United States Patent [19]

Titchenal

[11] **3,817,017**

[45] **June 18, 1974**

[54] **BAG CONSTRUCTION AND METHOD FOR FILLING THE SAME**

[76] Inventor: **Oliver R. Titchenal,** 143 Shakespeare Ln., Avon, Ohio 44011

[22] Filed: **Apr. 17, 1973**

[21] Appl. No.: **351,970**

Related U.S. Application Data

[63] Continuation of Ser. No. 81,500, Oct. 13, 1970, abandoned.

[52] **U.S. Cl.** **53/24,** 53/29, 53/126, 53/183

[51] **Int. Cl.** **B65b 43/12,** B65b 43/26

[58] **Field of Search** ..... 53/24, 29, 36, 37, 39, 53/44, 187, 191, 192, 182, 126, 183; 229/69, 14, 54 R; 93/20, 8 R, 8 W, 8 WA; 83/175, 178, 425

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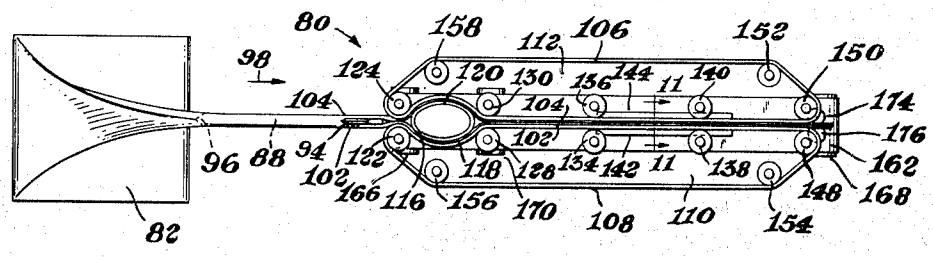
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Primary Examiner—Travis S. McGehee
Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Gustalo Nunez

[57] **ABSTRACT**

A bag construction embodied in a chain of connected bag elements and an efficient method for filling the same. In novel feeding and mounting concepts, the chain of bag elements is preferably fed to the filling apparatus from a folded pile, and is initially received by a mandrel which mounts the same in a curtain-and-rod-like fashion by means of a loop located along the top end of each bag. In the chain, the bag elements are substantially separated from one another such that their complete separation after filling can be easily achieved, as for example, by a gentle pulling action. In specific bag constructions, loading or filling through gusseted sections of the bag elements is made possible through novel gusset designs and filling methods, and scrap minimized, for example, by thinning strategic portions of the bag elements which later are customarily trimmed therefrom following sealing operations.

