United States Patent [19]

Membrino

[11] **3,751,875**

[45] **Aug. 14, 1973**

[54] **APPARATUS FOR FILLING, SEALING AND DISPENSING BAGS**

[76] Inventor: **Hercules Membrino,** 1934 Arch St., Philadelphia, Pa.

[22] Filed: **Sept. 9, 1971**

[21] Appl. No.: **178,908**

[52] **U.S. Cl.** **53/180,** 53/183
[51] **Int. Cl.** **B65b 9/08,** B65b 43/12
[58] **Field of Search** 53/28, 29, 37, 178–180, 53/182, 183, 186, 187

[56] **References Cited**

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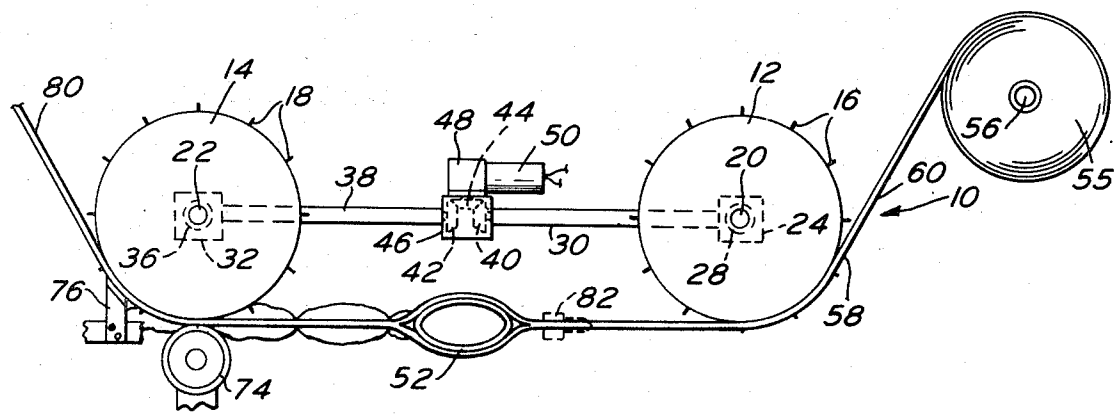
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Primary Examiner—Robert L. Spruill
Attorney—Arthur A. Jacobs

[57] **ABSTRACT**

A process and apparatus for filling, sealing and dispensing bags from a strip of interconnected bags which comprises moving the strip of bags from a supply roll along a path to at least one, but, preferably, two sprocket wheels. The strip of bags is provided with spaced sprocket apertures in a selvage portion along the edge corresponding to the open mouths of the bags, and these apertures are engaged by the sprockets on the sprocket wheels to move the strip of bags linearly at predetermined intervals. As the individual bags are brought into conjunction with a feed means, such as a chute or the like, they are filled, and are then moved through sealing and severing stations where the open mouths are sealed and the sealed bags are either totally severed from the selvage portion or are provided with scored or perforated lines to permit them to be thereafter severed from the selvage portion.

