Fig. 5.

Upon filling such a bag, the gussets are forced outwardly by the material, but in closing the mouth of the bag, the upper ends of the fold lines or creases *b* are pushed inwardly to re-form the gussets; but without the strips this would normally result in the upper ends of these fold lines *b* being below the plane of the top edge of the side panels **21**. Upon sealing the bag by heat and pressure, or by pasting a label over the mouth and onto the side panels, the bag may leak at the upper end of the fold line or crease *b*, and into the space between the gusset walls **20**, **20'**.

As one feature of my invention I provide strips which may be of stiffer sheet material, such as paper, and secure such strips to said sheet material in such positions that in forming the bag said strips are disposed in the gussets at the upper ends thereof, and act to reinforce and stiffen the upper edge portion of the gusset walls. They facilitate the holding of the upper ends of the fold lines at the same elevation as the upper edges of the side panels which said panels are being brought together in closing and sealing the bag. Thus the filled and sealed bag is sift-proof. The strips preferably have adhesive on both surfaces thereof, and on at least those areas within the gussets. Before the closing of the bag the strips so formed and so secured to one wall of each gusset may spread apart, to facilitate filling. Upon closing the bag, the opposite surface of the strip is heat-sealed to the other gusset wall so that the upper portions of the gusset are sealed to the strips, and the gusset is stiffened.

In Fig. 1 I have shown a bag provided with a

strip 23 which is of a length somewhat greater than the width of a gusset wall, so that one end of the strip is at the fold line *b* and the other end extends beyond the fold line *c* to form a tab 24. The strip is provided with adhesive on opposite surfaces of the portions of the strip within the gusset, so that after filling the bag and closing the mouth, the walls of the gusset are held in closed position. The adhesive on the portions of the strips which engage the gusset walls is preferably of a heat-sensitive or heat-activated type, so that the sealing of the gussets in closed position and the sealing of the walls of the bag at the mouth may be effected simultaneously by the action of heat and pressure.

In forming a tube from the flat sheet, the positions of the fold lines *b* will be defined by one end of each strip, and the positions of the fold lines *c* will be determined by the end of the area of the strip directly secured to the sheet. The opposite end portion of the strip will extend beyond the fold line *c* to form the tab 24, which may be of any desired length. The tab serves many purposes. It provides a handle which may be used in holding the inner end of the strip and the upper end of the fold line *b* at the proper elevation during the closing and sealing of the bag; it serves for connecting the bags together in pairs or chains during the feeding of the bags to and from a filling station; it may be moved sideways to pull the gussets outwardly to open the bag; it may serve to support the bags in upright position during filling; and it serves to hold the gussets closed when the bag mouth is closed. The adhesive on the surface of the tabs 24 may be a thermoplastic or an adhesive of the "self-stick" type, so that it will not be tacky and cause adherence of the tabs 24 until this is desired for chaining or other purposes. Such adhesive will readily permit peeling or separation of the tabs when this is desired.

In Fig. 2 I have shown two bags of the type shown in Fig. 1, and connected as a pair by sticking the ends of the tabs 24 of one bag to the ends of the tabs 24 of another bag. As the tabs are of stiffer material than the walls of the bags, the ends of the tabs which are sealed together may rest upon a pair of rails along which the bags may be moved to and from filling position.

The strips have a further function in that they may serve for opening the bags for filling. With the bags connected as shown in Fig. 2, it will be apparent that by pulling the bags away from each other from a flat or collapsed position, the gussets will be opened out and the side panels forced apart as the tabs swing on the fold lines at the bases of the tabs. This is particularly important where the bag walls are formed of very thin flexible material, and where it is difficult to take hold of the upper edges of the opposite side panels 21 and pull them apart. The opening up of the gussets automatically spreads the side walls apart.

In Fig. 3 I have shown a portion of a chain of bags in which the tab of each strip is connected to the tab of the next bag in succession in the chain, and with the bag offset.

In Figs. 1, 2 and 3 I have shown the strips secured to the gusset walls 20', but obviously one strip might be secured to the wall 20' of one bag and the other to the wall 20 of the gusset of the next bag, as shown in Fig. 4, and in this case the bags may be connected together as a chain, and in direct alignment, instead of being zigzag as in Fig. 3.

