United States Patent

[11] 3,559,874

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[54] **SERIES BAG CONSTRUCTION**
23 Claims, 31 Drawing Figs.

[52] **U.S. Cl.** **229/69**
[51] **Int. Cl.** **B65d 27/10**
[50] **Field of Search** 229/69, 53, 55; 150/5, 4, 62; 53/14

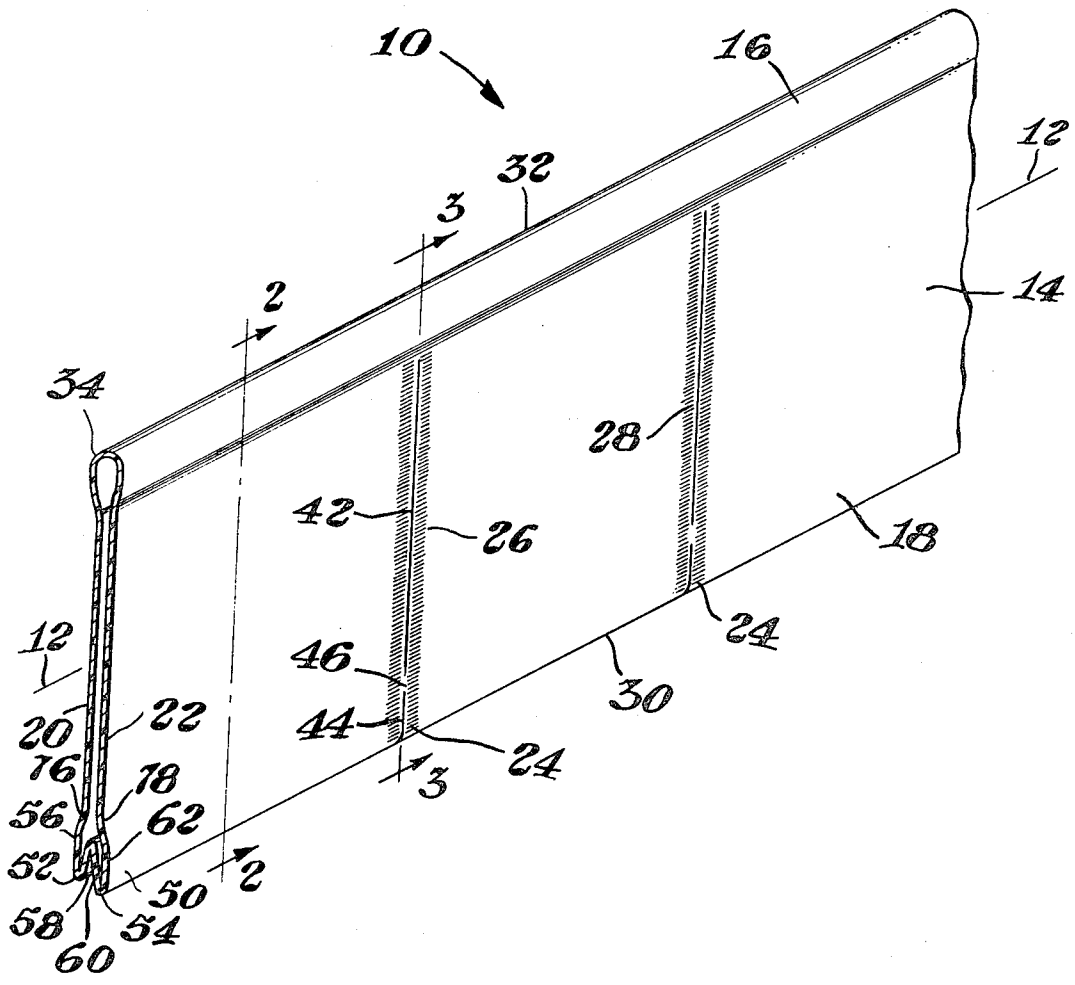
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ABSTRACT: A bag construction embodied in a chain of connected bag elements and an efficient method for filling the same. In novel feeding and mounting concepts, the chain of bag elements is preferably fed to the filling apparatus from a folded pile, and is initially received by a mandrel which mounts the same in a curtain-and-rod-like fashion by means of a loop or tunnel 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.



