US 20180312282A1

(19) **United States**

(12) **Patent Application Publication**

PETERSON et al.

(10) **Pub. No.: US 2018/0312282 A1**

(43) **Pub. Date: Nov. 1, 2018**

(54) **HORIZONTAL FORM-FILL-SEAL PACKAGING SYSTEM**

(71) Applicant: **ROLLSTOCK INC.**, Kansas City, MO (US)

(72) Inventors: **Todd PETERSON**, Kansas City, MO (US); **Mark TAYLOR**, Kansas City, MO (US)

(73) Assignee: **ROLLSTOCK INC.**, Kansas City, MO (US)

(21) Appl. No.: **15/963,607**

(22) Filed: **Apr. 26, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/491,585, filed on Apr. 28, 2017.

Publication Classification

(51) **Int. Cl.**

B65B 9/04	(2006.01)
B65B 41/16	(2006.01)
B65B 43/08	(2006.01)
B65B 47/02	(2006.01)
B65B 47/10	(2006.01)
B65B 51/10	(2006.01)
B65B 57/00	(2006.01)

(52) **U.S. Cl.**

CPC ***B65B 9/04*** (2013.01); ***B65B 41/16*** (2013.01); ***B65B 43/08*** (2013.01); ***B65B 57/00*** (2013.01); ***B65B 47/10*** (2013.01); ***B65B 51/10*** (2013.01); ***B65B 47/02*** (2013.01)

(57) **ABSTRACT**

A machine including a first film dispenser which dispenses a first film, a second film dispenser which dispenses a second film, a first form system configured to form a first shape in the first film, a second form system configured to form a second shape in the second film, and a seal system configured to join the first film to the second film after the first shape is formed in the first film and the second shape is formed in the second film, wherein the first form system includes a bucket configured to hold a forming plate and a form head configured to form a cavity between the form head and the bucket that receives the first film.