8 Claims, 16 Drawing Figures



Patented Aug. 14, 1973 3,751,875

5 Sheets-Sheet 1

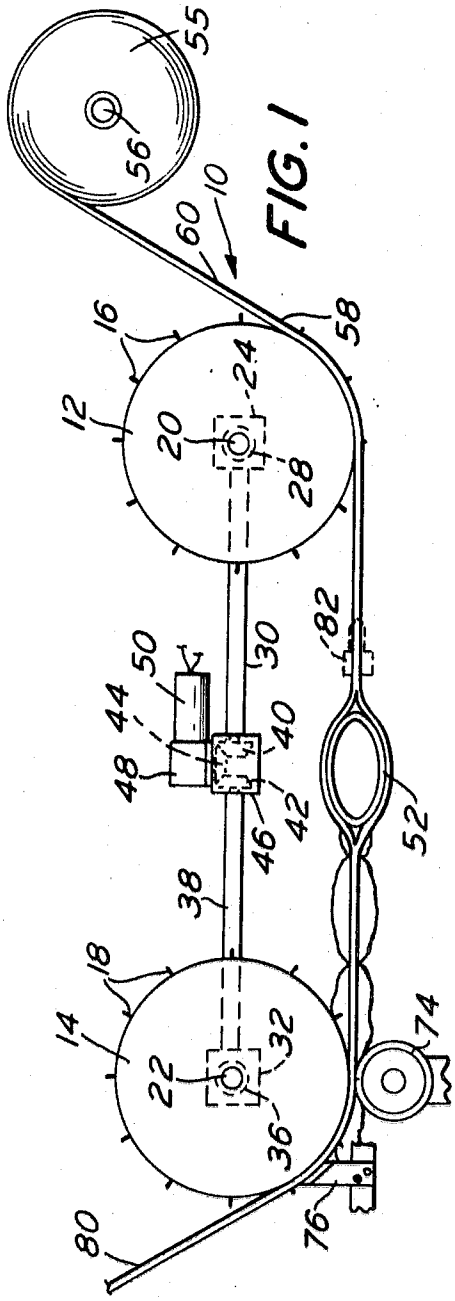


FIG. 1

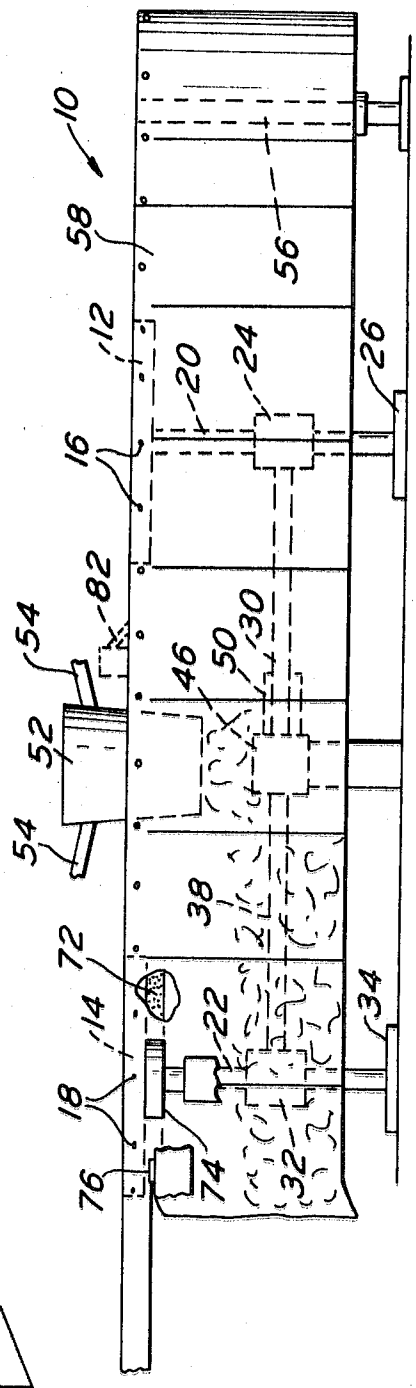


FIG. 2

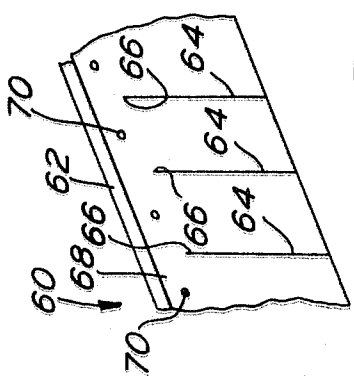


FIG. 3

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FIG. 4

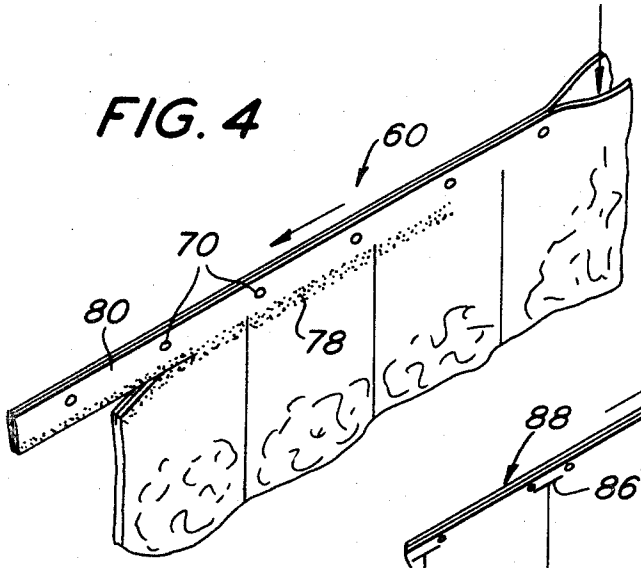


FIG. 7

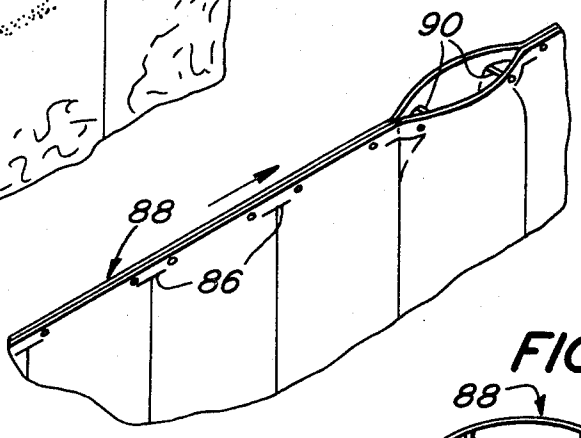


FIG. 8

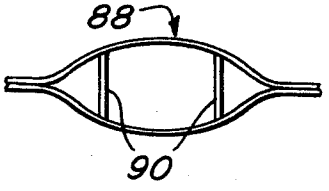


FIG. 5

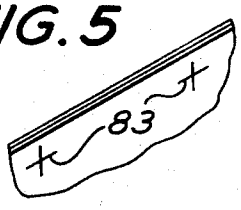
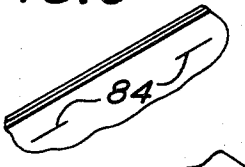