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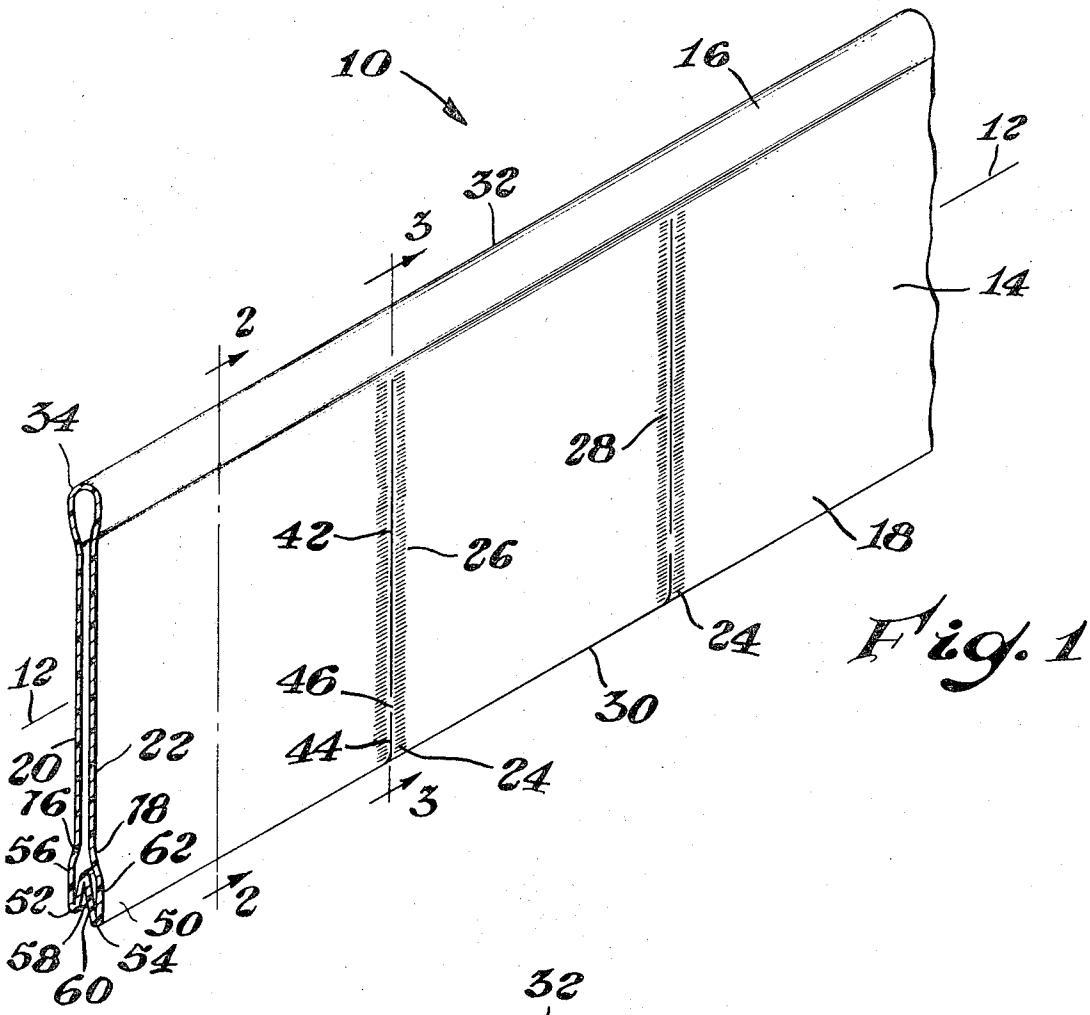


Fig. 1

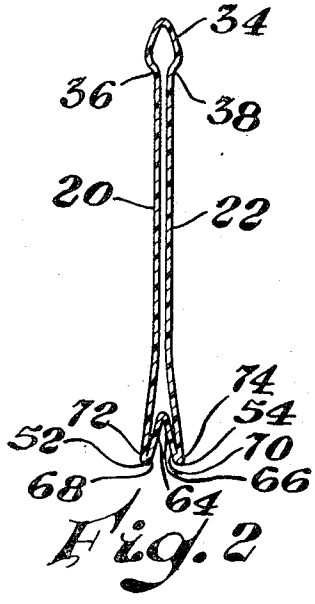


Fig. 2

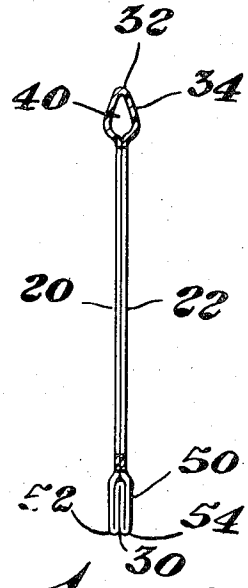


Fig. 3

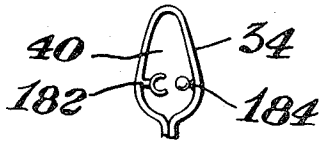


Fig. 4

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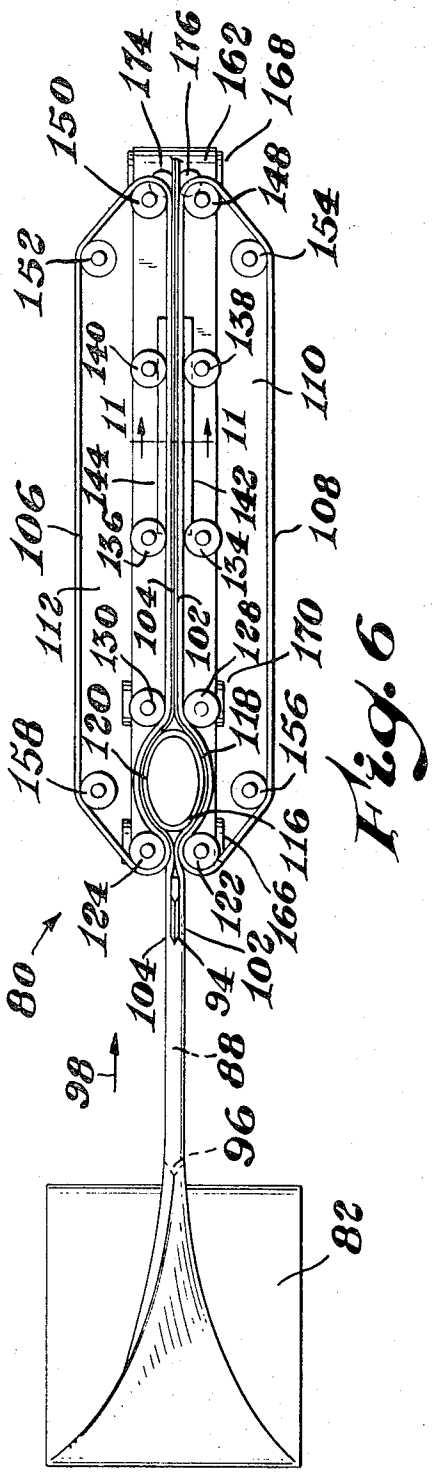