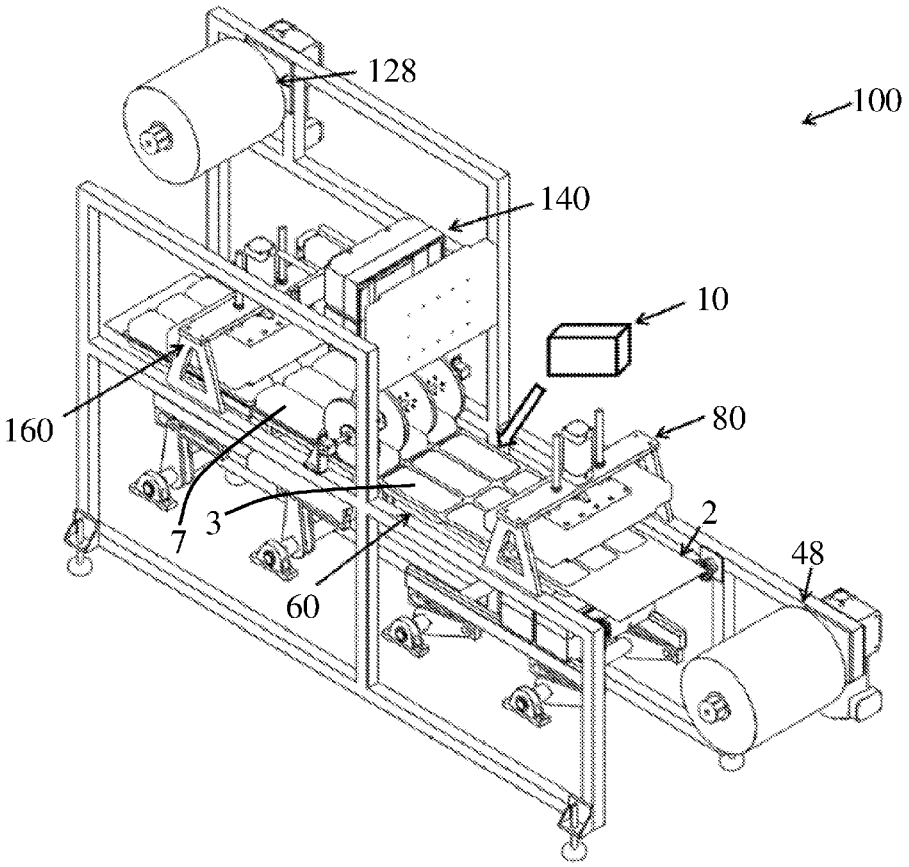


FIG. 1

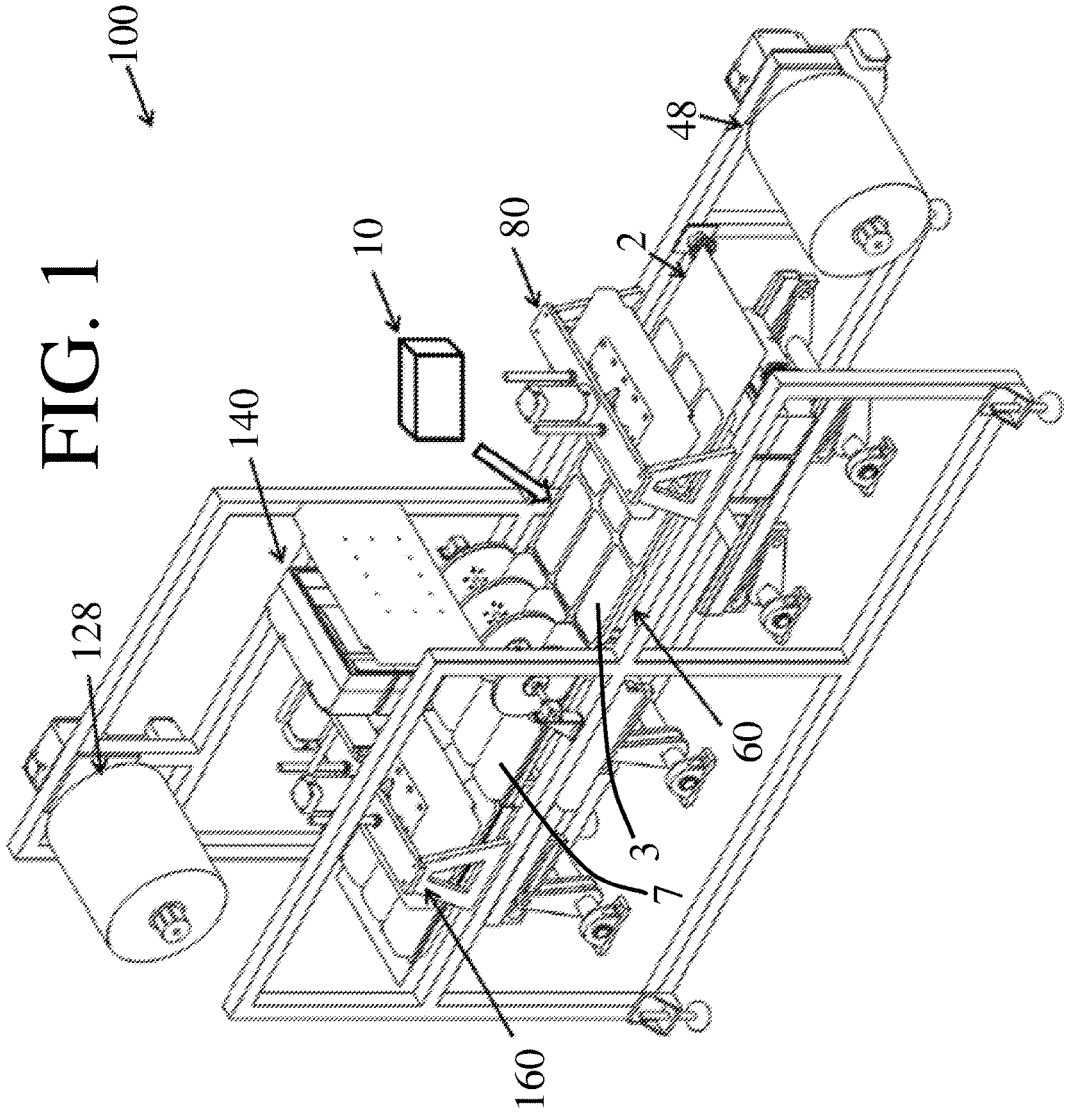
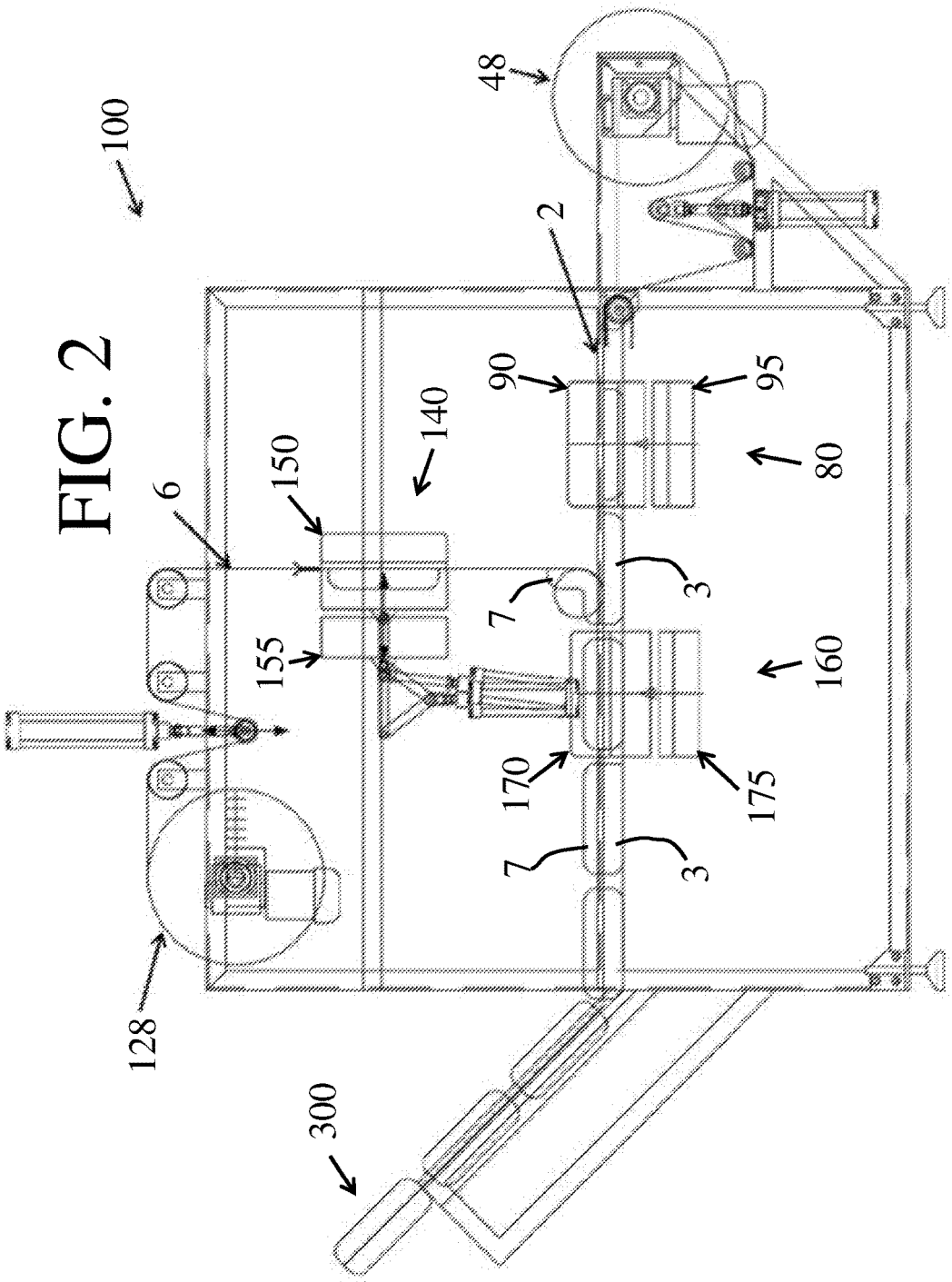