FIG. 6



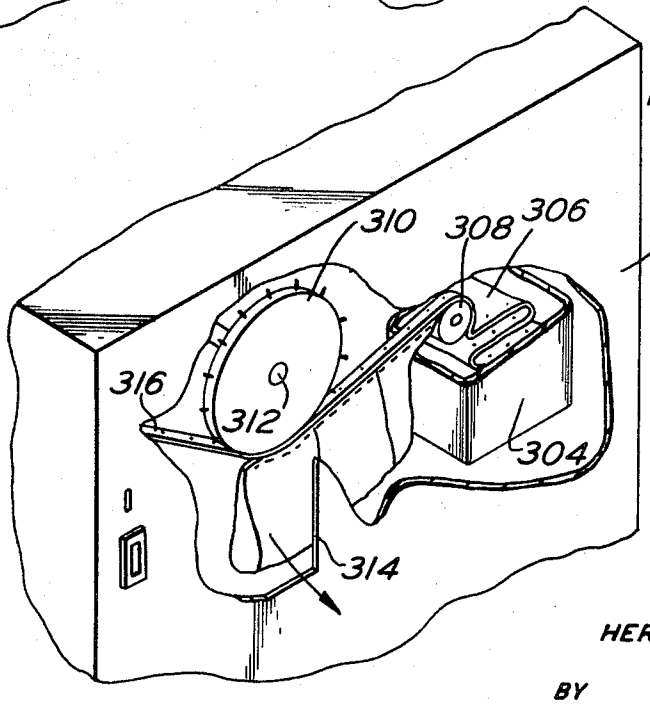


FIG. 13

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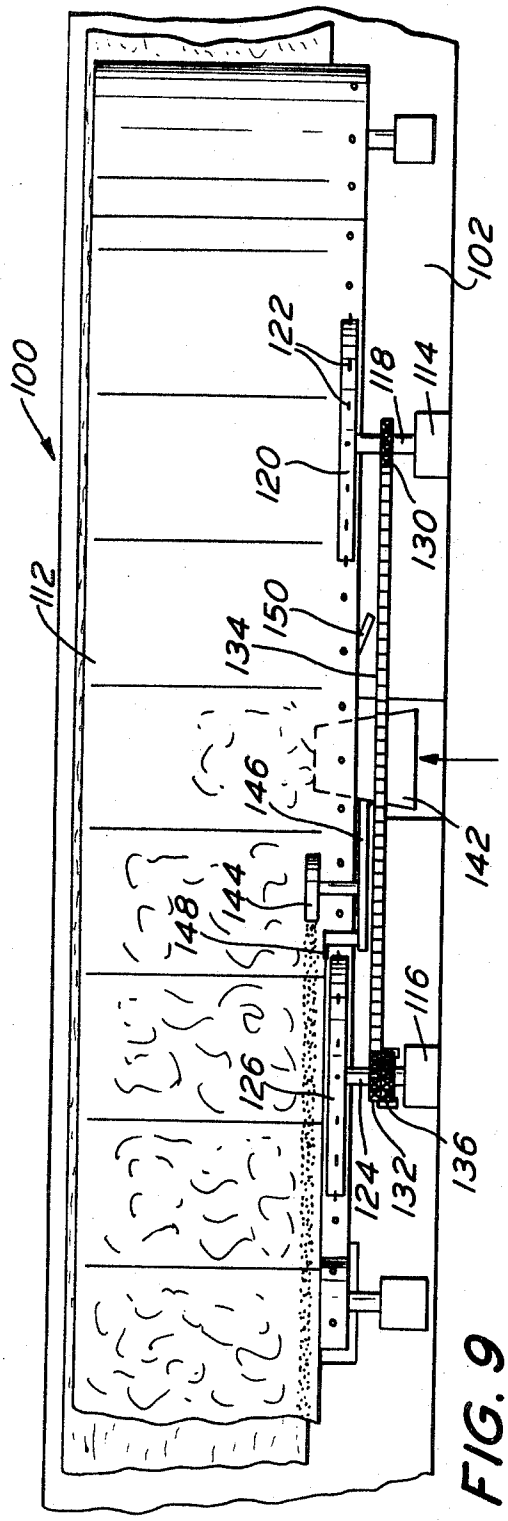