Fig. 6

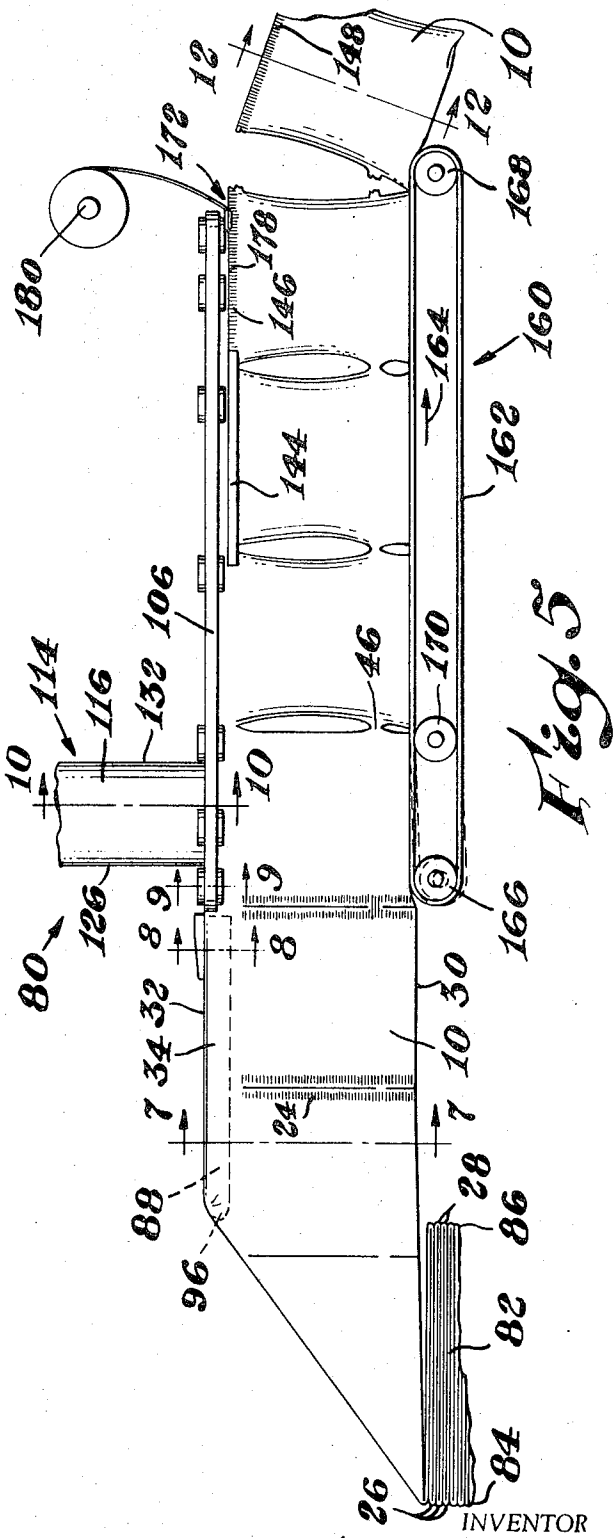


Fig. 5

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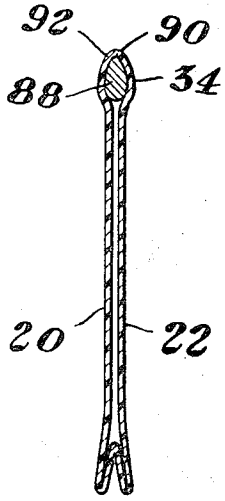


Fig. 7

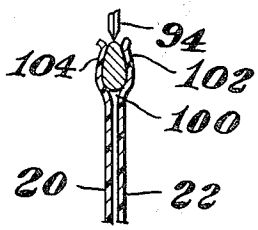


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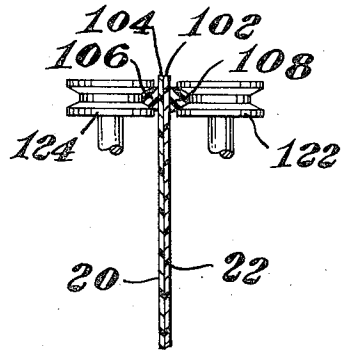


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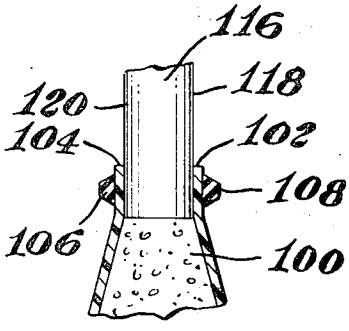