18 Claims, 31 Drawing Figures



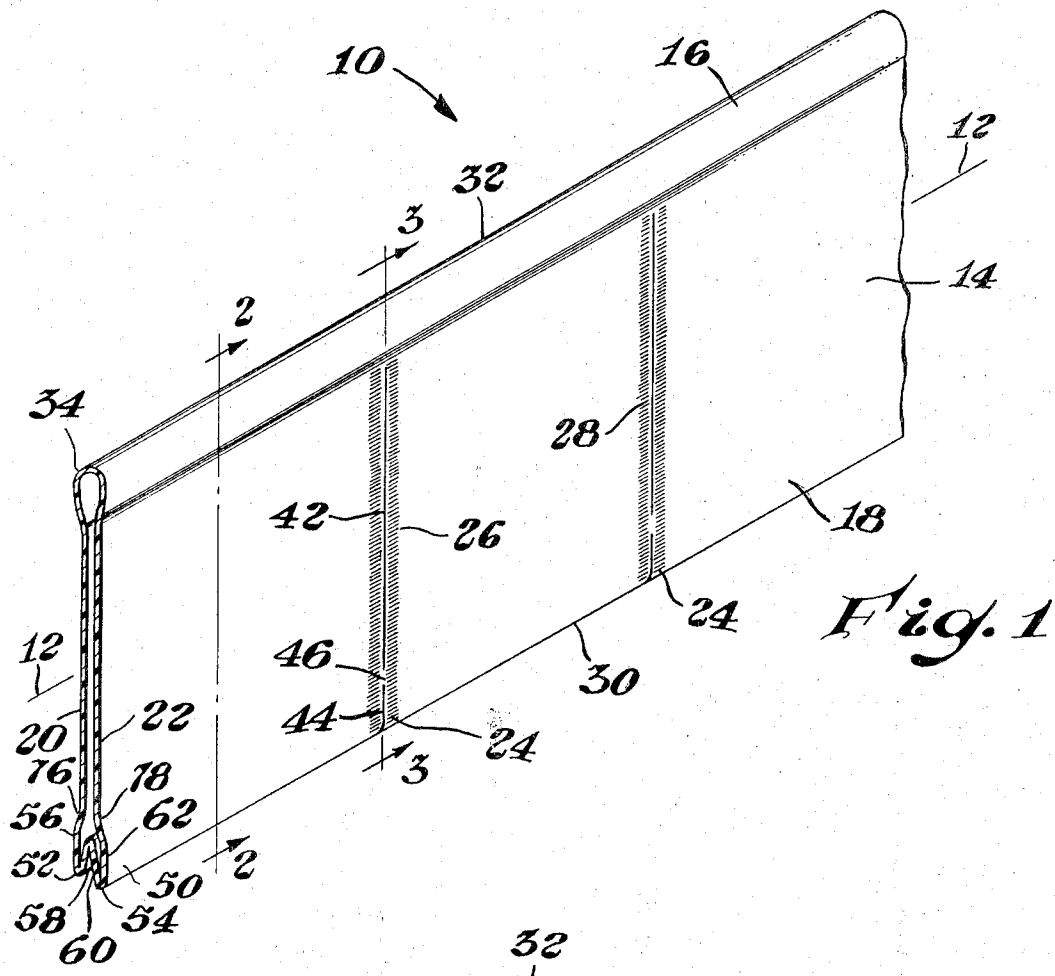


Fig. 1

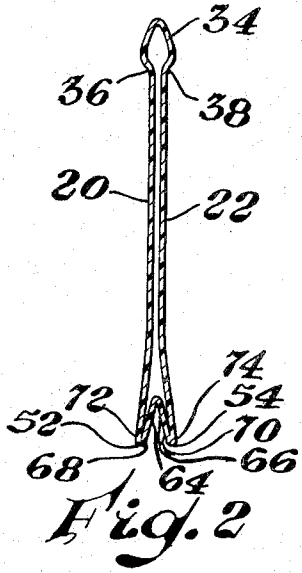


Fig. 2

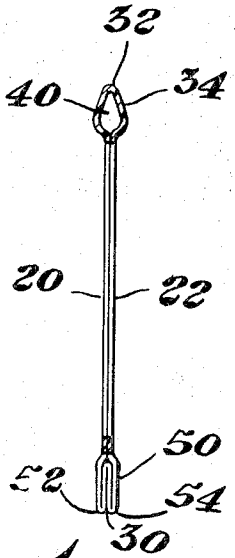


Fig. 3

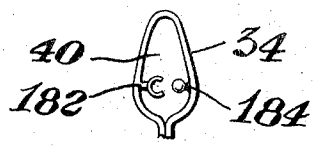


Fig. 4

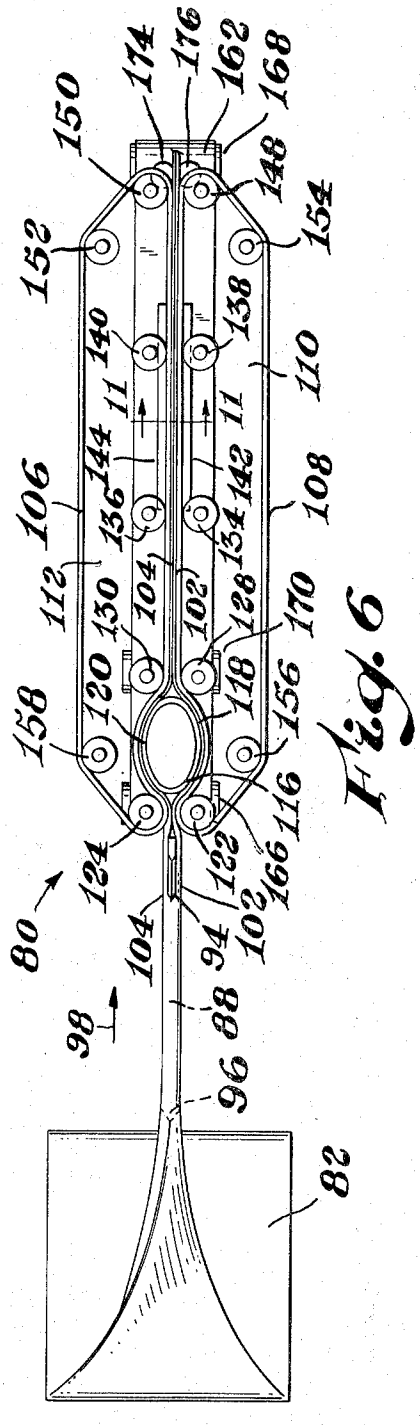


Fig. 6

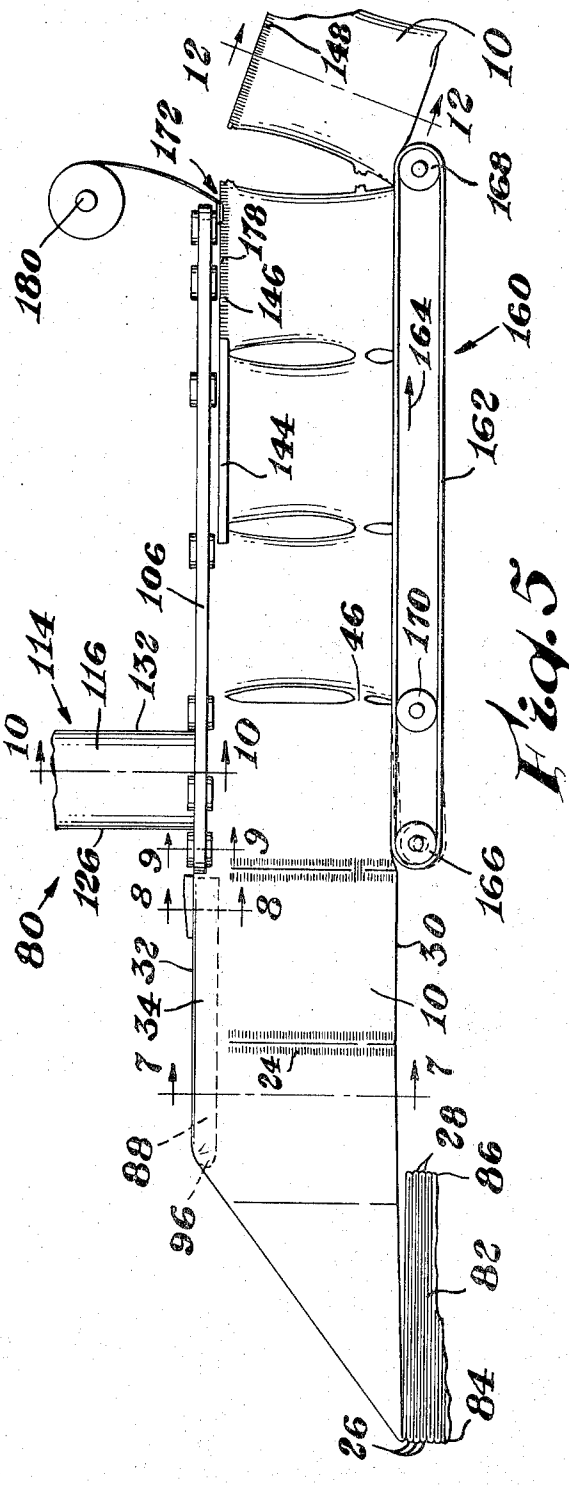


Fig. 5

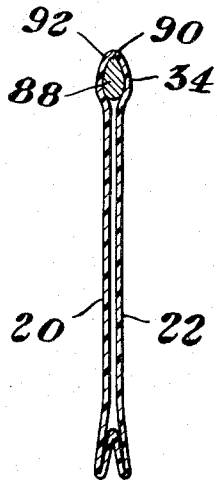


Fig. 7

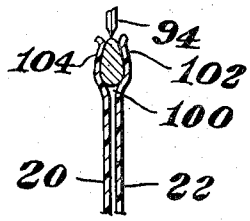


Fig. 8

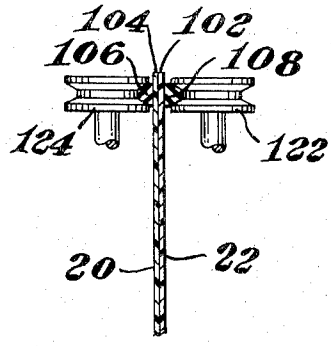


Fig. 9

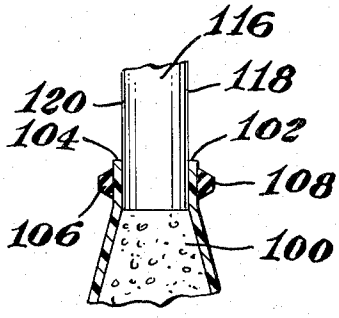


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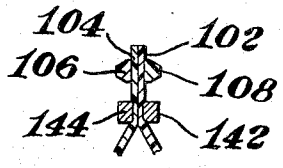


Fig. 11

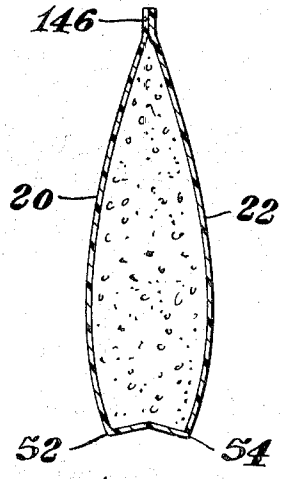


Fig. 12

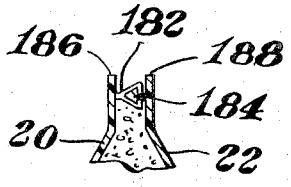


Fig. 13

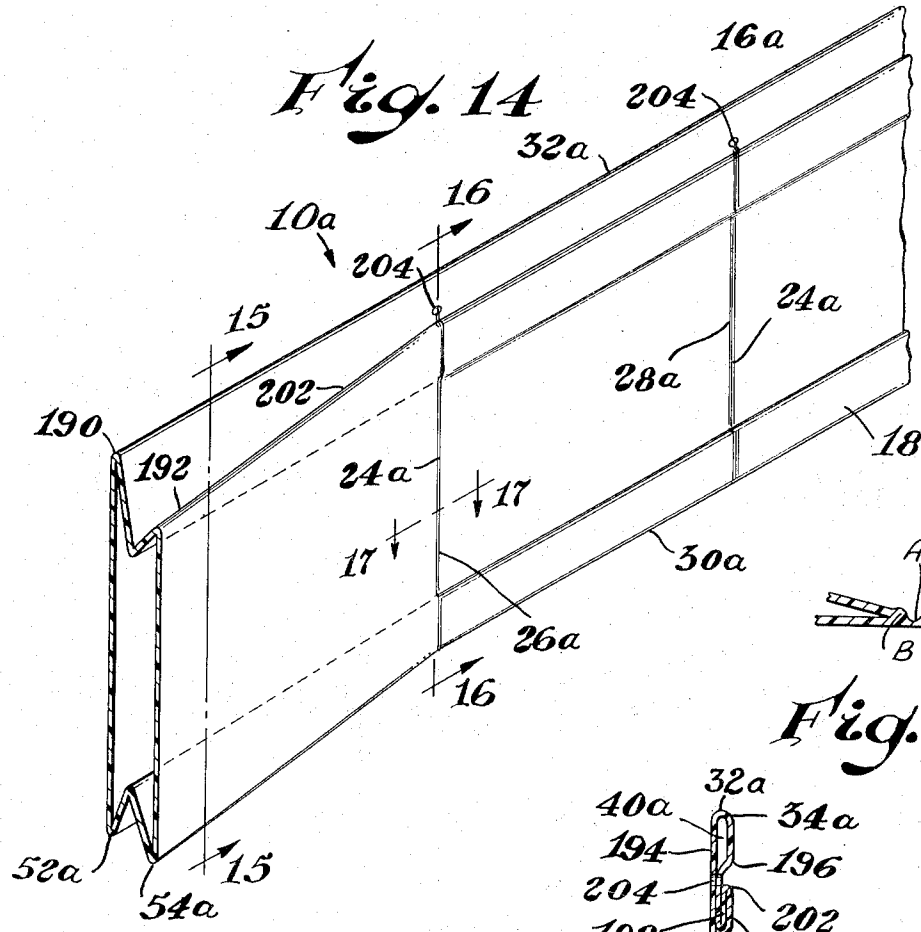


Fig. 14

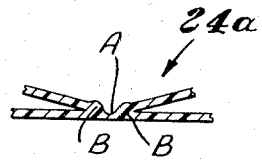


Fig. 17

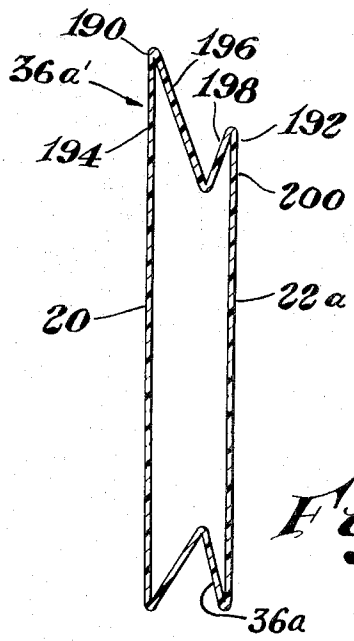


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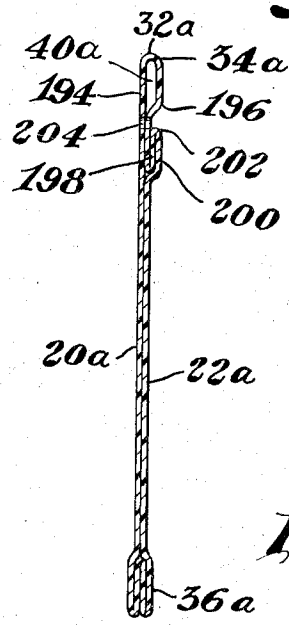