FIG. 9

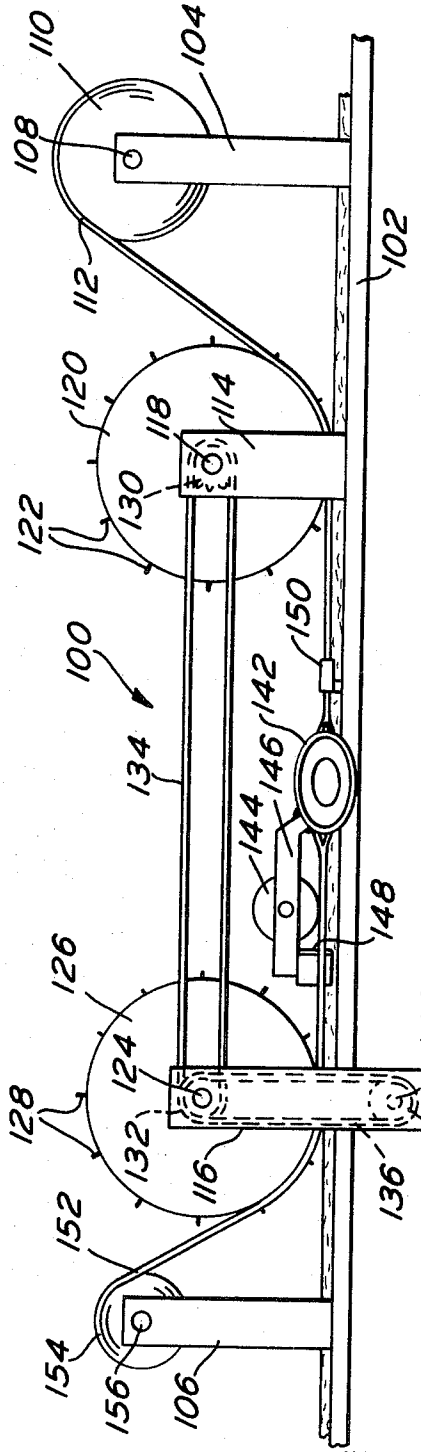


FIG. 10

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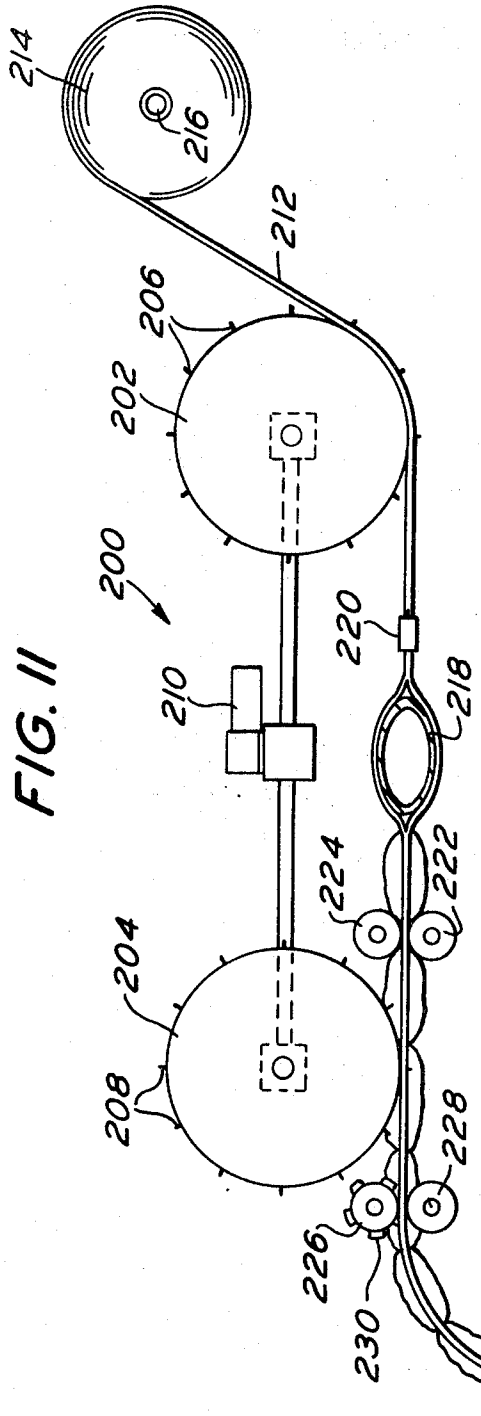


FIG. 11

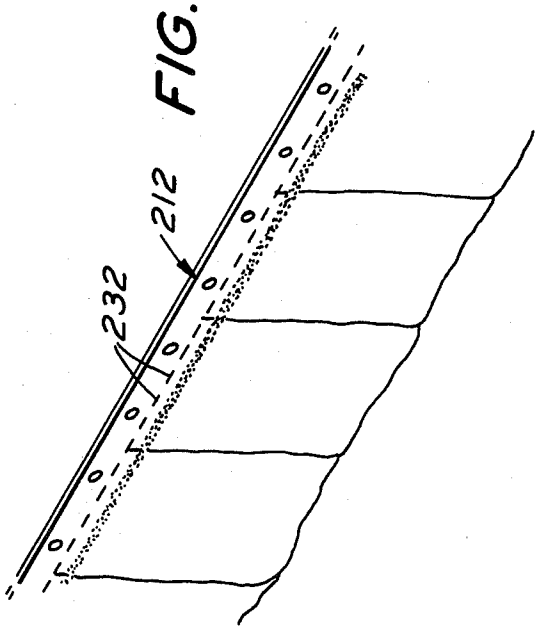


FIG. 12

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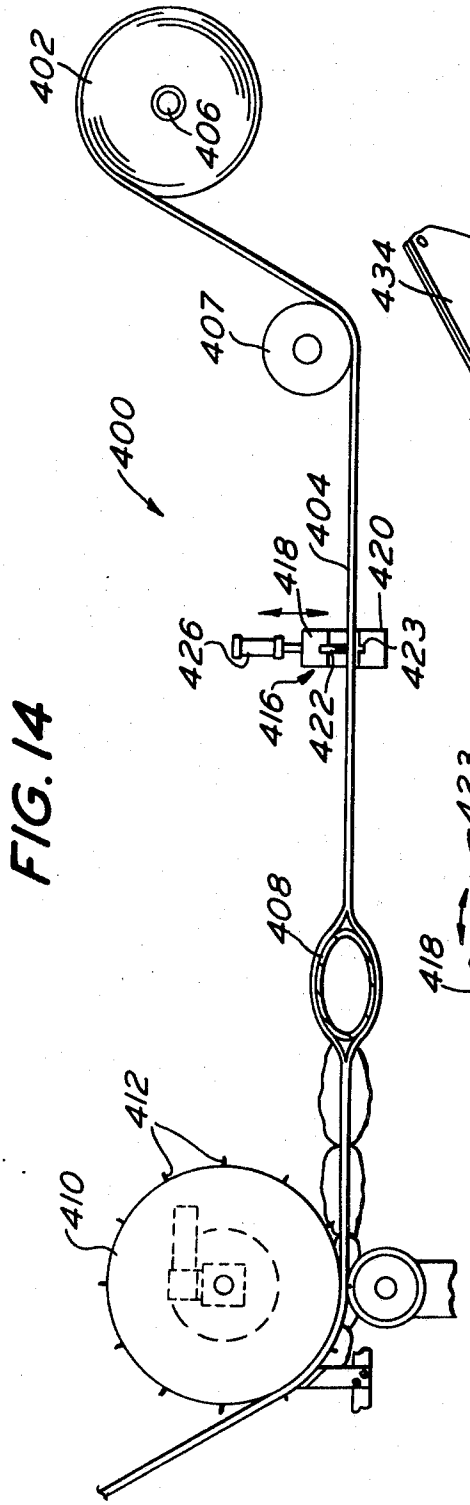