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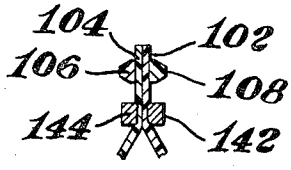


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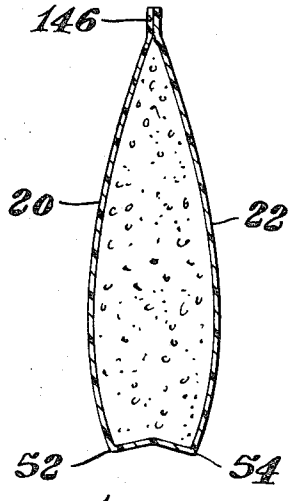


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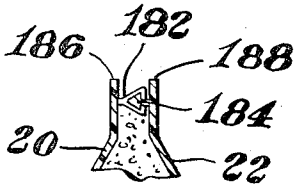


Fig. 13

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Fig. 14

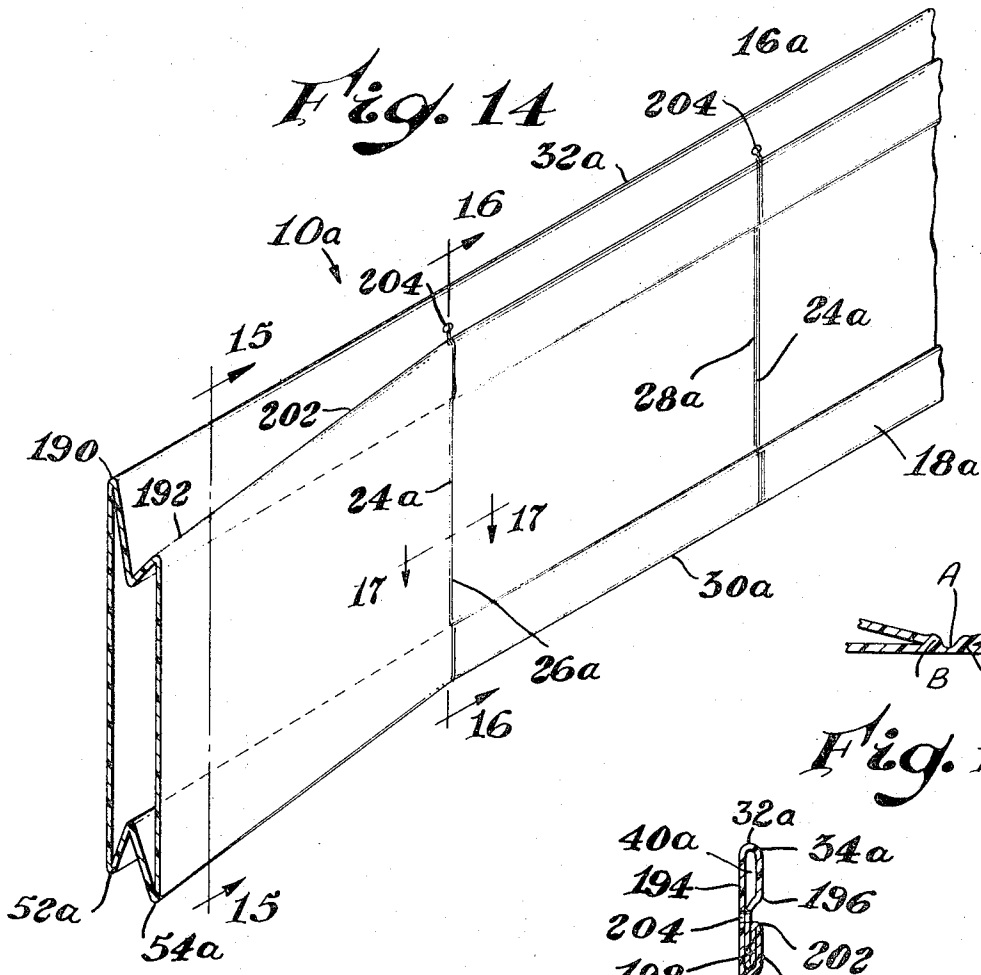


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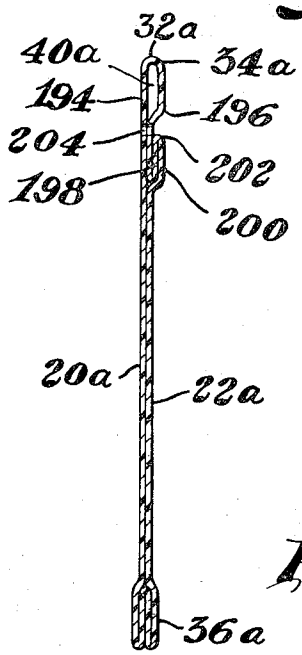