FIG. 2



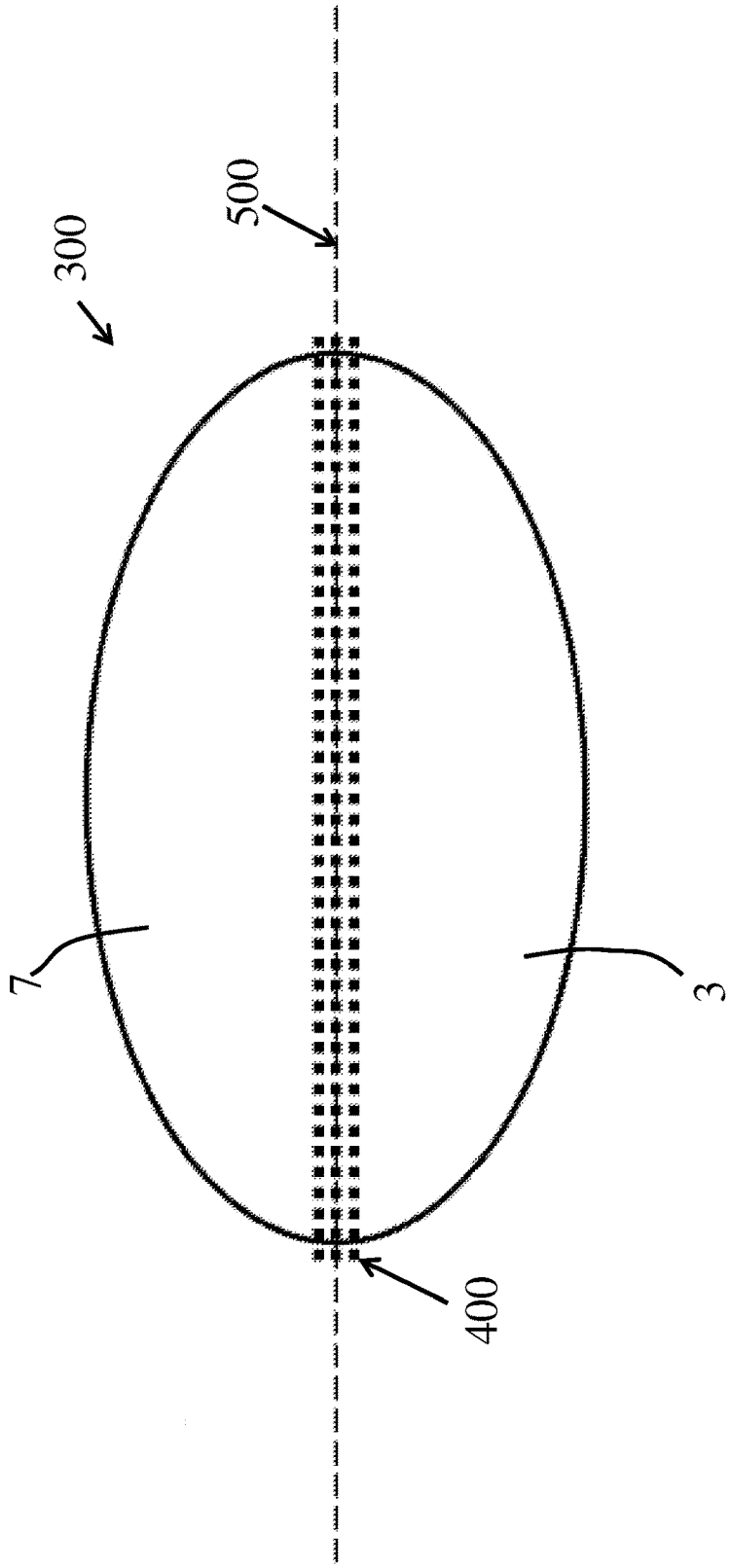
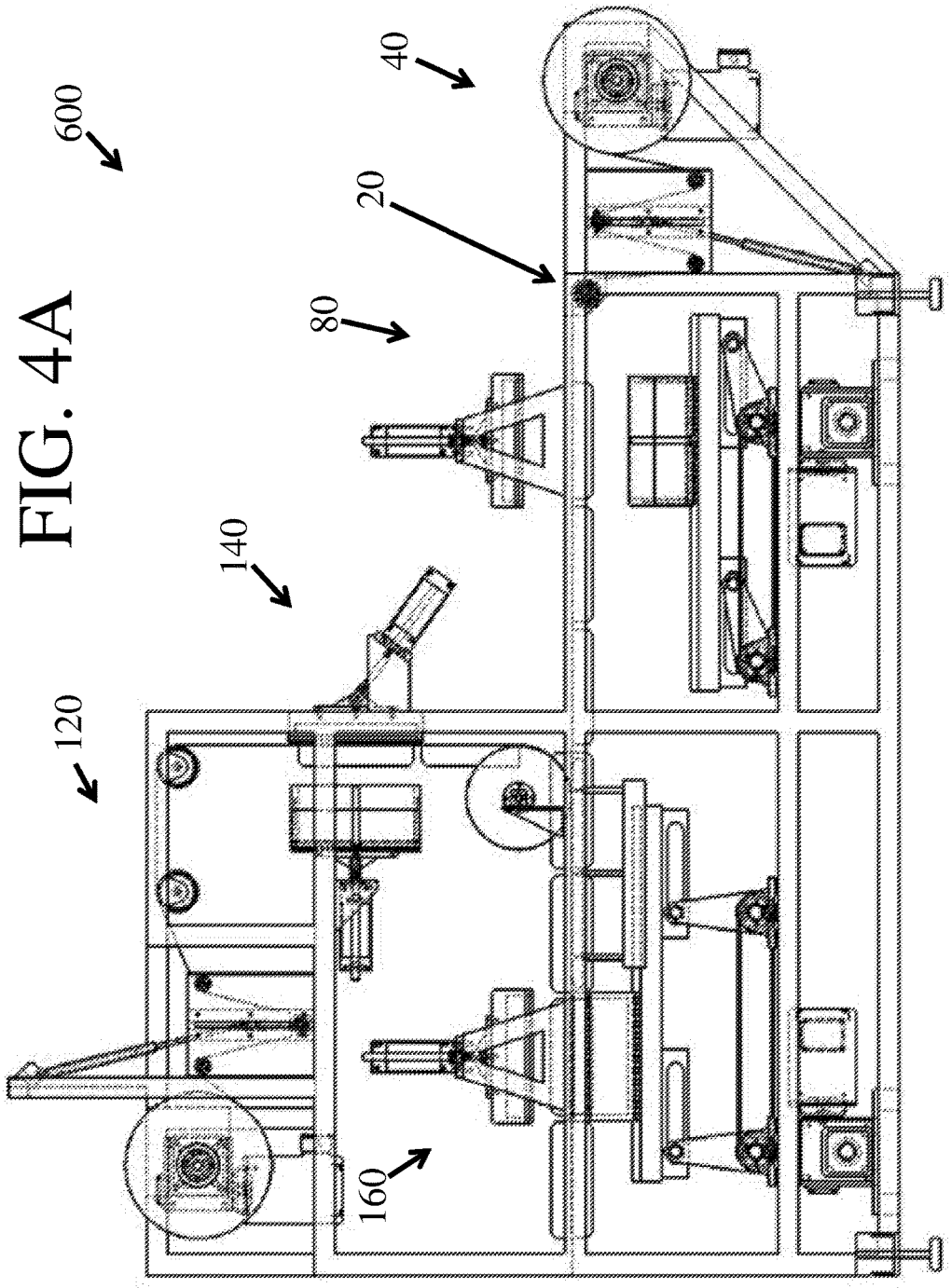