FIG. 14

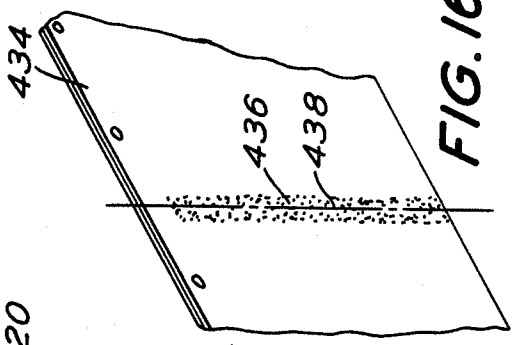


FIG. 16

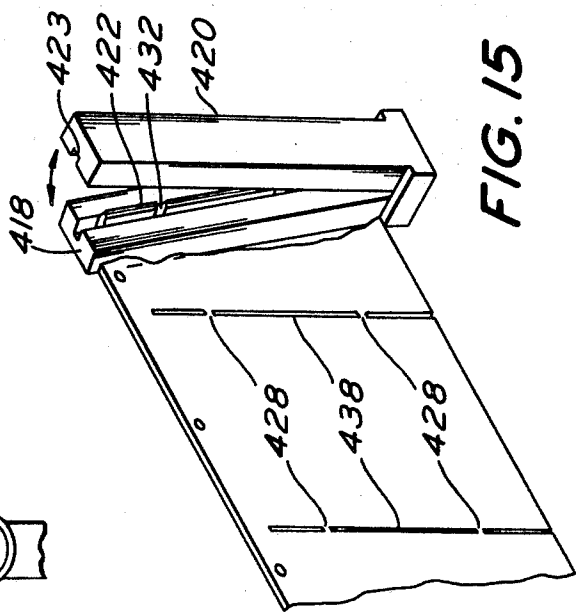


FIG. 15

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APPARATUS FOR FILLING, SEALING AND DISPENSING BAGS

This invention relates to a method and apparatus for filling, sealing and dispensing bags, and it particularly relates to such processing of bags which are initially connected in strips.

An important commercial feature of today's economy is the packaging of products, either in liquid, powdered or solid form, in inexpensive, throw-away type bags. Such bags may be constructed of a variety of different types of materials such as paper, regenerated cellulose, thermoplastics such as polyethylene, polypropylene, polyvinyl alcohol, etc., metal foil, laminates of one or more of the aforementioned materials, and various other materials which may be feasible for a particular utility.

In addition to the necessity that these bags be relatively inexpensive and easy to produce in large quantities, it is also necessary that they be capable of being easily, rapidly and inexpensively filled and sealed. Although various processes and mechanisms have, heretofore, been proposed for this purpose, and although some of such processes and mechanisms have proved to be a considerable improvement over earlier ones, it is, nevertheless, still important that a process and apparatus be provided which is not only more economical and more efficient than those heretofore known, but which is capable of being used with bags of any type material and construction.

Another problem inherent in prior bag filling and sealing machines was their use in conjunction with preprinted bags. Since the bag material generally has some stretchability, and there is otherwise a tendency to wander, there was a problem of proper alignment of each bag with the filling and sealing means so that the printing would be centered. In order to accomplish this, it was necessary to use expensive and complicated electric eye mechanisms to compensate for such displacement

Filling of bags of the present type is usually accomplished while the strip of bags hangs down so that the filler can most easily be inserted by gravity feed. However, when the filler was relatively heavy, in prior systems, the bags often tore loose under the weight of the filler.

It is one object of the present invention to provide a process and apparatus which is capable of operating on all feasible types of bag materials, either of single ply wall construction or laminated wall construction.

Another object of the present invention is to provide a process and apparatus of the aforesaid type which is capable of maintaining pre-printed bags in correct position while being filled and sealed, without the use of electric eye or similar mechanisms.

Another object of the present invention is to provide a process and apparatus of the aforesaid type which is capable of firmly supporting the bags during filling and sealing.

Another object of the present invention is to provide a process and apparatus of the aforesaid type which is capable of producing filled and sealed bags in condition for easy dispensing, as from a vending machine.

Another object of the present invention is to provide a process and apparatus of the aforesaid type which is capable of completing the forming of the bags as well as filling and sealing them.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a top plan view of an apparatus embodying the present invention, this apparatus being adapted to operate on a strip of hanging bags.

FIG. 2 is a side elevational view of the apparatus shown in FIG. 1.

FIG. 3 is a fragmentary, perspective view of a strip of bags formed from flat sheet stock material.

FIG. 4 is a fragmentary, perspective view showing the bags after being filled and sealed but prior to being separated from the connecting strip.

FIGS. 5 and 6 are fragmentary, perspective views showing alternative forms of sprocket apertures.

FIG. 7 is a fragmentary, perspective view showing a modified form of strip of bags, the bags being shown prior to filling and sealing.

FIG. 8 is a top plan view showing the mouth of the opened bag of FIG. 7.

FIG. 9 is a top plan view showing an alternative embodiment of the invention wherein the strip of bags is in a horizontal position while being filled and sealed.

FIG. 10 is a side elevational view of the apparatus shown in FIG. 9.

FIG. 11 is a top plan view of an apparatus similar to that shown in FIG. 1 but used for maintaining the filled and sealed bags in a connected strip.

FIG. 12 is a fragmentary, perspective view of the strip of bags used with the apparatus of FIG. 11.

FIG. 13 is a view of a vending device, with the housing partly broken away to show the bag vending mechanism.

FIG. 14 is a top plan view of another alternative embodiment of the invention wherein the bags are formed just prior to filling.

FIG. 15 is an elevational view of the sealing and severing means used with the apparatus of FIG. 14.