Fig. 16

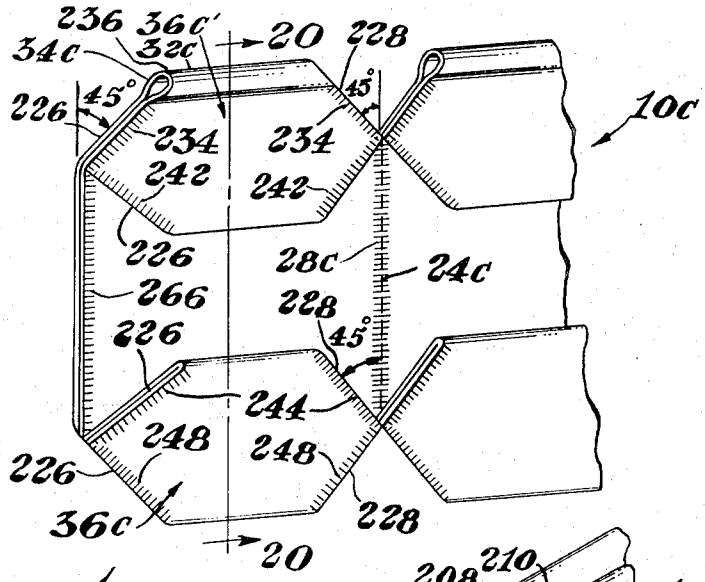


Fig. 19

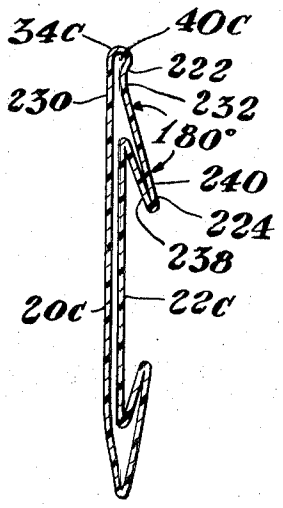


Fig. 20

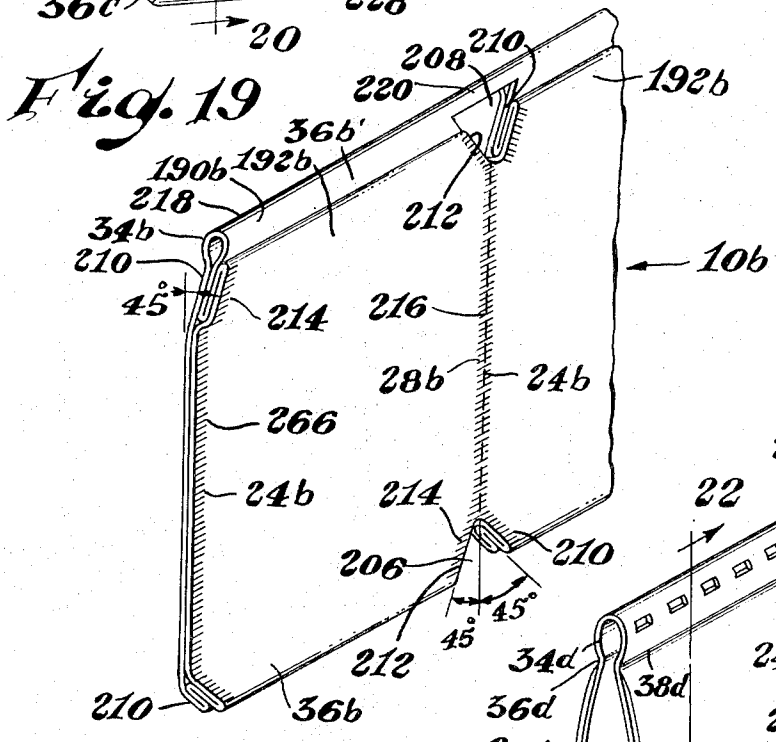


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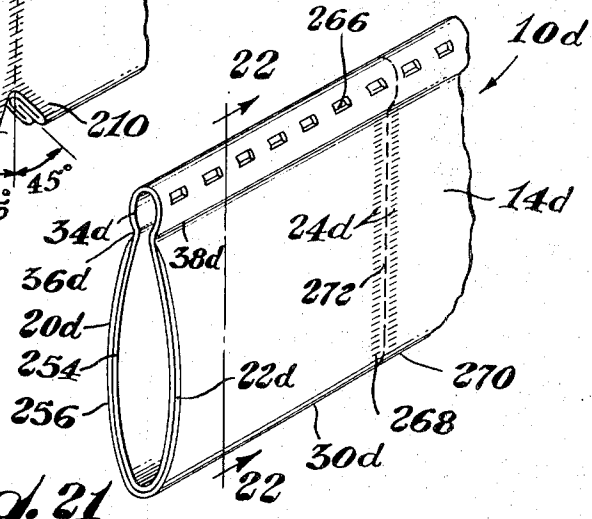


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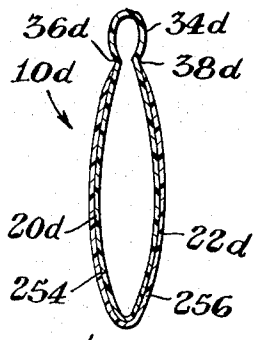


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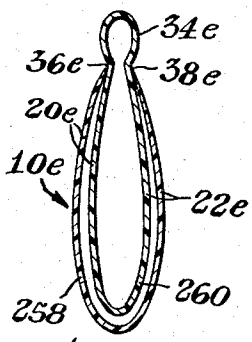


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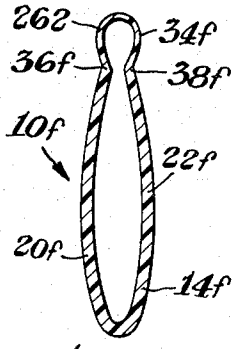


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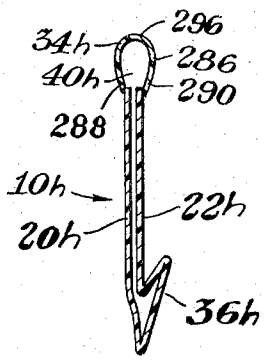


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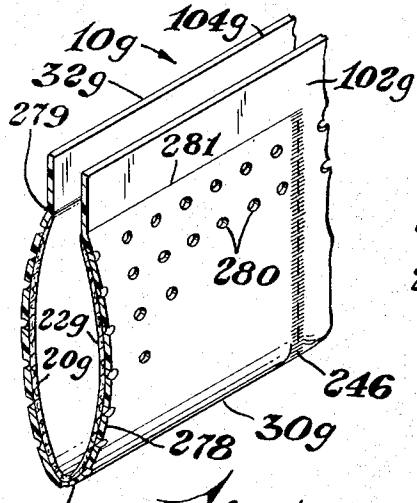