FIG. 3

FIG. 4A



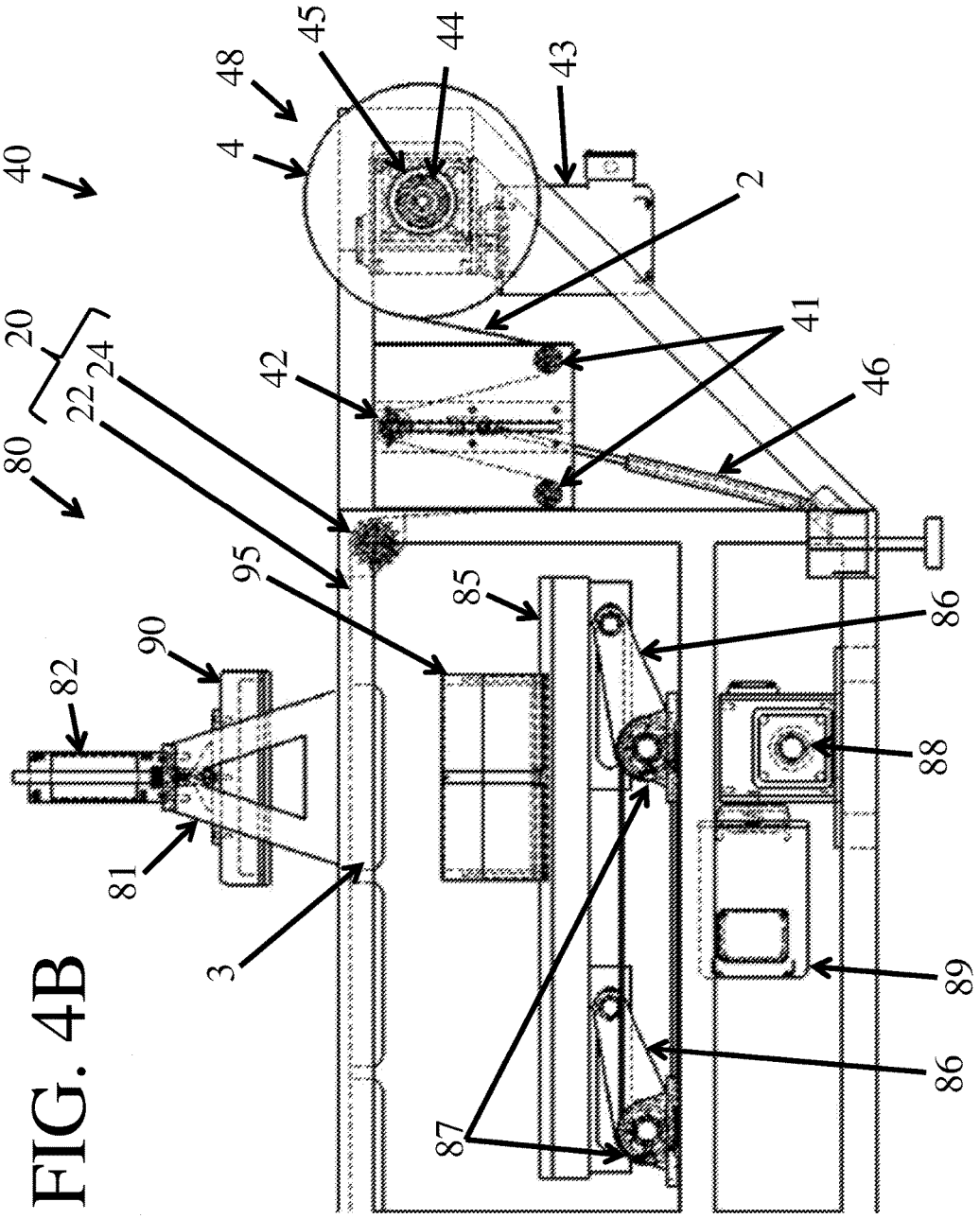
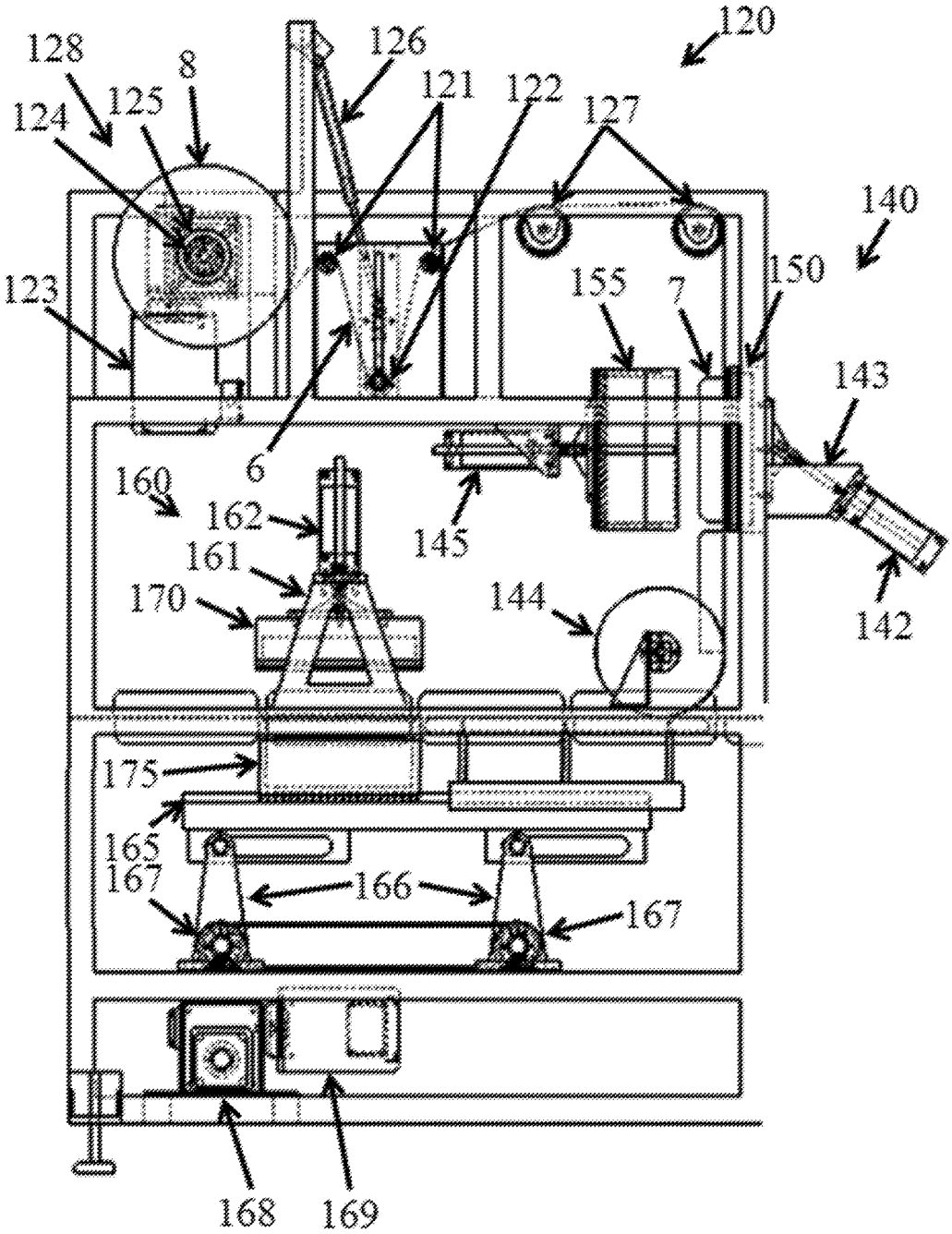