Where a sheet rather than a seamless tube is used, the tabs are preferably applied in the proper positions along the length of a strip of sheet material, the width of the sheet being slightly greater than the desired circumference of the bag, to permit overlapping and sealing of the edges of the sheet to form a tube, or the edges of the sheet may be first sealed to make a tube, or seamless tubing may be used.

The strips may be attached to the tube with proper spacing along the length thereof, and with the tube collapsed as shown in Fig. 5, with the edges of the tube forming the fold lines *b* and *c* at opposite edges of the tube. One of the tabs will project beyond the edge of the tubing, as shown at the left of Fig. 5, with one end of the strip defining the location of one fold line *b* when the gussets are formed. The other tab may be secured to the opposite wall of the tube and spaced inwardly from the edge to a distance equal to the width of the gusset wall 20, and with one end where the fold line *b* is to be formed. In opening up the tube the strips will define where the other fold will be formed, and one of the strips will be on the wall 20' of one gusset and the other strip will be on the wall 20' of the other gusset, as shown in Fig. 3.

In the construction shown in Figs. 1 to 5, inclusive, the strip is initially attached to only one wall of each gusset. Obviously the strips may be made as shown in Fig. 6, and of double length, with a fold line intermediate of the ends of the strip, so that the strip 23' will be initially secured to both walls of the gusset. In this form, the same as in the previous form, one surface of the body of the strip may be provided with heat-sensitive adhesive so as to become permanently attached to the walls 20 and 20' of the gusset, and to each other, and one surface of the tabs may be provided with a type of adhesive which is activated by pressure and which permits ready peeling apart with or without the application of a relatively low heat. In all cases the strip is attached to the sheet material before the crease line *b* of the gusset is formed.

In Fig. 7 I have shown a sheet having strips 23' of the type illustrated in Fig. 6, and applied in two rows along the length of a sheet and spaced in each row in accordance with the length of the bag to be formed. Each strip is so positioned as to lie across the dot and dash lines *a*, *b* and *c*, which are to form the fold lines of the gussets. The portions of each strip between the lines *a* and *c* may be permanently attached by heat-sealing in these areas, or by an adhesive which when applied is cold, or at a sufficiently low temperature so as not to activate a thermoplastic coating on the bag or strip at an opposed or adjacent area. The end portions of the strips beyond the lines *a* and *c* may be left free of the sheet to form the tabs 24 having adhesive permitting joining to and peeling from the tab of an adjacent bag.

This sheet may have its edges brought together and sealed to form a tube, and the gussets formed between the two pairs of lines *a* and *c*, the positions of which will be defined by the ends of the sealed areas of the strips. The upper end of the bag will then be as shown in Fig. 6, with the ends of the strips forming tabs for connecting the bags together in pairs or in chains. The strips may be scored intermediate of their ends, and on the surfaces away from the sheet, before being applied, and will thus accurately define the positions of the lines *b* when the sheet is folded to

tubular form, and there will be firm and continuous sealing across these lines. The outer ends of the sealed areas on the strips will define the location of the lines *a* and *c*, and the width of the panel **21**, that is, the distance between the two lines *c*.

The sheet may be cut transversely along the lines A—A, which are at the upper edge of each pair of strips, and the cutting may be before or after the opposite edges of the sheet are sealed together to form a tube. The bottom end of the tube may be closed in any suitable manner, as for instance by folding and sealing, as shown in Fig. 1, or by folding and sealing to form a flat bottom. Upon forming the bag as shown in Fig. 6, the ends of the strips may serve to connect the bags together in pairs or chains, as shown in Figs. 2, 3 and 4, as well as to hold the upper ends of the gussets flush with the upper edges of the panels while closing and sealing after filling.

If the bags are formed of seamless tubing, strips of the type shown in Fig. 6 may be applied to opposite surfaces of a flat collapsed tube, as shown in Fig. 8. In such a flattened tube there are fold lines at opposite edges corresponding to the line *a* of one gusset and the line *c* of the other gusset, and the two tabs **24** which are superposed on the walls **21** are free from said walls.