FIG. 16 is a fragmentary, side elevational view of a strip of bags which have been pre-sealed at the sides but are adapted to be at least partially severed from each other during processing by the apparatus of FIG. 14.

Referring now in greater detail to the various figures of the drawings wherein similar reference characters refer to similar parts, there is shown in FIGS. 1 and 2 a bag filling and sealing apparatus, generally designated 10, comprising a pair of sprocket wheels 12 and 14 provided with radially extending, equidistantly-spaced sprocket pins, as at 16 and 18. The sprocket wheel 12 is mounted on a rotatable shaft 20 and the sprocket wheel 14 is mounted on a similar rotatable shaft 22. The shaft 20 extends into a gear box 24, mounted on a pedestal 26, and is provided with a bevel gear 28 that meshes with a bevel gear (not shown) on the corresponding end of a drive shaft 30. Similarly, the shaft 22 extends into a gear box 32 mounted on a pedestal 34, and is provided with a bevel gear 36 that meshes with a bevel gear (not shown) on the corresponding end of a drive shaft 38. The inner ends of the drive shafts 30 and 38 are provided with bevel gears, indicated respectively at 40 and 42, and these gears mesh with a bevel gear 44 within a gear box 46. The bevel gear 44 is mounted on a shaft (not shown) which is connected by standard gearing (not shown), within a gear box 48, to

the motor shaft of an electric motor **50**. The motor **50** is connected to a timer means (not shown) of standard construction, which acts to start and stop the motor at timed intervals corresponding to a desired dwell time of the bags under a feed chute **52** which is mounted on any type of support means desired as, for example, by brackets indicated at **54**.

The bags to be filled and sealed are wound in a roll **55** on a spool **56**, and constitute a strip of bags **58**, made of thermoplastic material, wherein the bags are connected together. The individual bags may be formed from either tubular or overlapped flat sheet stock. As illustrated in FIG. **3**, the strip of bags **60** is formed from flat sheet stock; the individual bag units having been formed from an overlapped thermoplastic sheet of polyethylene or the like, having an open top **62**, by heat sealing and simultaneously severing the bags from each other, as indicated at **64**, by means of a heated wire or knife. This heat sealing and severing action retains a sealed nip **66** at the upper end of such severance, and these nips **66** act both as connecting means and as means to separate the upper ends of the bags from each other.

The strip of bags **60** has an upper connecting area **68** which is provided with a series of spaced apertures **70**. This area **68** constitutes what will thereafter become the selvage strip (hereinafter described). One such aperture **70** is shown for each bag unit, but any number of apertures may be provided for each bag unit as desired. However, it is important that the spacing between the apertures for the series of bag units be of a predetermined equidistant length because these apertures **70** act as sprocket holes and, thereby, determine the length of travel of the individual bag units and their relationship to both the filling device and the sealing device.

The sprocket wheel **14** is additionally provided with a lower peripheral portion **72** constructed of a heat resistant material such as Teflon or any other desirable or feasible heat resistant substance. Coacting with this peripheral surface **72** is a heated sealing roller **74**. The roller **74** may be heated in any desirable manner, such as by incorporating therein an electrical resistance means (not shown) connected to a source of electrical energy (not shown); such heating arrangement being of a standard type. The heated roller **74** may be an idler roller rotated by movement of the strip of bags or it may be rotated in timed relationship with the sprocket wheels **12** and **14** by the motor **50**, to which it may be operatively connected by standard means (not shown).

Downstream from the roller **74** and also in contact with the peripheral area **72** is a blade **76**. If desired, a rotatable knife may be substituted for the blade **76**, such rotatable knife also being operatively connected to the motor **50**.

In operation, the strip of bags **60** is fed from the spool **56** by the sprocket wheels **12** and **14**, the sprocket pins **16** and **18** engaging in the apertures **70** of the strip. The motor **50** is timed to stop for dwell periods of predetermined duration, during which successive bag units encompass the lower portion of the chute **52**. The filler substance is dropped through the chute, either manually or by any standard type feeder means (not shown) into the underlying bag unit, which then is moved into engagment with the sprocket wheel **14**. The heated roller **74** engages that portion of the strip which lies under the sprocket holes **70** and is in contact with peripheral portion **72**, and forms a seal, as indicated at **78** in FIG. **4**. Then, as the strip continues to move, it is engaged by the blade **76** which slices through the sealed area **78**, thereby severing the individual sealed bag units from the selvage strip **80**. The selvage strip **80** is carried onto a spool, or the like (not shown) to be discarded or otherwise disposed of, while the bags are collected in a bin or the like (not shown).

The apparatus has been described as used in conjunction with overlapped sheet stock bags where the upper end is already open. If tubular stock is used, a blade, indicated as an optional feature at **82**, is provided to slit the upper end of the bag strip prior to movement thereof under the chute **52**.

The sprocket apertures, although shown as round holes at **70**, may be constructed in other manners. For example, in FIG. **5**, there is illustrated a sprocket aperture **83** formed by making crossed slits. In FIG. **6**, the apertures **84** constitute single longitudinal slits.

Sometimes, it is desirable to square-off the mouths of the individual bags in order to obtain a wider filling opening. This may be accomplished in the manner illustrated in FIGS. **7** and **8**. As shown in FIG. **7**, a series of spaced slits **86** are formed so that each slit bridges the adjacent bag units of bag strip **88**, just below the sprocket holes. When the bag units are pulled out laterally, the slitted areas stretch out to form opposing side walls, as at **90**.