FIG. 4B

FIG. 4C


120
128
8
126
124
125
121
122
127
140
123
155
7
150
143
6
160
162
145
161
170
144
142
175
165
167
166
167
168
169

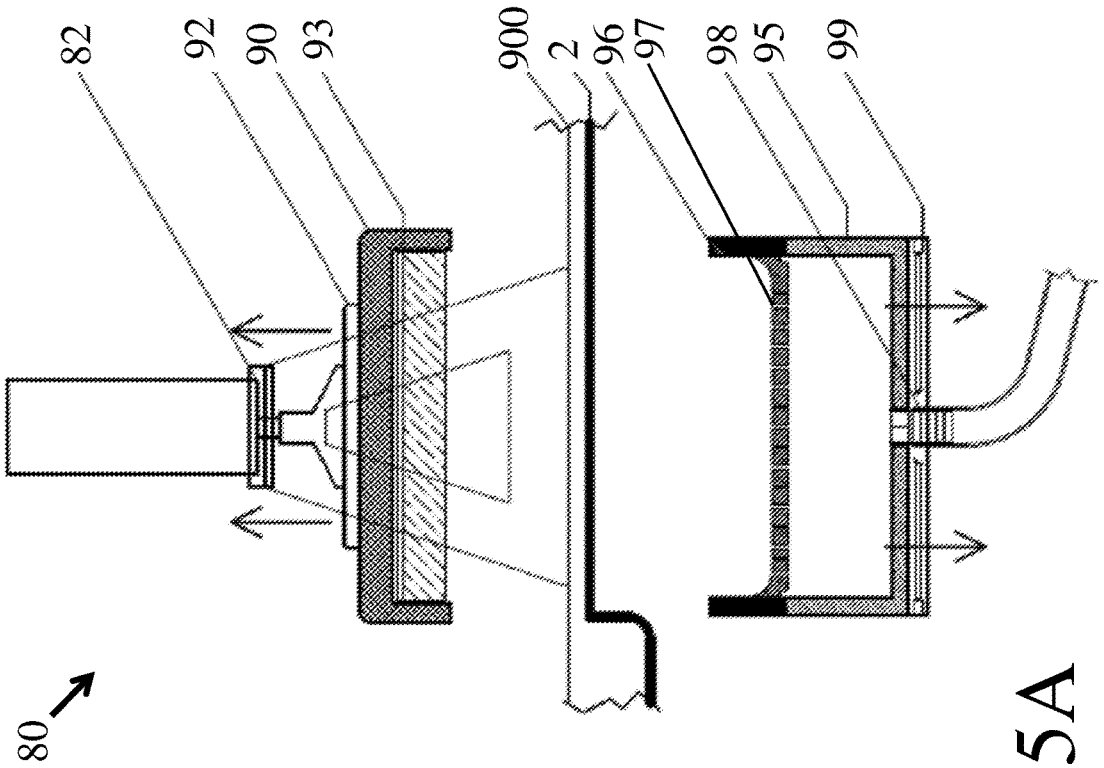


FIG. 5A

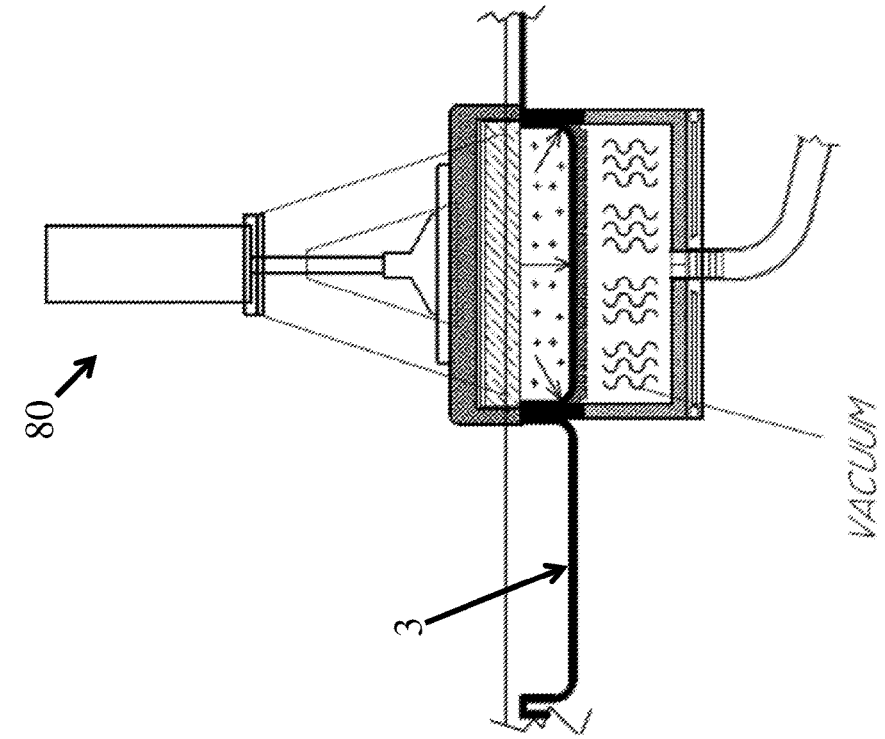


FIG. 5C

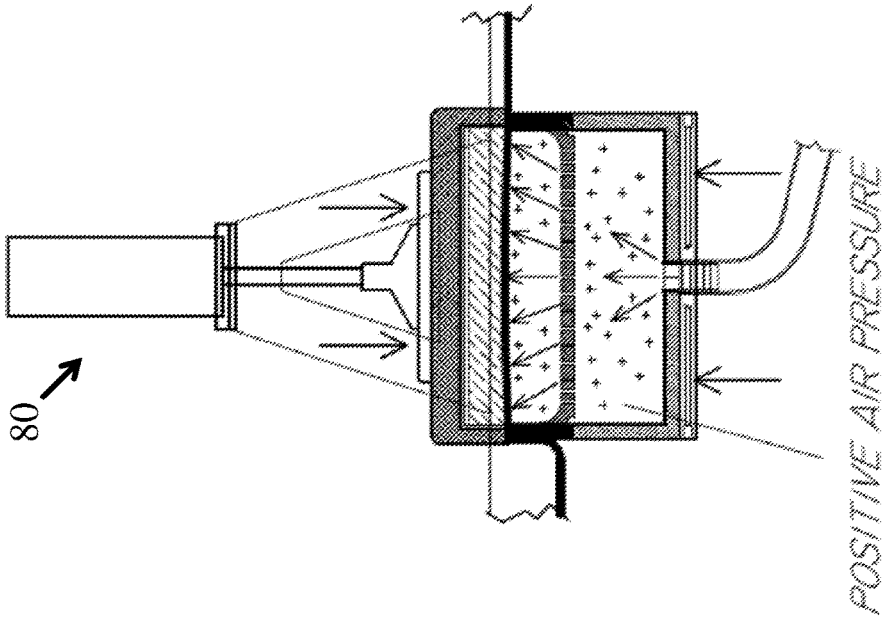
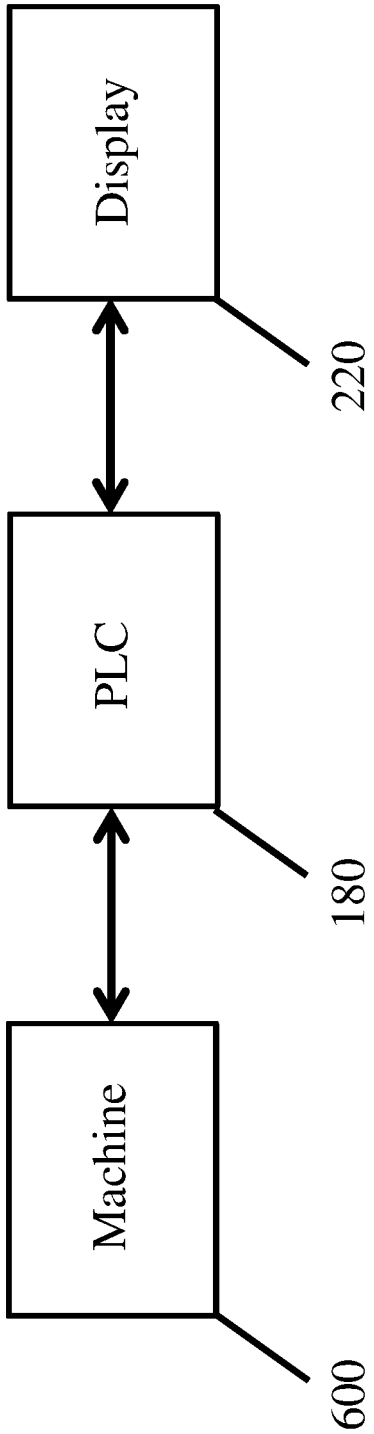


FIG. 5B

FIG. 6



HORIZONTAL FORM-FILL-SEAL PACKAGING SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional Application No. 62/491,585, filed on Apr. 28, 2017, the contents of which are incorporated herein by reference in their entirety.

BACKGROUND

Technical Field

[0002] Embodiments relate to a system and method for forming a form-fill-seal package which can be filled with a product and then sealed.

Description of Related Art

[0003] A form-fill-seal packaging system of embodiments of this disclosure may be applicable to horizontal form-fill-seal machines used in the food processing industry for packaging a product, or for packaging medical supplies, and the like.

[0004] In a conventional horizontal form fill seal machine, a pouch is formed for packaging a product which consists of a top (lid) and a formable bottom. In such a conventional machine, a product is placed in the formable bottom, the product is covered with a flat top (lid), and then the pouch is sealed to close the package. The packaging acts as a moisture barrier to keep the contents of the package fresh and sterile. In some configurations, a vacuum may be drawn to vacuum-package the product. The package may be sealed by heat or by adhesive.

[0005] The materials forming the packaging may be a plastic film. For example in the case of ground beef, a deformable plastic film is used as the formable bottom so that the packaging conforms to the shape of the product. In some configurations, instead of a formable bottom, a tray having rigidity may be used, for example in the case of cheese slices. Still further, a paper film may be used as the lid while a plastic film is used for the bottom, as in the case of syringes for medical use.

[0006] Typical form-fill-seal packaging machines operate in a horizontal direction for maximal speed and reliability of packaging. For example, a formable bottom which forms a pouch advances along a horizontal direction with respect to a gravitational direction so that products can be dropped into the pouches and filled easily.

[0007] However, a limitation of conventional horizontal form-fill-seal packaging machines is that, among other things, a product must completely reside in the pouch formed by the bottom before the flat top can be applied to cover and close the package. That is, a product may not protrude above a web line of the pouch or else the machine cannot properly seal the package with the flat top. Furthermore, a seal formed by a conventional system is typically at least 0.25 inches wide and protrudes around the perimeter of the packaged product at the top edge. Such a seal is considered unsightly and contributes to an increased overall form factor. It is desired to improve upon these shortcomings and provide various other improvements in horizontal form-fill-seal packaging systems.

SUMMARY

[0008] The present disclosure addresses several matters such as those described above, and other matters not described above.