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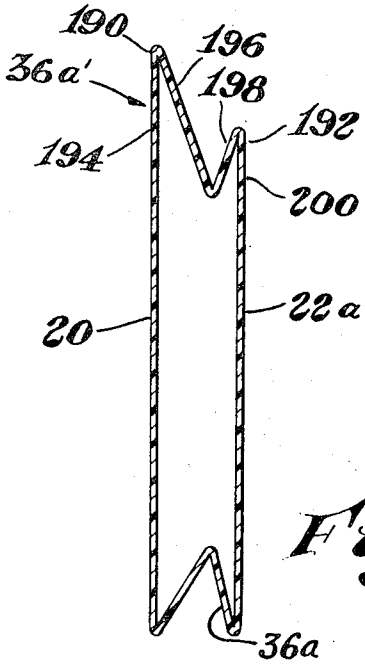


Fig. 15

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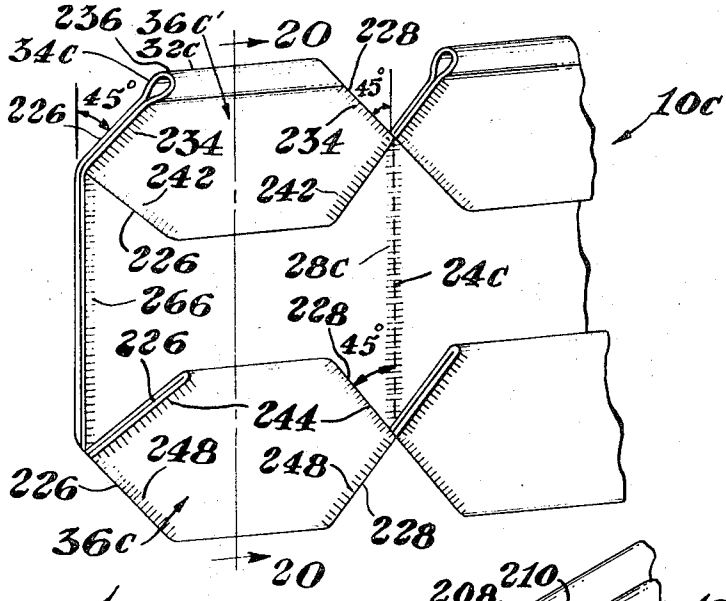


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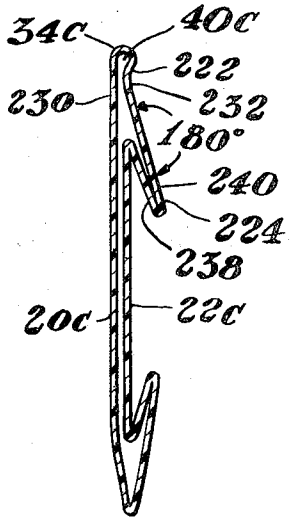


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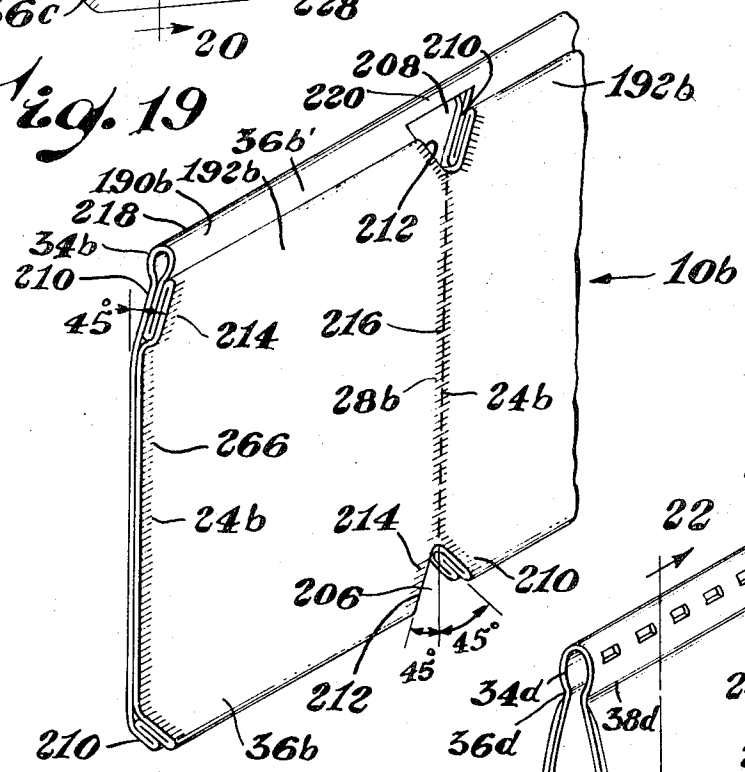


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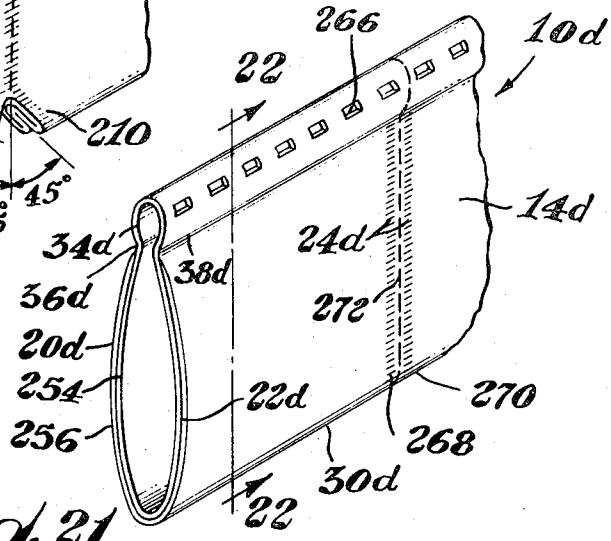