In Fig. 9 I have shown a construction which is similar to that shown in Fig. 6, and which may be formed as in Fig. 7 or Fig. 8, but in this construction the adhesive **23***b* on the surface of the strip which contacts the gusset extends down only about half way from the mouth of the bag, so that the lower edge of the strip will be free from the bag. The adhesive on the opposite surfaces which may be sealed together after the bag is closed, may cover only the lower section if the adhesive be of a type which cannot be readily applied to surfaces directly opposite to each other, or may cover the entire area if of other types. With the bag opened up for filling, the strips will extend in a straight line along the gusset sides of the bag, and the lower edges of the strips may be bent outwardly so that the bag may be supported by and moved along a pair of rails extending up into the space between the lower portion of the strips and the adjacent bag walls, and in a manner analogous to that disclosed in my copending applications Serial Nos. 38,477 filed June 13, 1948, and 48,675 filed September 10, 1948.

Where the strip is coated or otherwise treated with adhesive upon opposite surfaces, as in Figs. 6 and 9, the adhesive on one surface should be applied cold, or at a temperature sufficiently low not to activate other thermoplastic coatings or areas of the bag, tubing or strip.

In the forms above described the strips or other elements are applied to the outer surfaces of the sheet material which forms the walls of the bag. In some cases it is desirable to apply the strips to the inner surfaces of said walls, one example of such a construction and method being shown in Figs. 10 to 12.

In Fig. 10 there is provided a strip having a center section **30** of a length substantially equal to the width of one panel of the bag, and terminal sections **31** each of a length equal to the width of the gussetted walls. The strips may be applied to a sheet transversely thereof, as shown in Fig. 10, and positioned to extend from one fold line *a* to the other fold line *a* and thus across one panel and the sections which are to be infolded to form the gussets. The sheet is so folded as to

bring the strip inside of the bag mouth, and the opposite edges are secured together to form a tube. The strip may be coated over the entire area of both surfaces with a suitable adhesive, but preferably the coating on one surface is on about one-third or one-half the width and along the entire length, and on the opposite surface is along the other portion of the width, as shown in Fig. 12. There may also be provided two other strips **32** on one side panel or in the gusset, and extending out beyond the fold lines *c*, and at a distance sufficiently below the mouth of the bag to leave a top portion of the bag above the strips **32**. If desired, the strips may be secured to the walls **20** or the walls **20'** of the gusset instead of to the panel, so that they will not appear on the top of the sealed bag, and if desired they may be at the mouth of the bag instead of a short distance below, as illustrated.

After the bag is filled the mouth portions of the bag may be pressed together, and with the application of heat if the adhesive be of the heat-sensitive type, so that the upper portion of the bag will appear as shown in Fig. 13. The top part of the bag may then be folded over, and the ends of the strips **32** are attached to the gusset walls of the bag. Preferably the top portion above the strips **32** is folded over through 180° along approximately the line of the lower edges of the strips **30** and then folded under a second time to lie in a horizontal plane along the top of the bag. The ends of the strips **32** are then secured to the gusset walls to complete the package, with a substantially flat top wall. In Fig. 14 I have not illustrated this folding under of the mouth of the bags, as that would prevent proper illustrating of the layers in the sealed mouth portion.

If the strips **32** are applied to a flat web as shown in Fig. 10, the adhesive on their free end portions is preferably of a thermoplastic material to prevent the free ends from adhering to the web. When it is desired to fold over the mouth of the bag and secure the strip **32** to the gusset walls, such adhesive may be activated and adherence obtained. Opening of the package may be readily accomplished by rupture or tearing of the strip **32** to free the bag mouth from the balance of the package.

By having the adhesive on the outer surface of the strip **30** along the upper half, and the adhesive on the inner surface of the strip on the lower half, the side walls at the mouth of the bag will not be sealed together at their extreme upper edges, and they may be slightly separated, and to an extent permitting one to grasp the opposite walls between the thumb and finger and pull loose the adhesive on the inner side of the strip, and open the bag.

The strips **32** serve an additional function, as the end portions may be folded back upon themselves and attached to other bags, so that a chain will be formed before filling, as shown in Fig. 15, or they may be left unfolded and form such chains as are shown in Figs. 3 and 4.