[0009] According to an aspect of an embodiment, a machine may comprise a first film dispenser which dispenses a first film; a second film dispenser which dispenses a second film; a first form system configured to form a first shape in the first film, a second form system configured to form a second shape in the second film; and a seal system configured to form a package by joining the first film to the second film after the first shape is formed in the first film and the second shape is formed in the second film. The first form system may comprise a bucket configured to hold a form plate, and a form head configured to form a cavity between the form head and the bucket, the cavity configured to receive the first film.

[0010] According to an aspect of an embodiment, the first form system may press the first film in a first direction, the second form system may press the second film in a second direction, and the first direction may be perpendicular to the second direction. Also, the first film may advance in the machine along a direction perpendicular to the first direction, and the second film may advance in the machine along a direction perpendicular to the second direction.

[0011] According to an aspect of an embodiment, the first form system may further comprise an air port configured to supply positive air pressure and to draw a vacuum within the cavity and a form bar configured to heat a portion of the first film inside the cavity when the air port supplies the positive air pressure within the cavity. Also, the first form system may be configured to form the first shape in the first film with the form plate when the air port draws a vacuum within the cavity after the form bar heats the portion of the first film. The second form system may function similar to the first form system to form the second shape in the second film.

[0012] According to an aspect of an embodiment, the machine may further comprise a gripper chain system configured to draw the first film to the seal system, wherein the seal system is configured to join the first film to the second film such that the second film advances through the machine by being pulled by the first film.

[0013] According to an aspect of an embodiment, the first shape of the first film may be a first pocket and the second shape of the second film may be a second pocket. Also, the seal system may comprise seal head that is configured to form the package by joining the first film to the second film such that the first pocket and the second pocket are directly opposing, the package comprising the first pocket and the second pocket with a cavity formed therebetween.

[0014] According to an aspect of an embodiment, the first pocket of the first film may have a same shape of the second pocket of the second film, and the seal system may be configured to form a seam along a longitudinal axis of the package, the first pocket and the second pocket being symmetrical to each around the longitudinal axis.

[0015] According to an aspect of an embodiment, the first film may be welded to the second film to form the package.

[0016] According to an aspect of an embodiment, product may be inserted into the first pocket before forming the package such that a portion of the product rests above a top edge of the first pocket, and the package may be formed such that the portion of the product rests within the second pocket.

DESCRIPTION OF DRAWINGS

[0017] A brief description of some representative drawings is provided as follows.