Fig. 21

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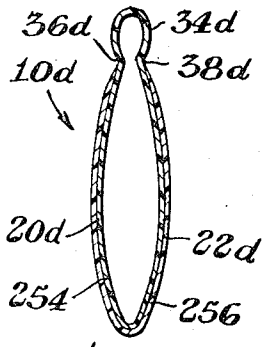


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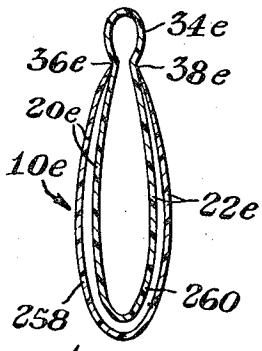


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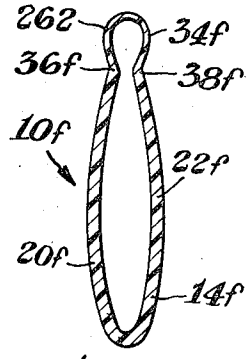


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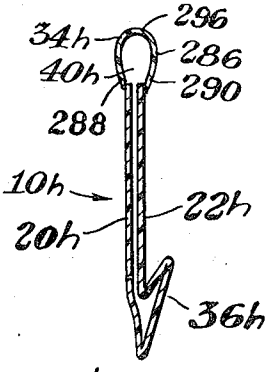


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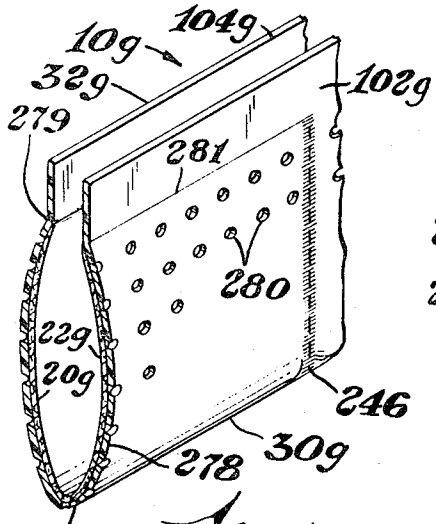


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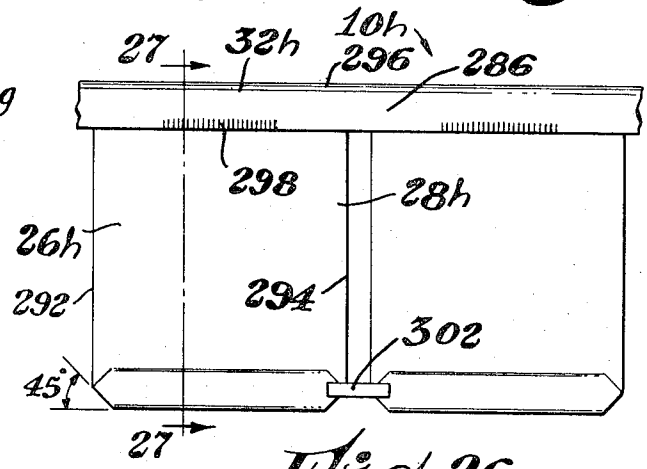


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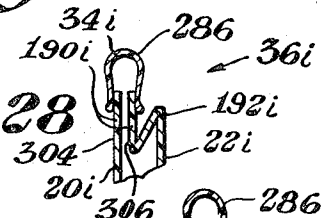


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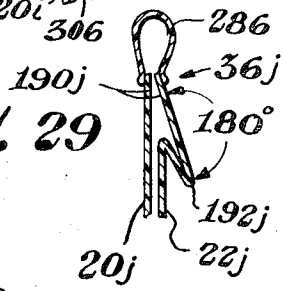


Fig. 29

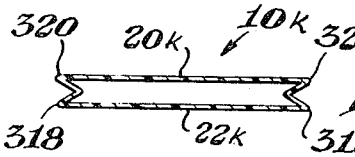


Fig. 31

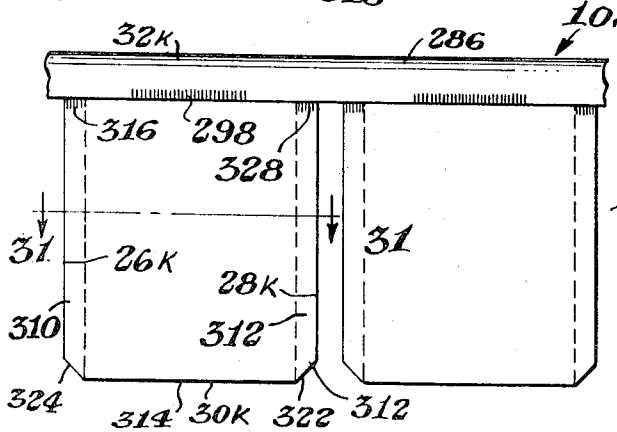


Fig. 30

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SERIES BAG CONSTRUCTION

DESCRIPTION OF THE INVENTION

The present invention relates to novel bag constructions as embodied in 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, therefore, to provide an improved method for filling a chain of connected bag elements wherein the bag elements can be fed to 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 cost 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 bag manufacture, shipping, and the eventual filling and sealing of the bags.