In the form of the invention illustrated in Fig. 6, the strips are adhered to the gusset walls at the top of the bag and have tabs extending outwardly therefrom and positioned in line with the top edge of the bag mouth, but it will be obvious that they may be positioned at any desired distance downwardly therefrom. When the strips are positioned below the top edge of the bag mouth, they may be utilized to combine the functions of supporting and sealing together the gusset walls as well as the functions of the strips

32 shown in Figs. 10 to 15, namely, securing the bag mouth to the completed package. To accomplish this, the tabs 24 at one side of each bag may be longer than the tabs at the opposite bag side wall, and when the mouth is folded down onto the top of the package, the longer extending tabs may be adhered similar to the way shown in Fig. 14. Since the strip members are sealed to the gusset walls, both side walls of the bag are secured without the strip being on the outside top of the folded over bag mouth. Further, if it is desired that the strips not be disposed on the outside bag walls, due to their interference with printing or their effect on the appearance of the package, the positioning of the strip members in the gussets presents a satisfactory solution.

The use of strip elements having end portions of different lengths is also a great advantage for connecting the bags into chains in a wide variety of ways, according to the application in which the claim is to be utilized.

Fig. 12*a* illustrates another modified form of strip 30*a* similar to that shown in Fig. 12, except that it is adapted to be disposed around exterior portions of the bag in the region of the mouth. The inside surface of the strip 30*a* along the upper margins thereof is provided with a suitable adhesive material, 31*a*, to secure the strip 30*a* to the bag along one side panel thereof and along the gusset walls. The lower portions of the strip on the inside are shown as being uncoated so that they will not be secured to the bag walls and may be used for supporting the bag as it is being advanced similar to the forms shown in Fig. 9. To permit the lower edge portions of the strip along the gusset walls to extend outwardly over rails or other supporting members, the strip may be slitted transversely and upwardly from the lower edge at the ends of the middle section which engage the panel and to the strips of adhesive on the inner surface.

On the exterior portions of the strip 30*a*, the end sections thereof may be provided with a suitable adhesive, preferably of a thermoplastic material, to permit securing of the gusset walls together simultaneously with the sealing of the bag mouth. The central section of the strip may also be provided along the region of its lower exterior portion with a coating of a suitable thermoplastic adhesive and thus when the bag mouth has been closed and is ready for sealing, the lower portion of the central section may be folded over the top of the bag mouth and secured to the opposite side panel of the bag, similar to a saddle sealing strip. This may be beneficial where the bag mouth is not heat-sealable to provide a mouth closure for the bag. When the bag mouth is heat-sealable the use of the central section as a sealing strip may be desirable to increase the sift-proofness of the closure and to provide a stronger closure.

In the construction shown in Figs. 1, 6, 9 and 13, the tab extensions on the strips in the infolds are not secured to a bag surface but are free, so that they may be attached to corresponding tabs of adjacent bags to form pairs or chains. An alternative arrangement is shown in Figs. 16 and 17. The sheet shown in Fig. 16 is the same as that shown in Fig. 7, except that the adhesive extends the full length of the strips 23*a* upon both surfaces, so that the tabs are not free to swing. Thus when the bag is formed as shown in Fig. 17, the ends 24*a* of the strips will lie on and be attached to the outer surface of the side panels and present adhesive upon their outer surfaces. A chain of bags may be formed by stacking the bags so that the adhesive on the outer surfaces of the end portions 24*a* of each bag will become directly attached to those on the strips 23*a* of the next succeeding bag. The bags are opened by pulling on the ends of the chain, and after each bag is filled it may be peeled loose from the next bag.

In Fig. 16 I have shown the lines A—A across the sheet midway between the edges of the strips. Thus the bottoms may be sealed and closed in the same way as the mouths are closed after filling, instead of folding over as shown in Fig. 1. If the bag mouths are heat-sealable they may be sealed by heat and pressure, or if not, sealing of the bag mouth may be obtained by a sealing strip, label, or in any other manner.