Fig. 25

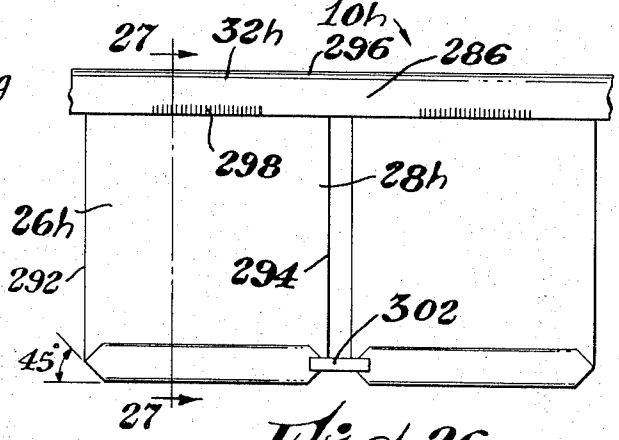


Fig. 26

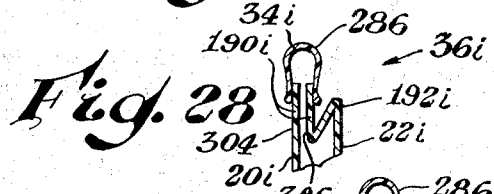


Fig. 28

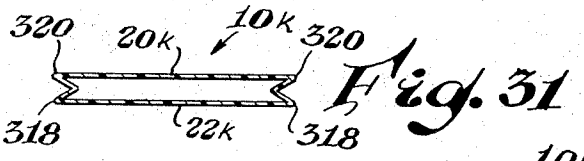


Fig. 31

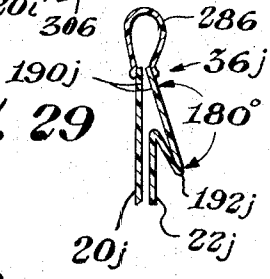


Fig. 29

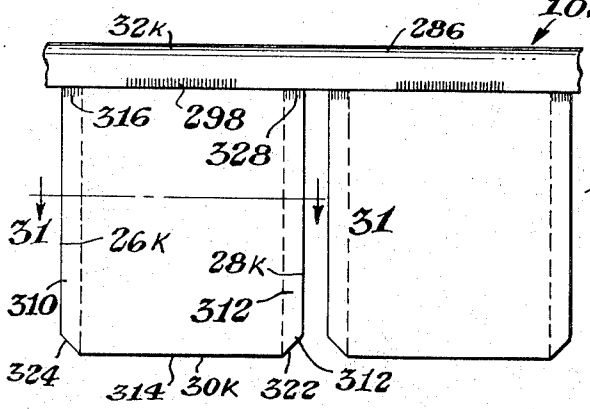


Fig. 30

BAG CONSTRUCTION AND METHOD FOR FILLING THE SAME

This is a continuation, of U.S. Pat. application Ser. No. 81,500 filed Oct. 13, 1970, and now abandoned.

DESCRIPTION OF THE INVENTION

The present invention relates to novel bag constructions as embodied on a chain of connected bag elements and further relates to a novel and improved method for feeding, filling and sealing the same.

It is an object of the present invention to provide an improved method for filling a chain of connected bag elements wherein the bag elements can be drawn to the filling apparatus from a folded pile, if desired, thereby permitting economies and advantages heretofore unknown in such filling methods.

It is still a further object of the present invention to provide an improved method for filling a chain of connected bag elements wherein a novel means of mounting the connected bag elements in the filling apparatus is provided to minimize the possibility of fouling the filling apparatus by misdirecting the bag elements thereto.

It is yet a further object of the present invention to provide an improved method for filling a chain of connected bag elements wherein the method allows for efficient filling of the bag elements while requiring only relatively low coat and uncomplicated filling apparatus.

It is still a further object of the present invention to provide an improved method for filling a chain of connected bag elements wherein a special cutting step to part the bag elements after filling operations can be advantageously eliminated from the method.

It is yet a further object of the present invention to provide an improved bag construction wherein the bags are normally connected together in a chain and wherein the novel construction of the bag elements permits economies and advantages heretofore unknown in the prior art.

It is yet a further object of the present invention to provide such bag constructions wherein the sterile condition of the bag elements is better insured during storage and shipping operations due to their unique and improved constructions.

It is a still further object of the present invention to provide such bag constructions wherein the bag elements are equipped with an improved valve especially adapted for powdered products whereby the valve can include a novel filter concept that serves to allow air to escape from the confines of the bag, but is an effective barrier to powdered or finely divided products.

It is yet a further object of the present invention to provide such bag constructions wherein the bag elements are so formed that their proper alignment in the filling apparatus is insured such that the possibility of the connected bag elements fouling the apparatus by being misfed thereto is minimized.

It is a still further object of the present invention to provide such bag constructions wherein the bags are so formed that waste and scrap accompanying the filling of the same as, for example, in sealing and trimming operations is minimized.

It is yet a further object of the present invention to provide such bag elements wherein the bag elements can include gussets along the sides or ends thereof strategically arranged and formed so as not to interfere with the sealing and filling operations to be performed on the bag elements.

It is still a further object of the present invention to provide such bag elements wherein unique constructions are employed to allow filling through a gusseted portion thereof.

It is yet a further object of the present invention to provide a chain of connected and flattened containers as, for example, folded cartons or flexible bags wherein the containers are connected together in a clothsline-like fashion to simplify the filling of the same and to permit efficiencies and advantages heretofore unknown. **Briefly then, the present invention contemplates an improved method for filling a chain of connected bag elements wherein each bag normally includes a closed bottom and top end, and two sides closed except at their uppermost extent so as to form an open ended loop across a top edge portion of each bag element. Most beneficially, the chain of connected bag elements is fed to the filling apparatus from a folded pile with each bag element being substantially broken away from the ones adjacent thereto. From the pile, the bags are initially received by a mandrel on which they are mounted in a curtain-and-rodlike fashion by means of the loop at the top end of each bag element. The loop is then parted in the longitudinal direction, as for example, by a knife fixed to the top edge of the mandrel, whereby fill openings are formed between the two closed sides of each bag element and the two parted edges of the loop. Thereafter the bag elements are directed to a filling station which plows open the two parted edges and deposits a product into each bag element through the respective fill opening thereof, which fill openings are then closed in a suitable manner. The weakly connected bag elements can thereafter be easily parted from each other without requiring a special cutting step. In specific embodiments, the weakening of the connection between the bag elements is beneficially accomplished in several different ways, each having enhanced value for specific filling arrangements. For instance, where maintaining sterile conditions is of importance, a break-away type seam is taught wherein the seam is thinned and weakened along its center line such that it is imperforate, but yet easily ruptured without cutting. Also, advantageous chain arrangements are taught for connecting together the bag elements. For example, is one embodiment the bag elements are connected together side by side in a clothesline-like fashion by a strip of material seamed along one edge to one side of the mouth or fill openings of each bag element, and then folded over and secured along the other edge to the opposite side of the mouth. In this arrangement, the strip of material also forms the loop on which the chain of bag elements are mounted. Yet other specific embodiments of the invention include unique bag constructions wherein, for instance, filling is possible through a gusseted portion of the bag, and scrap or waste accompanying trimming of the parted edges of the bag elements is reduced by minimizing the material forming the parted edges.** 9

Yet additional objects and advantages of the present invention, and its numerous and cognate benefits are even more apparent and manifest in and by the ensuing description and specification taken in conjunction with the accompanying drawings, in which wheresoever possible, like characters of reference designate corre-

sponding material and parts throughout the several views thereof in which:

FIG. 1 is an isometric view of a preferred embodiment of a chain of connected bag elements constructed according to the principles of the present invention;

FIG. 2 is a cross-sectional view of the connected bag elements of FIG. 1 taken along reference line 2—2 thereof;

FIG. 3 is a cross-sectional view of the connected bag elements of FIG. 1 taken along reference line 3—3 thereof;

FIG. 4 is an enlarged fragmentary cross-sectional view of the connected bag elements of FIG. 1 showing modifications thereof;

FIG. 5 is a side elevational view of filling apparatus illustrating schematically the practice of the principles of the method of the present invention;

FIG. 6 is a top view of the filling apparatus of FIG. 5;

FIG. 7 is a cross-sectional view of the filling apparatus of FIG. 5 taken along reference line 7—7 thereof;

FIG. 8 is a fragmentary cross-sectional view of the filling apparatus of FIG. 5 taken along reference line 8—8 thereof;

FIG. 9 is a fragmentary cross-sectional view of the filling apparatus of FIG. 5 taken along reference line 9—9 thereof;

FIG. 10 is a fragmentary cross-sectional view of the filling apparatus of FIG. 5 taken along reference line 10—10 thereof;

FIg. 11 is a cross-sectional view of the filling apparatus of FIG. 6 taken along reference line 11—11 thereof and showing the method of closing the connected bag elements after filling operations;

FIG. 12 is a cross-sectional view of a filled, sealed, closed, and trimmed bag element shown in FIG. 5 and taken along reference line 12—12 thereof;

FIG. 13 s a fragmentary cross-sectional view of a filled, sealed, closed, and trimmed bag element as modified according to FIG. 4;

FIG. 14 is an isometric view showing a modification of the connected bag elements of the present invention;

FIG. 15 is an enlarged cross-sectional view of the connected bag elements of FIG. 14 taken along reference line 15—15 thereon;

FIG. 16 is an enlarged cross-sectional view of the connected bag elements of FIG. 14 taken along reference line 16—16 thereof;

FIG. 17 is an enlarged cross-sectional view of connected bag elements of FIG. 14 taken along reference line 17—17 thereof, and show a modified break away seam construction;

FIG. 18 is an isometric view showing a modification of the connected bag elements of FIG. 14;

FIG. 19 is a view like FIG. 1 only showing still another modified form of the connected bag elements of the present invention;

FIG. 20 is a cross-sectional view of the connected bag elements of FIG. 19 taken along reference line 20—20 thereof;

FIG. 21 is a view like FIG. 1 only showing yet another modified form of the connected bag elements of the present invention;

FIG. 22 is a cross-sectional view of the connected bag elements of FIG. 21 taken along reference line 22—22 thereof;

FIG. 23 is a view like FIG. 22 only showing yet another modified form of the connected bag elements of the invention;

Fig. 24 is a view like FIG. 22 only showing still another modified form of the connected bag elements of the present invention;

FIG. 25 is a view like FIG. 1 showing still another modified form of the connected bag elements of the present invention and involves a novel valve construction.