It is s 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 clotheslinelike 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 closed bottom and top ends, 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-rod-like fashion be 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 side 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 a 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 breakaway type seam is taught wherein the seam is thinned and weakened along its centerline such that is imperforate, but yet easily ruptured without cutting. Also, advantageous chain arrangements are taught for connecting together the bag elements. FOr example, in one embodiment the bag elements are connected together side by side in a clotheslinelike fashion be a strip of material secured along one edge to one side of the mouth or fill openings of each bag element, and the 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.

Yet additional objects and advantages of the present invention, and its numerous and cognate benefits are even more apparent and manifest and by the ensuing description and specification taken in conjunction with the accompanying drawings, in which wheresoever possible, like characters of reference designate corresponding 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. 12 is 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 connect 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 connect 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 clotheslinelike

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 connect 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 sided sides 26 and 28 of each bag element. The second edge portion 18, as divided by seams 24, forms and 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 for FIG. 1, seams 24 extend upwardly from the second edge portion 18 of each of the bag element 10 to a point adjacent but spaced from their respective top ends 32. This inherently forms a loop of 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. The longitudinally extending central or intermediate portion of loop 34, existing between edges 36 and 38, defines an uninterrupted guide channel 40 which communicates from bag element to bag element whereby the chain of connect 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 gently 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 guide gusset 50 comprises first and second lets 52 and 54 with each let 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 is 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 ad 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.

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 ad and indexing of bag elements 10 in apparatus 80 such that a fouling of the apparatus by misdirected bag element is avoided.

In the prior art filling methods, the function of properly feeding and aligning the bag elements in the apparatus is customarily 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 from a 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, an effective method of feeding the bag elements from a pile is provided whereby the method in cob combination with particularly beneficial bag le elements constructions accomplishes important advantage. For instance, the usual tension forces incurred in the winding of the connected bag elements on a supply roll are eliminated. Accordingly, the connect bag

element 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 element 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 mad 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 of 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 edges 102 and 104 dividing loop 34 ti into freely spreadable flaps of generally equal height between which the bag elements can be progressively filled, as will be explained more fully hereinafter.

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 202 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 part 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 paid 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 snuggle 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 belt 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 128, and 130.

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 operation, 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 belts 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 a 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 belt 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 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 by 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 a 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 e 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 choices will 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 beadlike locking members extending longitudinally thereon and more specifically 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. 7000,470. What has bee 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 obtains. 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 s especially secure and tamperproof 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 another 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 economies 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 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 let **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 uninterrupted. At locations below the leading edge **202** of the second leg **192**, the four plies of the first an 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 breakaway 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 breakaway 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 tubular shaped ridges B on each side of the thinned strip. The strip A, of course, substantially weakens the strength of the connection between each of the bag elements **10***a* with the thickened tubular sections B forming especially tough seams at the sides **26***a* and **28***a* of each bag element **10***a*. To facilitate the bread breakaway 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 breakaway construction, that is, the inner portion of seams **214** joining together the facing surfaces of the respective sound 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 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 is 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 10c. Each bag element 10c includes a both a bottom and a top gusset 36c and 36c' respectively, which are generally like those shown in FIG. 18 but with the two legs of each gusset 36c 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 32cof 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 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 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 ti 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 or freely spreadably flaps 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 gauge material and wherein the first together second walls 20d and 22d of bag elements 10d of are of multi-ply construction. Specifically, in the illustrated embodiment, tubular material 14d comprises an inner ply 254 of preferably relatively thin gauge 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 10e, 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 36a and 38d of loop 34e.

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 10 f comprised of thermoplastic or like materials which can be readily thinned at strategic portions be 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 in 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 element 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 b 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, 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 bat. Specifically the filter is formed of paper or like material, pervious to air but substantially impervious to the product, and comprises in 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 the through perforations 18 280, 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 10g, to form the parted edges 102g and 104g thereof, whereby the concept of material sea savings by minimizing scrap is constructed into bag elements 10g.

FIGS. 26 and 27 illustrate yet another modified form of the invention wherein bag elements 10h 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 20h of each bag elements 10h, and then topwise folded over and joined together along its opposite longitudinal edge 290 with the respective second walls 22h thereof, as is best illustrated in FIG. 27. More specifically, the seams 292 and 294, securing together walls 20h and 22h along sides 26h and 28h, terminate in spaced relationship with the folded edge 296 of strip 286, whereby the folded strip 286 forms the opened ended loop 34h at the top end of each bag element 10h. Most beneficially, the seams, adhesive means of the like 298, joining walls 20h and 22h with the opposite edges 288 and 290 of strip 286, do not extend across the entire top end 34h of bag elements 10h, but terminate at a spaced distance from the opposite sides 26h and 28h thereof. This seam construction allows for a greater expansion of the fill

openings of each bag le 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 stabilized 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 let **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 **287** 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 edges 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 neat appearing seam can be made across the top ends **32***k* of bag elements **10***k*.

The clothesline chain 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.