[0018] FIG. **1** illustrates a perspective view of a form-fill-seal packaging machine of an embodiment;

[0019] FIG. **2** illustrates a front view of the form-fill-seal packaging machine of the embodiment;

[0020] FIG. **3** illustrates a sealed package formed by an embodiment;

[0021] FIG. **4**A illustrates a front view of a form-fill-seal packaging machine of an embodiment;

[0022] FIG. **4**B illustrates a first partial view of the form-fill-seal packaging machine of the embodiment illustrated in FIG. **4**A;

[0023] FIG. **4**C illustrates a second partial view of the form-fill-seal packaging machine of the embodiment illustrated in FIG. **4**A;

[0024] FIG. **5**A illustrates a lower forming system of an embodiment in an open state;

[0025] FIG. **5**B illustrates the lower forming system illustrated in FIG. **5**A in a closed state during a heating step;

[0026] FIG. **5**C illustrates the lower forming system illustrated in FIG. **5**A in a closed state during a film shaping step; and

[0027] FIG. **6** illustrates a form-fill-seal packaging system of an embodiment.

DESCRIPTION OF EMBODIMENTS

[0028] Embodiments may provide an apparatus and a method to form a package. In particular, the embodiments may comprise a machine having a first form system, a second form system, and a seal system. Each of the first form system and the second form system may be configured to form a pouch out of a respective film. The two pouches are brought together in the seal system to form a package. A product may be inserted into the package at a loading system prior to sealing.

[0029] According to embodiments, it becomes possible to form a package having a narrow-width sealing seam which is centrally located around a loaded product. For example, a product may be inserted at the loading section into a first pouch formed by the first forming system. The product may protrude above the top edge of the pouch, which may be the web line. A second pouch formed by the second forming system is brought together with the first pouch and joined. At the seal system, the package is closed around the product, resulting in the first pouch and the second pouch, which each comprise a respective half of the package, being sealed around the product. The sealed package may thus be top-to-bottom symmetrical relative to the web line. The embodiments may generate a unique presentation of a sealed package which is, for example, clean and sleek. Additionally, embodiments may achieve greater uniformity.

[0030] In one embodiment, a process description is outlined as follows with reference to FIGS. **1**-**3**. FIGS. **1** and **2** illustrate a machine **100** in which aspects of the machine **100** are omitted to provide greater clarity with respect to the outlined process description. For example, in FIG. **1**, a section between a second roller **128** and an upper forming system **140** and a section between a first roller **48** and a lower forming system **80** are omitted. In FIG. **2**, for example, a loading area **60** is omitted.

[0031] With reference to FIGS. **1** and **2**, the machine **100** may comprise a first roller **48** and a second roller **128**. A sheet of film **2** may be drawn off the first roller **48** and advance toward a lower forming system **80**. At the lower forming system **80**, a first pouch **3** may be formed in the film **2**. A process of forming the pouch will be described later. At an upper forming system **140**, in a similar manner, a second pouch **7** is formed in a sheet of film **6** drawn off the second roller **128**. The upper forming system **140** may operate by actuating a form head **150** in a direction different from the actuating direction of the form head **90** of the lower forming system **80**. For example, the film **2** may advance substantially in a horizontal direction with respect to gravity while the film **6** advances substantially in a vertical direction. The lower forming system **80** may actuate by pressing the form head **90** in a vertical direction, perpendicular to the film **2**. The upper forming system **140** may actuate by pressing the form head in a horizontal direction, perpendicular to the upper forming system **140**.

[0032] The film **2** may advance along the horizontal direction, for example, along the web line of the machine **100**. The film **2** may advance intermittently, such that the sheet of film **2** is held stationary for a predetermined length of time while certain processing occurs at a particular system. Forming the first pouch **3** by the lower forming system **80** may occur simultaneously with forming the second pouch **7** by the upper forming system **140**. Further, sealing by the seal system **160** may also occur simultaneously, so that the machine **100** operates on an indexed basis.

[0033] The film **2** used to form the first pouch **3** and the film **6** used to form the second pouch **7** may be the same type of material. The films **2**, **6** may be a shrinkable film that is sensitive to heat, humidity, stress, strain, and the like, such that the films **2**, **6** exhibit formability. Using such a shrinkable film presents a challenge in that once the film is formed into a particular shape, such as that of a pouch, the film tends to shrink back to its original state. Therefore, the conditions of forming the first pouch **3** at the lower forming system **80** and the second pouch **7** of the upper forming system **140** may be controlled, as discussed later.

[0034] Furthermore, although one type of die is shown in the lower forming system **80** and the upper forming system **140**, various dies may be used to form a desired shape of a pouch.

[0035] At a loading area **60**, as shown in FIG. **1**, a product **10** may be placed into the first pouch **3**. The product **10** may be any kind or states such as, for example, raw pork cuts, ground hamburger, frozen fish, beef jerky, and also nonfoods such as medical supplies, bug repellent, tools, etc.

[0036] Loading of the product **10** may be accomplished by hand or by dropping the product **10** into the pouch **3** formed by the bottom film **2**. For example, a conveying machine may transport pre-formed products and guide them over an edge so that they fall into respective pouches by gravity. Also, the loading area **60** may be, for example, long enough so that three advances are present before the film **2** is pulled under the seal head **170** of the sealing system **160**.

[0037] When the formed pockets **3** filled with the product **10** are advanced into the sealing system **160** of the machine **100**, the top film **6** may also be pulled under the seal head **170** along with the product **10**, so that the product **10** has a layer of formed film **2** below and a layer of formed film **6** above. At this time, the machine **100** may begin a sealing process. At the seal system **160**, as shown in FIG. **2**, the

sealing process may occur where the upper film **6** and the lower film **2**, with the product **10** in between, are sealed together. For example, the first pouch **3** and the second pouch **7** come together and are joined by the seal head **170**. The sealing may be a vacuum-sealing process which results in an air- and liquid-tight seal. Upon sealing, the product **10** may be enclosed in the packaging comprising the first pouch **3** of the film **2** and the second pouch **7** of the film **6**. As a result, a package **300** may be generated, as shown in FIG. **3**. The seam **400** of the packaging may coincide with the web line **500** of the machine **100**, which also coincides with a longitudinal axis of the product **10** so that the packaged product exhibits symmetry.

[0038] After the sealing process, where the first pouch **3** of the film **2** and the second pouch **7** of the film **6** have been sealed together, the sealed films with the product **10** in between, as a package **300**, may then be pulled into a cutting area (not shown) of the machine **100**. It is in the cutting area that a portion of the films **2**,**6** may be, for example, cut crosswise by guillotine knife system and during final discharge, cut lengthwise by a rotary knife system such that the package **300** is separated from the remainder of the films **2**, **6** or other packages **300** formed and sealed by the machine **100**. After both directions of the film are cut, the package **300** may be free from the machine **100** and may be grabbed by a retrieval system (not shown). Further post-processing steps may include adding a label, etc.