FIG. 26 is a front view of a chain of connected bag elements showing yet another modification of the present invention wherein the bag elements are connected together as on a clothesline;

FIG. 27 is a cross-sectional view of the bag elements of FIG. 26 taken along reference line 27—27 thereof;

FIG. 28 is a view like FIG. 27 only showing a modification thereof;

FIG. 29 is a view like FIG. 28 showing yet another modification of the present invention;

FIg. 30 is a view like FIG. 26 only showing a modified form of the invention wherein each of the bag elements are provided with gussets extending along the two opposite sides thereof; and

FIG. 31 is a cross-sectional view of connected bag elements of FIG. 30 taken along reference line 31—31.

Referring now more particularly to the drawings, there is shown in FIG. 1 a chain of connected bag elements 10 arranged or strung out along a generally longitudinally defined axis 12. Specifically, the connected bag elements 10 comprise a length of tubular material 14 flattened to form first and second longitudinally extending edge portions 16 and 18, and first and second walls or portions of material 20 and 22, respectively, located opposite each other. The first and second walls 20 and 22 are intermittently secured to each other in the transverse direction by seams 24 located at spaced intervals along tubular material 14. In particular, seams 24 divide tubular material 14 into separate bag elements 10 with respective pairs of the seams forming the two closed sides 26 and 28 of each bag element. The second edge portion 18, as divided by seams 24, forms or comprises the respective bottom end 30 of each bag element 10 with the first edge portion 16 accordingly referenced as comprising the respective top end 32 thereof.

As can be readily observed from FIG. 1, seams 24 extend upwardly from the second edge portion 18 of each of the bag elements 10 to a point adjacent to but spaced from their respective top ends 32. This inherently forms a loop or tunnel structure 34 across the top end 32 of each bag element 10 with the opposite longitudinally extending edges 36 and 38 of the loop respectively merging together with the first and second walls 20 and 22. Specifically, a channel 40 defined by loop 34, commnicates from bag element to bag element whereby the chain of connected bag elements 10 can be mounted in a curtain-and-rod-like fashion by inserting an elongated element through loop 34, which method of mounting is discussed more fully hereinafter.

In order to realize the full benefit of the method described hereinafter, the connection between each of the bag elements **10** has been substantially weakened such that the bags can be parted from each other by a gentle pulling action. In bag elements **10** this is achieved by forming slits **42** and **44** parting each seam **24** along the transverse or length dimension thereof, Specifically, the two slits **42** and **44** are interrupted by a joined portion or land **46** which connects together the bag elements **10** adjacent their bottom ends **30.**

Each bag element **10** can further include a bottom gusset **50** which extends across the bottom end **30** thereof. Structurally, bottom gusset **50** comprises first and second legs **52** and **54** with each leg **52** and **54** respectively comprising first and second panels **56** and **58,** and **60** and **62.** The second panels **58** and **60** of legs **52** and **54** together form what in generally referred to as an inverse fold and are merged or joined together with each other along their respective inner longitudinally extending edges **64** and **66.** The two outer longitudinally extending edges **68** and **70** of the composite or joined second panels **60** and **62** are respectively joined together with the adjacent longitudinal edges **72** and **74** of the first panels **56** and **62.** The opposite longitudinal edges **76** and **78** of first panels **56** and **62** in turn respectively merge together with the first and second walls **20** and **22** of each bag element **10** thereby longitudinally closing gusset **50.** To close ends of each gusset **50,** the four panels of legs **52** and **54** are edgewise joined together at each side **26** and **28** of the individual bag elements **10** by seams **24.**

Referring now specifically to FIGS. **5** and **6,** there is shown an apparatus **80** adapted for efficiently filling the chain of connected bag elements **10** according to the principles of the unique method taught by the present invention. As illustrated particularly in FIG. **5,** the chain of connected bag elements **10** are preferably and most beneficially fed to apparatus **80** from a folded pile **82** instead of the usual supply roll arrangements customarily used in the prior art filling methods. In pile **82** the connected bag elements **10** are located face down one on top of the other in a continuous Z-like stacking arrangement wherein the sides **26** and **28** of the bag elements **10** are respectively aligned in two vertical rows **84** and **86.**

Specifically, apparatus **80** includes a mandrel **88** which initially receives the bag elements **10** from pile **82.** Specifically, loop **34** of the chain of connected bag elements **10** is fed about mandrel **88** such that the connected bag elements **10** are strung or mounted on the mandrel in a curtain-and-rod-like fashion. Particularly, this method of mounting has been found to achieve precise aligning and indexing of bag elements **10** in apparatus **80** such that a fouling of the apparatus by misdirected bag elements is avoided.

In the prior art filling methods, the function of properly feeding and aligning the bag elements in the apparatus was initially facilitated by first winding the bags on a supply roll. Since these bags, then, were previously correctly mounted on a supply roll, problems as to misfeeding were made less difficult to overcome. However, when feeding the folded pile, like pile **82,** no really effective initial alignment of the connected bag elements **10** is provided. By the employment of the unique mandrel concept taught herein, however, on effective method of feeding the bag elements from a pile is provided whereby the method in combination with particularly beneficial bag element constructions accomplishes important advantages. For instance, the usual tension forces incurred in the winding of the connected bag elements on a supply roll are eliminated. Accordingly, the connected bag elements **10** can be almost completely severed from each other prior to being received by apparatus **80,** as for example, by the slits **42** and **44** made in seams **24** of the connected bag elements **10.** Thus, a special cutting station to part the connected bag elements **10** after filling can be eliminated from the filling apparatus. Furthermore, the bearings, couplings, frames and the like necessary to rotatably mount the supply roll in the apparatus can also be dispensed with.

In particular, the shape of mandrel **88** is preferably of a generally dew-drop cross-sectional configuration with the tapered or sharpened edge of the dew-drop comprising the top edge **90** of the mandrel. This configuration facilitates automatic centering of the fold or crease **92** of loop **34** on mandrel **88** such that the chain of connected bag elements **10** drape from mandrel **88** in generally precise vertical alignment.

A parting means or knife **94** is mounted atop mandrel **88** downwardly of the leading edge **96** thereof as concerns the direction of travel of connected bag elements **10,** which direction is indicated by arrow **98.** Specifically, knife **94** parts the loop **34** longitudinally as the chain of bag elements **10** proceed past knife **94.** Parting of loop **34** forms a separate fill opening **100** for each bag element **10** with the separate fill openings **100** defined between the two parted edges **102** and **104** of the loop and the two closed sides **26** and **28** of each bag element.

As the connected bag elements **10** pass from mandrel **88** and knife **94,** the two parted edges **102** and **104** are engaged by a pair of endless belts **106** and **108** driven by separate pulley systems **110** and **112.** Specifically, the two parted edges **102** and **104** are squeezed together between the belts **106** and **108,** as illustrated in FIG. **9,** whereby the chain of connected bag elements **10** is directed to a filling station **114** which includes a hopper **116.**

Hopper **116** is suitably mounted so as to bisect the two parted edges **102** and **104** of bag elements **10** such that the edges **102** and **104** are plowed open by hopper **116** and pass about the opposite sides **118** and **120** thereof. Accordingly, hopper **116** can be employed to deposit a product into each bag element **10** through the separate fill openings **100** thereof located between the plowed open parted edges **102** and **104.** Most simply the filling of bag elements **10** is accomplished on an intermittent basis wherein belts **106** and **108** direct the bag element to hopper **116** one at a time. Accordingly with a bag element **10** positioned beneath hopper **116,** the belts **106** and **108** are stopped for a time interval sufficient to allow the charge or fill to be dropped through hopper **116** into the particular bag element being filled.