I claim:

1. A chain of connected bag elements which when strung out define a longitudinal axis, each of said bag elements comprising bottom and top ends and two sides, and bag elements arranged in said chain in generally side-by-side relationship with said top and bottom ends extending in planar relationship with said longitudinal axis, each of said bag elements closed across the top and bottom ends thereof, said two sides closed except at the too uppermost extend thereof, thereby forming an open ended loop at the top end of each bag element, the channels defined by said loops being longitudinally aligned with each other and being of sufficient width such that said chain of bag elements can be mounted in a curtain-and-rod-like fashion by means of the loop located at the top end of each bag element.

2. A chain of bag elements which when strung out defines a longitudinal axis, said bag elements comprising a tubular body flattened for to form first and second edge portions extending longitudinally thereon and first and second walls located opposite each other, said bag elements defined by seams extending generally transversely to said longitudinal axis and securing together said first and second walls at spaced intervals along said tubular body, respective pairs of said seams forming the two opposite sides of each bag element with said first and second edge portions comprising the respective top and bottom ends thereof, the uppermost extend extent of said side seams terminating at points in spaced relationship with the leading edge of said first edge portion, whereby the first edge portion forms an open ended loop at the top end of each bag element, the channels defined by said loops being generally longitudinally aligned with each other and being of a sufficient width so that said chain of bag elements can be mounted in a curtain-and-rod-like fashion by means of said loops.

3. A chain of connected bag elements which when strung out defines a longitudinal axis, said bag elements including first and second opposed wall portions and being arranged in said chain in side-by-side relationship, a separate continuous strip of material connecting together said bag elements and extending parallel along said longitudinal axis, said strip secured together along one longitudinal edge thereof with said first wall portion, and topwise folded over and secured together along the opposite longitudinal edge thereof with said second wall portion the channel definite by said loop being continuous and communicating with the interiors of said bag elements, said channel being of sufficient size for mounting said bag elements in curtain-and-rod-like fashion.

4. In a chain of containers of the general type connected together to permit continuous feed of the containers to filling apparatus, the containers being successively fillable at the top ends thereof between opposed portions of material forming the containers, the improvement which comprises, material substantially closing said top ends and joined together along its opposite longitudinal edges with said opposed portions, respectively, the longitudinally extending central portion of said material defining a noninterrupted guide channel of sufficient width to permit mounting of said chain in a curtain-and-rod-like fashion.

5. The containers of claim **4** wherein said containers comprise connected bag elements.

6. The containers of claim **5** wherein a line of weakness is located in the connected region between successive bag elements in said chain.

7. The containers of claim **5** wherein said bag elements include a gusset, a let of said gusset comprising said loop structure.

8. The containers of claim **7** wherein said leg is offset beyond the opposite leg of said gusset.

9. The containers of claim **5** wherein said bag elements include gussets extending along the opposite sides thereof, respectively, said loop structure being located adjacent a common end of each of said bag elements, respectively.

10. The bag elements of claim **5** wherein said bag elements comprise at least two layers of material, at least one of said layers comprising material porous to the passage of air, said bag elements including means to permit air to pass from the interior of said bag elements through said porous layer and to the space exterior of the bag elements.

11 the bag elements of claim 10 wherein said porous layer comprises the innermost layer of said bag elements, and wherein said means comprises apertures formed in a layer of said bag elements exterior to said innermost layer.

12 In containers of the general type including opposite side and opposed portions of material extending between its opposite sides such that the containers are fillable through the area between the opposed portions, and wherein the containers are side-by-side connected together to form a chain of containers, the improvement which comprises, and open ended loop associated with the top end of each container and comprising material extending between and joined together with said opposed portions, respectively, said loops being of sufficient size for mounting said containers in a curtain-and-rod-like fashion, the channel defined collectively by said loops being uninterrupted along the longitudinally extending central region of the loops so that said central region is slip slittable longitudinally to form freely spreadable flaps of generally equal height between which said containers can be progressively filled.

13 The containers of claim 12 wherein said containers comprise bag elements.

14. The containers of claim 13 wherein the material comprising said loop is continuous.

15 A chain of containers connected together in successive fashion, said chain including a tunnel extending longitudinally thereon, the channel defined by said tunnel communicating from container to container and further communicating with the interior of said containers said channel extending longitudinally contiguous with an upper longitudinal edge of said chain so that said tunnel is slittable longitudinally generally along the midregion thereof to form freely spreadably flap portions of generally equal height between which the containers can be progressively filled, said channel being of sufficient size for mounting said containers in a curtain-and-rod-like manner.

16. The containers of claim 15 wherein said containers comprise bag elements.

17. The containers of claim 16 wherein said tunnel includes cutout portions whereby said tunnel is divided into segments associated with said containers, respectively.

18. The containers of claim 17 wherein a strip of material connects between successive tunnel segments in said chain.

19. The bag elements of claim 5 wherein at least a portion of said loop structure is of less thickness that than a region of said bag elements remote therefrom.

20. The bag elements of claim 7 wherein said loop is parted and comprised comprises freely spreadably flaps.

21. The bag elements of claim 9 wherein said loop is parted and comprises freely spreadably flaps.

22. The bag elements of claim 19 wherein said loop is parted and comprises freely spreadable flaps.

23. The bag elements of claim 10 wherein said loop is parted and comprises freely spreadably flaps.