It has been previously pointed out that the strips should be attached to the sheet before the fold line *b* is formed therein. In Figs. 7, 10 and 16 the strips are applied to flat sheets. In Figs. 18 and 19 I have illustrated how such strips may be attached to seamless tubing 40. The strips 23*b* are applied to the tube while the latter is inflated, and in two rows upon opposite sides of the tube. The strips in each row are spaced apart along the length of the tube to distances equal to the desired bag length. Such strips 23*b* may be of the type shown in Figs. 1, 6, 7, 9 or 17, but are shown the same as in Fig. 9. The tubing with the strips as shown at the upper part of Fig. 18, and of any desired length, may be passed through suitable apparatus to form the infolded pleats. Preferably the infolding is done during the collapsing of the tube. For this purpose there may be provided gusset forming members such as rotary discs or plates 41 which have curved inner edges spaced apart to the desired distance between the inner fold lines *b* of a bag, and the tube is so oriented that as it is moved endwise the portions of the tube wall bearing such strips are forced inwardly to form a collapsed tube having infolded pleats with the strips attached, as shown at the lower end of Fig. 19.

In some cases the tube may be merely collapsed with the strips around the fold lines, and without infold pleats as shown in Fig. 18, and the strips 23*b* later reversely bent to form the infolded gussets. During the feeding of the tube endwise, and during the application of the strips, the tube may be supplied with air or other fluid to keep it inflated, and at the delivery end it may pass between rollers which hold the tube collapsed to prevent escape of the inflating fluid. It may then be fed to any suitable cutting mechanism to subdivide it into bag sections, and to heating and/or pressing means to seal the bottoms of the bags.

In Figs. 21 to 25 there is illustrated another embodiment of my invention which is similar to the form shown in Fig. 6, except that attached elements are provided in the gussets at both the top and bottom portions of the bag and the bags are of the flat bottom type. A number of important advantages accrue from such constructions. The bags illustrated each have side panels 21 and infolded or gusset walls 20 and 20' as in the other bags above referred to, but the bags have a flat bottom 50.

In the packaging of light materials, it is difficult to properly fill bags, due to the fact that the bottom portion of the collapsed bag is folded up against one side panel and the opening of the gussets in the area of the bottom is constricted.

Where a commodity is packaged in a bag formed of relatively stiff sheet material, or in multi-ply bags, this problem is rendered more acute. Conventional packaging practices now require that in preparation for filling, the bags be moved to one station where a former or mandrel is inserted into the bag for the purpose of adequately opening the gussets at the lower end and swing the bottom of the bag down into a horizontal plane. I have found that this operation may be eliminated by the use of properly positioned strips across the gusset walls in this bottom region of the bag.

As shown in Fig. 21, a chain or series of bags each having side panels **21** and infolded gussets having walls **20** and **20'**, is provided with strips **23**. These are secured to the gusset walls in the region of the mouth, as shown in Fig. 6, but spaced a short distance therebelow. In addition, similar strips **23***a* are adhered to the gusset walls in the region of the bottom portion of the bag. The bags are shown in Figs. 21 and 23 as a part of a series or chain, and of the type known as "automatic" bags, which means that the bottom portion of the bag is fabricated in a manner to permit the formation of a flat bottom on which the bag may rest. These strips **23** and **23***a* are of the type which extend outwardly in both directions from the center fold lines of the gussets. However, the strips are not provided with adhesive on their exterior surface to seal the gusset walls together, but are present to facilitate opening of the bag mouth and to facilitate detachably connecting the bags in a series so that they may be advanced to and from a filling station. It is therefore not required that the strips be adhered to the gussets along the complete width of the gusset wall. Preferably the two halves of the strip are of different lengths, which is desirable to facilitate chaining. Fig. 22 illustrates the strips in the form in which they are attached to the sheet material from which the bag is to be made, and it will be noted that the strips are secured to the gusset walls only in the areas adjacent the fold lines *a* and *c*.

The long half of the strip may be scored to provide a tab **24'** which may be folded over upon the balance of the strip to facilitate a detachable connection between the strip and the strip of an adjacent bag. The opposite end or short end of the strip is provided at its end portion with a coating of a suitable thermoplastic adhesive which may be activated to tacky condition to permit adherence to the long end of the strip of the next adjacent bag. The connection of the strips with those of adjacent bags in the formation of a chain is illustrated best in Fig. 23, which illustrates such a chain in the process of opening.

It will be noted from Fig. 21 that the strips adhered to the gusset walls at the bottom portion of the bag are similar to those at the top portion of the bag so that they may be chained to facilitate the complete opening of the bag. While Fig. 21 illustrates the use of two strips, one disposed at the top of the bag and the other at the bottom of each of the gussets, it will be understood that additional similar strips may be used, or in some instances it may be desirable to utilize one strip extending for a substantial portion of the distance from the mouth to the bottom of the bag. To insure adequate opening in the region of the bottom of the bag, the connection between the lowermost strip and the gusset walls should terminate near the bottom edge of the bag in its squared-up position.