In the apparatus **80** described, belts **106** and **108** are designed to support parted edges **102** and **104** entirely about the periphery of hopper **116** and thereafter direct the filled bag elements **10** to a closure station as is described more fully hereinafter. To this end, pulley systems **110** and **112** cooperate together to provide a first pair of nip pulleys **122** and **124** located adjacent the front or plowing end **126** of hopper **116,** and a second pair of nip pulleys **128** and **130** disposed adjacent

the opposite end of the hopper, that is, the rear or back end **132** thereof. Accordingly, belts **106** and **108** support and squeeze together parted edges **102** and **104** at the front end **126** of hopper **116** by means of the pressure supplied by the first pair of nip pulleys **122** and **124,** and thereafter the belts respectively snuggly pass about the opposite sides **118** and **120** of hopper **116,** whereby parted edge **102** is supported by being squeezed between belt **108** and side **118,** while parted edge **104** is supported in the same manner between bolt **106** and side **120.** The belts **106** and **108** with the parted edges **102** and **104** squeezed between them, are then reunited at the rear end **132** of hopper **116** by means of the second pair of nip pulleys **106** and **108.**

Thereafter, belts **106** and **108** with the parted edges **102** and **104** squeezed between them, are directed between third and fourth pairs of nip pulleys **134** and **136,** and **138** and **140.** Located generally between and directly below the two pairs of nip pulleys **134** and **136,** and **138** and **140** are a pair of cooperating impulse sealing bars **142** and **144.** Sealing bars **142** and **144** are of the conventional sort, heated, for example, by electric current to a temperature suitable for sealing bag elements **10** having heat sealable qualities as, for example, those formed of thermoplastic materials such as polyethylene, polyvinyl chloride and the like. Specifically, bars **142** and **144** are activated during the stop interval accompanying filling operations whereby the bars **142** and **144** close together across the first edge portion **16** of the particular bag element **10** positioned therebetween. The heat and pressure supplied by bars **142** and **144** form seal **146** welding together the first and second walls **20** and **22** across the first edge portion **16** of the bag element **10,** with the seal formed connecting together with the seams **24** at each side **26** and **28** thereof to provide a leak proof closure of fill opening **100.**

After completion of sealing operations, belts **106** and **108** direct the filled and sealed bag elements **10** to a fifth pair of nip pulleys **148** and **150.** Specifically, pulleys **148** and **150** respectively anchor the separate pulley systems **110** and **112** thereby returning the bolts **106** and **108** to the first pair of nip pulleys **122** and **124** via a route including tension pulleys **152** and **154,** and **156** and **158.** Beneficially, the tension pulleys are slidingly mounted to move either inwardly or outwardly of their shown positions whereby the tension on belts **106** and **108** can be adjusted.

As the two belts **106** and **108** pass about the anchor pulleys **148** and **150,** they separate from each other thereby releasing their grip on the parted edges **102** and **104** of the filled and sealed bag elements **10.**

Beneficially assisting belts **106** and **108** in their driving function is a conveyor system **160** including an endless conveyor bolt **162,** which supports and drives the bottom ends **30** of the connected bag element **10** during filling and sealing operations. Specifically, conveyor belt **162** is anchored at each end and travels about (in the direction indicated by arrow **164**) a pair of drive rollers **166** and **168.** Located intermediate of drive rollers **166** and **168** is a pivot roller **170** which works in combination with drive roller **166** to form a settling station for apparatus **80.** Specifically, roller **166** is reciprocally mounted (as, for example, by a conventional cam mechanism not shown) to vibrate generally upwardly and downwardly about the axis of roller **170** thereby causing likewise vibration of the portion of the conveyor belt **162** located beneath hopper **116.** This vibrating action shakes the bottom ends **30** of the bag element **10** during filling operations such that a more complete fill and settling of the product in the bottom end **30** of the bag is obtained.

From roller **170,** conveyor belt **162** directs the bottom ends **30** of the filled bag elements **10** to the aforementioned impulse sealing bars **142** and **144.** Thereafter, conveyor belt **162** returns to roller **166** whereby support for the bottom ends **30** of the filled and sealed bag elements **10** is terminated. Termination of the support provided by conveyor belt **162,** together with the release of the top ends **32** of bag elements **10** be belts **106** and **108,** frees the filled and sealed bag elements **10** from apparatus **80.** Thus, by their own weight, the bag elements **10** are allowed to fall away from apparatus **80** usually substantially breaking apart from each other during the process.

Assisting in the breaking apart of the connected bag elements **10** is a trimmer mechanism **172.** Trimmer **172** generally includes a pair of rotatably mounted and peripherally sharpened discs **174** and **176** disposed on each side of bag elements **10** at a location directly below belts **106** and **108,** and adjacent the anchor pulleys **148** and **150.** Discs **174** and **176** cooperate together to shear or cut off the parted edges **102** and **104** of bag elements **10** across the top edge **178** of seam **146.** Beneficially the removal of the parted edges **102** and **104** further weakens the connection between each of the bag elements **10** whereby the bag elements **10** more easily part from each other upon their release by apparatus **80.** Preferably, the trimmed parted edges **102** and **104** are directed to a reel **180** upon which they are wound and conveniently placed out of the way.

In particular, belts **106** and **108** and conveyor belt **162** can be activated from a single power outlet driving these two mechanisms in synchronized intermittent motion. This is customarily achieved by employing an electric eye which focuses on a printed legend on each bag element **10.** The electric eye is usually circuited to the electric motor (not shown) which drives belts **106** and **108** and conveyor belt **162.** Specifically, the electric eye functions to cut the power supplied to the electric motor thereby stopping the operation with one bag element located directly beneath the hopper **116.** After filling operations are completed, by means of a suitable timer, the electric motor can be restarted whereby the filling cycle is repeated. Similarly, the dropping of a change or product through hopper **116** and the activating of sealing bars **142** and **144** during the stop intervals, is customarily achieved by incorporating a second timer into the system whereby upon stoppage of belts **106** and **108** and conveyor belt **162,** the drop mechanism depositing the product through hopper **116** is activated together with the sealing bars **142** and **144,** which seal closed the fill opening **100** of a previously filled bag element **10.** Parts for intermittently driving apparatus **80** as, for example, suitable electric eye circuits, electric motors, timer mechanisms, etc., are widely known and available as well as commonly employed in filling apparatus. Their proper and efficient selection for apparatus **80** would be usually a matter of choice well within the powers of those skilled in the art in view of the disclosure of invention herein.

In FIGS. **4** and **13** a modification is shown wherein the loop **34** is fitted with two bead-like locking members extending longitudinally thereon and more specifi-

cally a female member **182** and a male member **184.** These type locking members are well known in the art and are particularly described in detail in U.S. Pat. No. 3,338,284 which shows and teaches a particular advantageous embodiment of such a locking system. Such locking members, in fact, can be extruded directly with the tubular material as, for example, in a method like that illustrated in detail in Canadian Pat. No. **700,470.** What has been found unique in such a locking system is that when the parted edges **102** and **104** are trimmed and the members locked together as, for example, like that shown in FIG. **13,** an especially effective mechanical closure of the bag element is obtained. This is not the result one would expect since this type locking feature is widely known for its easy opening abilities. However, with the parted edges **102** and **104** trimmed from loop **34** such that the locking members **182** and **184** are disposed adjacent the trimmed edges **186** and **188** of the filled bag element **10,** an especially secure and tamper-proof mechanical lock closing fill opening **100** is provided.

Bag elements **10** having such a mechanical locking feature are particularly desired since the closure of these bags after filling is particularly simple and easy to accomplish without requiring special heat sealing or other closing apparatus. Furthermore, the closing of such bag elements can be accomplished on a continuous basis whereby filling operations are speeded up allowing for heretofore unknown economics especially suited for high volume packagers.

Referring to FIGS. **14** through **17,** there is shown another modification of the unique bag construction taught herein. Generally, bag elements **10***a* are like those described above with each bag element including closed bottom and top ends **30***a* and **32***a*, and two sides **26***a* and **28***a* closed except at their uppermost extent to form the open ended loop **34***a* across the top end of each bag element **10***a*. Each bag element **10***a*, however, further includes both a bottom gusset **36***a* and a top gusset **36***a'*. Gussets **36***a* and **36***a'* are similar to gussets **36** of bag elements **10** with the exception that in the top gussets **36***a'* the first leg **190** is offset beyond the second leg **192,** as is best illustrated in FIG. **15.** Thus, the first and second panels **194** and **196** of the first leg **190** extend beyond panels **198** and **200** of the second leg **192** whereby the offset portions of panels **194** and **196** are advantageously positioned to form the loop **34***a* at the top end of each bag element **10***a*. Specifically, loop **34***a* is defined by means of terminating the seams **24***a* adjacent the leading edge **202** of the second leg **192,** leaving the offset portion of first leg **190** substantially unseamed. Accordingly, there is formed a channel **40***a* defined by the offset portions of panels **194** and **196,** which channel **40***a* extends from bag element to bag element substantially unobstructed. At locations below the leading edge **202** of the second leg **192,** the four plies of the first and second panels of legs **190** and **192** are secured together at each side **26***a* and **28***a* of the bag elements **10***a* by seams **24***a*. Accordingly, seams **24***a* securely hold the top gusset **36***a'* in its folded position during the filling and sealing operations performed by apparatus **80.**

Bag elements **10***a* further include a unique break-away seam **24***a* construction as best shown in the cross-sectional view of FIG. **17.** Seam **24***a* is particularly designed for bag elements formed of thermoplastic material, and allows the bag elements to be of the break away variety without the need for extra perforating or slitting steps. This is accomplished by thinning a strip A along the center of the seam **24***a* as illustrated in FIG. **17** with the material originally located along strip A being displaced and forming bulbular shaped ridges B on each side of the thinned strip. The strip A, or couse, substantially weakens the strength of the connection between each of the bag elements **10***a* with the thickened bulbular sections B forming especially tough seams at the sides **26***a* and **28***a* of each bag element **10***a*. To facilitate the break-away construction of seams **24***a*, an aperture **204** can be cut through the panels **194** and **196** of the first leg **190** adjacent the upper terminating end of the seam. After trimming, the portion above aperture **204** is removed as, for instance, by trimming mechanism **172,** with the aperture **204** then being located in a position to initiate the parting of seam **24***a* along weakened strip A.