In FIGS. **1** and **2**, an apparatus was described for filling and sealing bags which are hanging vertically. In some instances, it is preferable to fill and seal the bags while they are supported, in the horizontal position, on a flat surface. An apparatus for accomplishing this is illustrated in FIGS. **9** and **10**.

FIGS. **9** and **10** show an apparatus, generally designated **100**, comprising a flat table **102** which supports two spaced, opposed pedestals **104** and **106**, one adjacent each end of the table. The pedestal **104** is provided with a spool **108** around which is wound a roll **110** of a strip of bags **112** similar to the strip of bags shown at **60**. A pair of spaced standards **114** and **116** are positioned between the pedestals **104** and **106**. The standard **114** supports a rotatable spindle **118** upon which is mounted a sprocket wheel **120** having a plurality of equidistantly-spaced sprocket pins **122** on its peripheral surface. The standard **116** supports a rotatable spindle **124** upon which is mounted a sprocket wheel **126** having a plurality of equidistantly-spaced sprocket pins **128** on its peripheral surface.

Although this apparatus may be driven by the same type of gearing illustrated in FIGS. **1** and **2**, an alternative chain drive mechanism is illustrated. This mechanism comprises a sprocket **130** mounted on the spindle **118** and a sprocket **132** mounted on the spindle **124**. An endless chain **134** extends around the sprockets **130** and **132**. The chain **134** is driven by a drive means comprising an endless chain **136** mounted on spindle **124** and extending around a sprocket **138** mounted on a motor shaft **140** connected to an electrical motor (not shown) similar to motor **50**.

The strip of bags **112** moves from roll **110** under the sprocket wheel **120** and along the flat table **102**. The strip encompasses the outlet portion of a filling means **142** during the movement and then passes under a heated sealing roller **144** similar to roller **74** but arranged with its radial plane in the horizontal direction. The roller **144** is rotatably mounted on an arm **146** sup-

ported by the filling means **142**, and bears against the strip of bags while the table **102** acts as an anvil. The table **102**, at least in the area of the roller **144**, is constructed of, or is covered with, heat resistant material.

Also mounted on the arm **146** is a blade **148** which serves the same purpose as the blade **76**, and which may also, if so desired, be substituted by a rotary knife.

If tubular stock is used, a blade, indicated at **150**, may be provided to slit the strip prior to its movement past the filling means **142**.

After the successive bags are filled and sealed, and the selvage strip **152** is severed therefrom, the selvage strip is wound up into a roll **154** on spool **156**, for disposal, while the filled and sealed bags are removed either manually or by any feasible mechanical means such as a belt conveyor or the like (not shown).

Since the filling is accomplished in a horizontal direction, instead of a gravity feed such as may be used with chute **52**, the preferable feeding means is either manual insertion or a conventional type ram or pusher means (not shown).

In many instances, especially where it is desired to use the filled and sealed bags in a vending machine or the like, it is preferable to keep the filled and sealed bags linked together rather than separating them. In FIGS. **11** and **12** an apparatus is illustrated for filling and sealing such linked bags.

The apparatus shown in FIG. **11** is generally designated **200**, and comprises a pair of spaced sprocket wheels **202** and **204**, similar to those shown in FIGS. **1** and **2**, and each provided with sprocket pins, as at **206** and **208** respectively. These sprocket wheels **202** and **204** are synchronously driven by an electric motor **210**, similar to motor **50**, through a gearing system identical to that shown in FIGS. **1** and **2**, and, therefore, not further described here.

The strip of bags **212** moves from a roll **214**, mounted on a spool **216**, by means of the sprockets **202** and **204**, in similar manner to that shown and described in FIGS. **1** and **2**. This apparatus is similarly provided with a chute **218** similar to chute **52**, as well as with an optional blade **220** in the event tubular material is used.

The strip of bags **212** is similar to the strip **60** and is sealed, after filling, by means of a pair of rollers **222** and **224**, the roller **222** being a heated roller, similar to roller **74**, while the roller **224** acts as a back-up roller. After sealing, the sprocket **204** moves the strip between a pair of rollers **226** and **228**. The roller **226** is provided with radially extending, spaced teeth **230**, and these teeth act to score the strip as it moves between these rollers; the roller **228** acting as a back-up roller. The scores are illustrated at **232** in FIG. **12**.

By this means, the bags, although filled and sealed, are still held in the strip by means of the unscored portions. The rollers **226** and **228**, which are preferably driven in timed relationship with the sprocket **204**, also act as conveyor means to move the strip of filled and sealed bags into a bin or the like shown at **234**.

FIG. **13** illustrates the use of linked bags, such as provided by the apparatus of FIGS. **11** and **12**, in a vending machine. The vending machine is indicated generally at **300** and includes a housing **302**. Within the housing **302** is provided a removable and replaceable bin **304** similar to that shown at **234** and loaded with a strip of filled and sealed bags indicated at **306**. A guide roll **308** is provided in the machine for the purpose of guiding the strip of bags toward the sprocket wheel **310** mounted on a spindle **312** within the housing. The sprocket wheel **310** is provided with radially extending sprocket pins **314** on its periphery for the purpose of engaging the sprocket holes in the strip. An electric motor (not shown) is operatively connected to the spindle **312** for rotating it a predetermined distance as measured by the width of a bag. The motor is actuated by a coin or the like through a mechanism (not shown) which may be of any standard type generally used in such vending machines, but generally including a normally open, solenoid-operated, microswitch actuated by the coin to momentarily close the circuit and actuate the motor.

As the linked bags are moved by the sprocket wheel **310**, they successively come within the aperture formed by an open window **314**. The purchaser then reaches through the window and pulls off the bag along the perforated line. The selvage strip **316** is pulled around a spool (not shown) within the housing **302** for later disposal.