As the bags are advanced toward filling position and it is desired to open them, the tabs of each gusset may be pulled to their straight line position as illustrated at the lower portion of Fig. 23, and due to the location of the strips, complete opening of the bag will be effected, as the bottom **50** will be caused to swing from a position adjacent to one side panel through the position shown in Fig. 24 to a horizontal position.

It will be apparent from Fig. 23 that due to the construction, a strong chain is provided, and one which will not have a tendency when pulled to peel the connections between adjacent bags, because such tensioning of the strips places a shear stress on the adhesive, thus taking advantage of the high shear strength normally possessed by many adhesives. It may also be noted that with the arrangement shown, the application of adhesive to the strips is simplified, since the adhesive is all applied to the same surface of the strip in its flat condition.

Ordinarily it is desirable to remove the strips from the gusset walls when they have accomplished their purpose of opening the bag, if their presence on the completed package may be considered objectionable, and after removal the strips may be re-used.

Preferably the adhesive on the tabs or extensions of the strips in the areas **23***e* is of a different character than that in the areas **23***d* connecting the strips to the gusset walls, and the latter adhesive is of a type permitting the peeling of the strips from the bags. The bags may be advanced in succession to a filling station and automatically opened by pulling on the strips. Preferably the ends of the strips are attached to and wound up on reels **51** so that after each filled bag passes the filling station, the strips are pulled loose from the bags and wound up. Such pulling and winding peels the strips loose at the sealed areas **23***d*, but does not disconnect each strip from the next one at the sealing area **23***e*, because there is no peeling stress exerted in these latter areas. The connected strips may be unrolled later and utilized in making another chain of bags.

In some cases the strips may be made of a transparent material and attached by a substantial transparent adhesive, so that the strips may be left on the bags but will not be noticeable.

In all of the embodiments of the invention above described the attached strips are disposed parallel to the top or mouth of the bag, but this is not essential in some cases. In Fig. 20 there is shown a bag similar to that shown in Figs. 1 to 9, with strips **23***d* positioned in the gussets, but in this case they are at an angle to the plane of the mouth of the bag and somewhat longer than in the forms above described. The strips may be employed for all of the same purposes as the strips in the other forms above described, but they have an additional function. The end portions **23***e* may be folded at an angle, so that they are disposed along the upper edge portion of a panel **21** and extend above the latter. After filling and closing the bag the upper edge portions of these ends may be folded over the closed mouth and sealed to the other panel.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A plurality of bags each having side panels, connecting infolded gussets, and a sealed bottom portion, each gusset having a strip of sheet

material disposed therein at the mouth of the bag and of greater length than the width of the gussets, said strip having free end portions extending outwardly from said bag detachably connected to the ends of corresponding strips of other similar bags, and each of said gussets having a strip of sheet material disposed therein in the region of bottom sealed portion of said bag and of a length greater than the width of the gusset, said last mentioned strip having free end portions extending outwardly from said bag detachably connected to the ends of corresponding strips of other similar bags.

2. A chain of bags, each bag being formed of sheet material and including side panels and connecting infolded gussets, each of said gussets having adhered thereto a stiffening element of sheet material extending along a surface of at least one wall thereof at the mouth of the bag, and at least from the inner fold line of the gusset to a side edge of a side panel, the stiffening element being formed with a tab extending beyond the side edge of said panel and projecting therebeyond at an angle to the plane of the side panel and parallel to the plane in which the mouth of the bag lies when the bag mouth is open, said tab having adhesive material thereon, the outer end of the stiffening element of each bag being detachably connected to the outer end of the stiffening element of a next successive bag.

3. A plurality of bags each having side panels, connecting folded gussets and a sealed bottom

portion, each gusset having a strip of sheet material secured thereto at the mouth of the bag and extending at least from a fold line of the gusset outwardly along the gusset and to a point beyond a side edge of a side wall of the bag to provide a free end portion extending laterally from said bag, the free end portion of each strip being detachably connected to the free end of a corresponding strip of another adjacent and similar bag to connect them in side-by-side relation.

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