FIG. **18** shows yet another modified form of the invention as embodied in a chain of connected bag elements **10***b*, constructed generally like those illustrated in FIGS. **14** through **17,** but additionally defining triangular shaped cutouts **206** and **208** removed, respectively, from gussets **36***b* and **36***b'* adjacent the opposite ends of each seam **24***b*. Cutouts **206** and **208** trim back the opposite ends **210** and **212** of each gusset **36***b* and **36***b'*, at an angle of about 45°, whereby the bag elements **10***b*, when filled and separated, tend to square-out nicely at their corners. The four panels comprising the first and second legs of each gusset **36***b* and **36***b'*, and specifically excluding the offset portion of the first leg **190***b* of the top gusset **36***b'*, are secured together at each end **210** and **212** by seams **214** which in turn merge into and comprise a part of seams **24***b* closing the sides of each bag element **10***b*. Specifically seams **214** are of a break away construction, that is, the inner portion of seams **214** joining together the facing surfaces of the respective second panels of gussets **36***b* and **36***b'* at each end **210** and **212.** provide only a relatively light bond whereby upon filling bag elements **10***b*, the first and second legs of each gusset **36***b* and **36***b'*, break apart from each other. More specifically, the seams **214** closing top gussets **36***b'*, terminate in spaced relationship with the leading or folded edge **218** of the first leg **190***b*. This leaves the offset portion of the first leg **190***b* at least partially open at each end **210** and **212,** thereby forming the open ended loop **34***b* at the top end of each bag element **10**b. Yet even more specifically, the cutouts **208** made in gussets **36***b'* leave a strip of material **220** intact and connecting together adjacent loops **34***b* of the bag elements **10***b*. The continuous loop structure provided by strips **220,** enables a smoother feeding of the elements **10***b* about mandrel **88** whereby the possibility of a loop **34***b* catching on the leading edge of the mandrel is minimized. A variation in seams **24***b* is also shown in bag elements **10***b*, wherein a series of perforations **216** are employed to substantially part each seam **24***a* down the middle thereof such that the connected bag elements **10***b* can be more easily separated from each other as described above.

In FIGS. **19** and **20** yet another modified embodiment of the invention is illustrated in the form of connected bag elements **10***c*. Each bag element **10***c*, includes both a bottom and a top gusset **36***c* and **36***c'*, respectively, which are generally like those shown in FIG. **18** but with the two legs of each gusset **36***c* and

36c' located approximately 180° apart. Specifically, in top gussets 36c', the first legs 222 thereof are disposed or oriented generally upright and form the top ends 32c of bag elements 10c, with the second legs 224 of gussets 36c' folded over to a position generally superposed with the second walls 22c. The upright position of the first legs 222 strategically positions the same to form the open ended loop 34c at the top end 32c of each bag element whereby the first legs 222 need not be of a deeper construction, that is, offset beyond the second legs 224 in order to allow sealing and trimming operations to be performed without interference from the second legs.

More specifically, the folding apart of the legs 222 and 224 is made possible by seaming the legs 222 and 224 separately at the opposite ends 226 and 9 228 of gussets 36c'. Thus, the two panels 230 and 232 of first leg 224 are secured together at the opposite ends 226 and 228 thereof by seams 234, which seams terminate in spaced relationship with the folded edge 236 of legs 222 to form loops 34c. Likewise, panels 238 and 240 of legs 224 are secured together at ends 226 and 228 by seams 242. In particular, both seams 234 and 242 merge together with seams 24c to close the sides 26c and 28c of each bag element 10c, except at the uppermost extend thereof whereat the channel 40c is located.

Generally, the bottom gussets 36c are formed like top gussets 36c', except that both the first and second legs of gusset 36c are completely closed off at the opposite ends 226 and 228 by seams 244 and 248. Also, the opposite ends 226 and 228 of gusset 36c and 36c' are trimmed back at an angle of approximately 45°, like in bag elements 10b, with the one exception that in the first leg 222 of gussets 36c', a strip of material is not left intact. In particular, removal of such a strip may in some instances be desired, for example, to simplify the trimming and sealing operations necessary to form the top gussets.

FIGS. 21 through 24 illustrate yet another modified embodiment of the present invention wherein the material forming the loop of each bag element is thinned somewhat such that the scrap accompanying trimming of the loop, or more aptly, the two edges formed by parting the same, is reduced. In FIGS. 21 and 22 this is accomplished by forming the bag elements 10d from laminated plies of material wherein the loop 34d, for example, can be a single ply of a relatively light guage material and wherein the first and second walls 28d and 22d of bag elements 10d are of multi-ply construction. Specifically, in the illustrated embodiment, tubular material 14d comprises an inner ply 254 of preferably relatively thin guage lightweight material (but capable of suitably supporting bag elements 10d through fill, sealing and closing operations) which has laminated over portions thereof, excluding the loop 34d, a relatively heavy gauge outer ply 256. More specifically, the heavy gauge ply 256 extends from the longitudinal edge 36d of the loop 34d, in intimately joined relationship with the inner ply 254, around the bottom end 30d of bag elements 10d to the opposite longitudinal edge 38d of the loop.

In FIG. 23, showing bag elements 10a, material savings are accomplished by using a double wall concept like that shown in FIG. 22, with the exception that the outer ply or layer 258 is secured together with the inner ply or layer 260 at only strategic areas as, for example, along the opposite longitudinally extending edges 36c and 38e of loop 34c.

In bag elements 10f of FIG. 24, material savings are accomplished in a more direct fashion by actually thinning the material comprising loop 34f as, for example, by extruding tubular material 14f having a thinner cross section at the edge portion 262 thereof forming the loop. This would be suitable, of course, only for bag elements 10f comprised of thermoplastic or like materials which can be readily thinned at strategic portions by extrusion or other equally effective techniques.

A further modification of the bag elements 10d illustrated in FIG. 21, relates to a series of notches or cutouts 266 removed at spaced and regular intervals along the loop 34d thereof. Beneficially, notches 266 provide means to index the location of bag elements 10d in apparatus 80. Thus, notches 266 can be employed, for example, to precisely time and trigger the filling and closing operations to be performed on the bag elements. Still yet another variation of bag elements 10d concerns seams 24d, each of which comprises a pair of closely spaced and parallel seams 268 and 270, extending from the bottom ends 30d of bag elements 10d, to adjacent the opposite longitudinal edges 36d and 38d of the loop. Perforations 272 are located between each pair of seams 268 and 270, for the reasons discussed above, and extend upwardly therefrom through loop 34d. Weakening of the loop 34d by perforations 272 would usually be advantageous for bag elements to be filled and sealed by apparatus not including a trimming mechanism as, for example, one like mechanism 172 shown in FIG. 5.

FIG. 25 illustrates yet another modified form of the invention as embodied in connected bag elements 10g. In particular, the loop of these bag elements is preslit or parted, whereby the filling of bag elements 10g would customarily be from a supply roll-like arrangement. This illustrates generally the versatility of the bag constructions of the present invention, wherein, if desired, they can be readily adapted for use in the more conventional filling and sealing apparatus.

Further modifications to bag elements 10g concern the provision of a valve integrally formed in the bag construction, and especially suited for powdered or finely divided products, whereby excess air trapped within the bag can escape through a filter in the valve, but the filter is made impervious to the passage of the product. Such a valve is particularly beneficial for use in combination with powdered products and the like, since these products seem to actually absorb or trap air particles, which tend, after filling, to bloat the bag. Specifically, the filter is formed of paper or like material, pervious to air but substantially impervious to the product, and comprises an inner ply or layer 276 forming at least a portion of the walls 20g and 22g of each bag element 10g. Layer 276 is covered by and along its two opposite longitudinal edges 279 and 281, joined together with an outer ply or layer 278. Where the outer layer 278 comprises an air or gas impervious material, as, for example, a thermoplastic film, the same can include a multitude of perforations 280. Accordingly, the excess air entrapped within the powdered product is able to pass through the inner filter layer 276, and then through perforations 280, such that excessive air is expelled from the confines of the bag elements 10g automatically. Beneficially, the outer layer 278 extends beyond the inner layer 276, at the top end 32g of each

bag element **10***g*, to form the parted edges **102***g* and **104***g* thereof, whereby the concept of material savings by minimizing scrap is constructed into bag elements **10***g*.