Instead of the bin **304**, a supply spool on which the bag strip is wound, or any other supply means, may be used.

In FIGS. **14**, **15** and **16**, there is shown a modification of the invention whereby the apparatus is capable of not only filling and sealing the bags but also of initially forming the bags from the raw stock, either tubular or flat sheet stock. This apparatus, generally designated **400**, comprises a roll **402** of overlapped, flat sheet stock **404**, the roll being mounted on a spool **406**. The sheet stock **404**, in the form of a strip, is moved from the roll **402** over an idler roller **406**, past chute **408** and around a sprocket wheel **410**, which is similar to sprocket wheels **12** and **14** and has sprocket pins **412**. The apparatus is constructed and functions similarly to that illustrated in FIGS. **1** and **2** except that, prior to the strip contacting the filling chute and the sprocket wheel **410**, the strip is transversely severed and sealed to form bag units, such as shown in FIG. **3**, by means of a sealing unit **416** (best shown in FIG. **15**). The idler roller **407** is illustrated without sprocket pins but may, if desired, also be provided with sprocket pins to engage with the sprocket apertures in the strip.

The unit **416** comprises a pair of forming means **418** and **420**, which are pivoted to each other or otherwise movable relative to each other. The forming means **418** is provided with a blade **422** that is heated in any desired manner, as for example, by incorporating an electrical resistance element connected to a source of electrical energy (not shown). The other forming means **420** is provided with a groove **423** and is preferably not heated, but acts as a backing means or anvil. The forming means **418** is actuated by a solenoid **426** in timed relation with the rotation of sprocket wheel **410**.

In operation, as the strip **404** passes between the forming means **418** and **420**, these elements intermittently close together like a scissors to slit the strip and simultaneously weld the severed edges of the plies together to form slits similar to those shown at **64** in FIG. **3**.

It may sometimes be desirable to have connecting nips between the bag units. As shown in FIG. **15**, these nips are formed by unsealed and uncut areas **428** in the slits **438** between the bag units. These nips serve not only as connecting means but as vent-hole forming means, since, when they are broken, they leave holes in the sides of the bags corresponding to the size of the

unsealed nips. The unit **416** performs this function by providing one or more recesses **432** in the operative edge of blade **422.** These recesses are sufficiently deep to prevent welding heat from passing to the bag unit from the blade **422** when heated, or prevent cutting of the bag unit in those areas when the blade is not heated. However, these nip-forming recesses may be omitted when a complete severance, without nips, is required.

The above operation, of course, applies to thermoplastic strip material. However, the same general procedure may be used with strip material which has been provided with pre-sealed but not slitted sections. This is especially adapted for materials other than thermoplastic, or for laminated materials which have walls constructed with only one thermoplastic ply. Such material is shown in FIG. **16** where a two ply strip **434,** constructed of superinposed plies of polyethylene and paper, is pre-treated to form a sealed area **436,** between bag units. In this form of the invention neither blade **422** nor groove **423** is heated. When the area **436** is brought between the blade **422** and groove **423,** neither of which is heated, a slit **438** is formed. Since the area on either side of the slit is already sealed, this results in the formation of individual bag units.

The invention claimed is:

1. A bag filling and sealing apparatus comprising a supply means for a linearly movable double-ply, bag-forming, thermoplastic strip, said strip having a linear selvage portion along one edge with a linear series of sprocket apertures in said selvage portion, a sprocket wheel assembly spaced from said supply means, said sprocket wheel assembly and said supply means forming a linear path therebetween for said strip, said sprocket wheel assembly having at least one sprocket wheel provided with peripherally positioned, radially extending sprocket pins successively engageable with the sprocket apertures in said selvage portion in such manner that said selvage position is in surface-to-surface contact with and is movably supported by said sprocket wheel as said strip passes thereover, said sprocket wheel assembly forming the sole supporting and conveying means for said strip as it passes from said supply means, drive means operatively connected to said sprocket wheel assembly, a feed means interposed in the path of travel of said strip, said feed means being constructed and arranged to insert filler material into successive bag units formed in said strip, sealing means positioned downstream of said feed means, said sealing means being constructed and arranged to form a linear seal across said bag units below said linear series of sprocket apertures, and severance means constructed and arranged to at least partially sever the filled and sealed bag units from said selvage portion.

2. The apparatus of claim **1** wherein said severance means is a slicing means constructed and arranged to make a linear cut completely severing said selvage portion.

3. The apparatus of claim **1** wherein said severance means is a perforating means constructed and arranged to make a line of perforations between said selvage portion and said bag units.

4. The apparatus of claim **1** wherein forming means are provided, upstream from said sprocket wheel and from said feed means, for forming said bag units from an unformed strip of double ply material selected from the group consisting of over-folded flat sheet stock and tubular stock, said forming means comprising a pair of former elements relatively movable toward and against each other, at least one of said elements having a cutting blade, said forming means being so arranged in said path that a portion of said unformed strip passes between said former elements and is at least partially transversely severed thereby, and means actuating said forming means at timed intervals relative to the linear movement of said unformed strip.

5. The apparatus of claim **4** wherein at least one of said former elements is heated.

6. The apparatus of claim **1** wherein said sprocket wheel assembly comprises two sprocket wheels and said feed means is positioned in the path of travel of said strip between the two sprocket wheels.

7. The apparatus of claim **1** wherein said sealing means is a rotatable heated roller.

8. The apparatus of claim **6** wherein said second sprocket wheel is provided with a rotatable peripheral anvil portion coacting with said heated roller to form linear seal across said bag units as said bag units pass between said heated roller and said anvil portion.

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