FIGS. **26** and **27** illustrate yet another modified form of the invention wherein bag elements **10***h* are strung or draped in side by side relationship, as, for example, like on a clothesline. This is accomplished by means of a strip of material **286** which is joined together along one of its longitudinal edges **288** with the respective first walls **20***h* of each bag elements **10***h*, and then topwise folded over and joined together along its opposite longitudinal edge **290** with the respective second walls **22***h* thereof, as is best illustrated in FIG. **27.** More specifically, the seams **292** and **294,** securing together walls **20***h* and **22***h* along sides **26***h* and **28***h*, terminate in spaced relationship with the folded edge **296** of strip **286,** whereby the folded strip **286** forms the opened ended loop **34***h* at the top end of each bag element **10***h*. Most beneficially, the seams, adhesive means of the like **298,** joining walls **20***h* and **22***h* with the opposite edges **288** and **290** of strip **286,** do not extend across the entire top end **34***h* of bag elements **10***h*, but terminate at a spaced distance from the opposite sides **26***h* and **28***h* thereof. This seam construction allows for a greater expansion of the fill openings of each bag element **10***h*, formed after parting loop **34***h* such that loading or filling operations are facilitated.

A further connection between adjacent bag elements **10***h* is provided near their bottom ends **30***h* by means of short strips of material **302,** respectively connecting together adjacent bag elements **10***h* thereat. A connection at this location stabilizes the bag elements **10***h* on strip **286** such that when feeding from a pile located in a box or like container, catching of the bottom ends of the bag elements on an edge of the container is avoided.

FIGS. **28** and **29** show modifications of the general inventive concept illustrated in FIG. **26** wherein the concept is adapted to allow for loading or filling through gusseted sections of the bag elements. Specifically, FIG. **28** shows a top gusset **36***i* constructed generally like gussets **36***a'*, with the exception that in gusset **36***i* the two panels **304** and **306** forming the first leg **190***i* thereof, are not joined directly to each other, but to the opposite edges **288** and **290** of strip **286.** In FIG. **29,** a likewise joining of strip **286** to a gusset **36***j* is shown wherein gusset **36***j* is of the general type having the two legs thereof folded 180° apart, as was described in detail with regard to FIGS. **19** and **20.**

In FIGS. **30** and **31,** yet another embodiment of the general inventive concept of FIG. **26** is shown, wherein the bag elements **10***k* of FIG. **30** each include along the opposite sides **26***k* and **28***k* thereof, side gussets **310** and **312.** Gussets **310** and **312** are generally of the inverse fold type described in detail in regard to FIG. **1,** and each include two legs **318** and **320.** The four panels of legs **318** and **320** are edgewise secured together at the respective bottom ends **30***k* of each bag element **10***k* by seams **322** and **324.** More specifically, seams **322** and **324** merge into and comprise a portion of seams **314** securing together the first and second walls **20***k* and **22***k* across the bottom end of bag elements **10***k*. The four panels of each leg **318** and **320** are also edgewise secured together adjacent the respective top ends **32***k* of each bag element by seams **316** and **328.** Beneficially, seams **316** and **328** are employed to maintain gussets **310** and **312** in a folded position to assist closing operations whereby after filling a heat appearing seam can be made across the top ends **32***k* of bag elements **10**k.

The clothesline, claim concept illustrated in FIGS. **26** through **31** can be employed for folded cartons as, for example, those formed of paperboard, as well as bag elements as described in detail above.

The bag elements of the present invention can be formed from conventional packaging materials as, for example, paper, burlap, cotton, plastic film, plastic sheeting and the like with polyethylene, polystyrene, and polyvinyl chloride being examples of the latter. When formed from plastic film or sheeting, the bag elements would be conventionally manufactured from either tubular material or a single web or from two webs superposed upon each other and edgewise sealed in the longitudinal direction. Specifically, those bag elements formed with an open ended loop at the top end thereof would normally be formed from tubular material, while those having edges at the top end thereof like those bag elements shown in FIG. **25,** formed from a single web suitably folded such that the opposite longitudinal edges of the web form the edges at the top end of the bag element.

Seams and like attachments as described above can be formed by the usual techniques, as, for example, by heat sealing methods, adhesives, solvents, sewing, and the like as would be appropriate for the materials involved.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope of the invention.

Accordingly what is claimed is:

1. A method of filling a chain of connected bag elements wherein each bag element normally includes closed bottom and top ends and two sides, said sides closed except at their uppermost extent whereby an open ended tunnel portion is formed at the top end of each bag element, said tunnel portions being aligned, said method comprising the steps of:

a. feeding the tunnel portions of said bag elements about an elongated mandrel member to mount said bag elements in a curtain-and-rod-like fashion;

b. parting said tunnel portions in the longitudinal direction to form a fill opening for each bag element located between the two closed sides thereof and the two parted edges of the tunnel portion;

c. plowing open said parted edges; and

d. thereafter depositing a product in each bag element through the fill opening thereof.

2. The method of claim **1** including the step of intermittently feeding said bag elements about said elongated mandrel member.

3. The method of claim **2** including the step of feeding said chain of connected bag elements to said elongated mandrel member from a folded pile, said folded pile comprising connected bag elements positioned one on top of the other in a continuous Z-like stacking arrangement.

4. The method of claim **3** including the step of vibrating said bag elements during the step of introducing a fill product in said bag elements thereby permitting a more complete fill.

5. The method of claim 4 including the step of individually filling each of said chain connected bag elements.

6. The method of claim 5 including the step of trimming a portion of said parted tunnel portion edges after introducing said fill product in said bag elements, thereby further weakening the connection between said chain connected bag elements.

7. The method of claim 6 including the step of placing said filled chain connected bag elements in a position resulting in said chain connected bag elements breaking apart from each other by their own weight.

8. The method of claim 7 including the step of sealing said elements after said fill product is introduced into said bag elements.

9. The method of filling a chain of connected bag elements wherein each bag element normally includes closed bottom and top ends, two sides, said sides closed except at their uppermost extent, whereby an open ended tunnel portion is formed at the top end of each bag element, said tunnel portions being aligned, said method comprising the steps of:

a. intermittently feeding the tunnel portions of said bag elements about an elongated mandrel member to mount said bag elements in a curtain-and-rod-like fashion;
b. moving said chain of connected bag elements to a product filling station;
c. parting said tunnel portions in the longitudinal direction to form a fill opening, for each bag element, located between the two closed sides thereof and the two parted edges of said tunnel portion;
d. plowing open said parted edges; and
e. activating said product filling station thereby depositing a fill product in said bag elements while said bag elements are intermittently positioned adjacent said product filling station.

10. The method of claim 9 including the step of feeding said chain of connected bag elements to said elongated mandrel from a folded pile of connected bag elements.

11. The method of claim 9 including the step of feeding said chain of connected bag elements to said elongated mandrel from a fan folded pile of connected bag elements.

12. The method of claim 9 including the step of feeding said chain of connected bag elements from an endless pile of connected bag elements.

13. The method of claim 9 including the step of vibrating each of said bag elements during the step of introducing a fill product in said bag elements.

14. The method of claim 9 including the step of vibrating each of said bag elements after the step of introducing a fill product in said bag elements.

15. The method of claim 14 including the step of placing said filled bag elements in a position resulting in said connected bag elements breaking apart from each other by their own weight.

16. A method of individually filling a chain of connected bag elements, wherein each bag element normally includes closed bottom and top ends, two sides, said sides closed except at their uppermost extent whereby an open ended tunnel portion is formed at the top of each bag element, said tunnel portions being aligned, said method comprising the steps of:

a. intermittently feeding the tunnel portions of said chain of bag elements about an elongated mandrel member to longitudinally mount said connected bag elements in a curtain-and-rod-like fashion;
b. moving said mounted chain of connected bag elements to a product filling station;
c. parting said tunnel portions in a longitudinal direction to form a fill opening for each bag element, located between the two closed sides thereof and the two parted edges of said tunnel portion;
d. plowing open said parted edges;
e. activating said product filling station and depositing a product fill singularly in each of said bag elements while said bag element is intermittently positioned adjacent said product filling station;
f. vibrating said bag elements;
g. conveying said filled bag elements to a position resulting in said connected bag elements separating from each other by their own weight; and
h. sealing said bag elements.

17. The method of claim 16 including the method of claim 9 including the step of vibrating each of said bag elements during the step of introducing a fill product in said bag elements.

18. The method of claim 16 including the method of claim 9 including the step of vibrating each of said bag elements after the step of introducing a fill product in said bag elements.

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