[0039] Explanation will now be given in greater detail to a form-fill-seal packaging system embodiment. Referring to FIGS. **4**A-**4**C, the machine **600** may comprise a gripper chain system **20**, a lower unwind system **40**, a lower forming system **80**, an upper unwind system **120**, an upper forming system **140**, and a sealing system **160**. The machine **600** may also be provided with a programmable logic controller **180** (PLC) and a touch-screen display **220** as illustrated in FIG. **6**. Further, the machine **600** may comprise a loading area **40** similar to the machine **100** illustrated in FIG. **1**.

[0040] [Gripper Chain System **20**]

[0041] With reference to FIG. **4**B, a gripper chain system **20** may comprise a gripper chain **22** that may pull a film **2** along the machine **600** at intervals with a dwell time in between. The time it takes to advance the film **2** may be set by an input device such as touch-screen display **220**. It is during this dwell in the film's advance that the machine may begin and complete a lower form process, an upper form process, a sealing process, and a cutting process

[0042] The gripper chain **22** may be pulled through the machine **600** via a drive motor (not shown) that may be, for example, a servo motor with a speed reducer that rotates a drive shaft with two drive sprockets, one sprocket **24** on each side of the machine **600**. The drive sprockets may directly engage the gripper chain **22**. The gripper chain **22** may be guided through the machine **600** along plastic guide blocks. The drive motor may be powered via a drive amplifier that is controlled by the programmable logic controller **180** (PLC).

[0043] [Lower Unwind System **40**]

[0044] With reference to FIG. **4**B, the lower unwind system **40** may comprise a motor **43** and a first roller **48**, the first roller **48** including a spindle **44**, driven by the motor **43**, and a core **45** on the spindle that holds a roll **4** of the film **2**. The motor **43** may be, for example, a servo motor. The core **45** may be made from, for example, cardboard, and include the film **2** wound thereon. The lower unwind system **40** may further comprise two fixed rollers **41** and a single traversing roller **42** that at all times applies constant pressure onto the film **2**. The film **2** being tracked center and stretched tight by the two fixed rollers **41** and a single traversing roller **42**. Further, with activation of the motor **43**, the lower unwind system **40** may unwind the film **2** from the core **45**. The lower unwind system **40** may also comprise a gas shock or a compression spring **46**.

[0045] The lower unwind system **40** may function such that, when the machine **600** advances the gripper chain **22**, the gripper chain **22** pulls along the film **2** through the machine **600**, thereby moving the traversing roller **42** in a direction such as a vertical direction. The movement of the traversing roller **42** may activate a switch that sends a signal to the PLC **180**. The PLC **180** may activate a drive amplifier, which turns on the motor **43** to rotate the spindle **44** and unroll the film **2**. The unrolled portion of film **2** may then be pulled into the machine's gripper chains **22**. When the film **2** is pulled along the machine **600** by the gripper chains **22**, a portion of the film **6** within the lower unwind system **40** moves to the lower forming system **80**. As the spindle **44** rotates and the film **2** unwinds from the core **45**, the traversing roller **42** may return to a neutral position, and the switch may disengage. This may stop the spindle **44** from unrolling any more film.

[0046] [Lower Forming System **80**]

[0047] With reference to FIG. **4**B, the lower forming system **80** may comprise a form head **90**, a form bucket **95**, a form head lifting system framework **81**, and a forming actuator **82**. The actuator may be, for example, electric or fluid-based actuator. The lower forming system **80** may further comprise a form bucket lifting system that includes, for example, a lifting rail **85**, lifting arms **86**, lifting shaft & bearing **87**, lifting system pulley & timing belt **88**, and a motor **89**. With reference to FIG. **5**A, the lower forming system **80** may also comprise an attachment plate **92**. Moreover, the form head may comprise a form bar **93**, and the form bucket **95** may comprise a gasket **96**, forming plate **97**, port **98**, and water porting section **99**.

[0048] The form bar **93** may be, for example, an aluminum bar with a machined cavity into which a heating element and thermocouple are inserted. The heating element may be electrically connected to a solid state relay which is controlled by the PLC **180** and powered from the main cabinet's electric panel. The heating element may be controlled in such a way that a set value is entered on the touch screen display **220** and the heating element heats the bar until reaching the set value. After the set value is reached, the heating element may be powered on or off, or otherwise controlled, to maintain a constant set temperature.

[0049] The lower forming system **80** may function by, for example, "air over vacuum forming." That is, with reference to FIG. **5**B, the form head **90** may lower onto the film **2** at a position near a deck **900** of the machine **600**, creating a sealed cavity between the form head **90**, the film **2**, and the form bucket **95**, thereby the form head **90** with the form bucket **95** acts as a closed die. It is in this sealed-off cavity that positive air pressure may be introduced into the form bucket **95** through, for example, a port **96** of the form bucket **95**. Positive air pressure may then push the film **2** against the form bar **93** of the form head **90**, and the film **2** may be heated as a result of direct contact with the form bar **93**. The form bar **93** may heat the film **2** to a set temperature for a set duration of time.

[0050] After positive air pressure is applied to heat the film **2**, with reference to FIG. **5**C, vacuum may be then introduced into the cavity by the port **96** at the floor of the form bucket **95** and positive air pressure may also be introduced above the film **2** by the form head **90** for a set duration of time. With air pressure above the film **2**, vacuum below the film **2**, and the film **2** being hot and formable, the film **2** is pushed or pulled into forms located in the form bucket **95**. For example, a form may be form plate **97**. The film takes shape to the forms as it cools and the vacuum and air pressure are turned off.

[0051] Water may then be run through the form bucket **95** by, for example, water porting section **99** so that the forms onto which the film **2** is pushed or pulled are chilled, which causes the film **2** to undergo a thermal shock from a formable heated state to a hardened cooled state so that the film **2** maintains the shape of the form. Accordingly, a first pouch **3** is formed in the film **2**.

[0052] Following, neutral air pressure may be reintroduced back between the form head **90** and the form bucket **95** for ventilation and the form head **90** and the form bucket **95** may be separated. For example, the forming electrical actuator **82** may lift the form head **90**, and the form bucket lifting system may lower the form bucket **95**. When the machine **600** advances, the first pouch **3** of the film **2** may be moved to the load area **40** by the gripper chain system **20** to be supplied with product **10**.

[0053] [Upper Unwind System **120**]

[0054] With reference to FIG. **4**C, the upper unwind system **40** may comprise a motor **123** and a second roller **128**, the second roller **128** including a spindle **124**, driven by the motor **123**, and a core **125** on the spindle **124** that holds a roll **8** of film **6**. The motor **123** may be, for example, a servo motor and the core **125**, may be made from, for example, cardboard. The upper unwind system **120** may further comprise two fixed rollers **121** and a single traversing roller **122** that at all times applies constant pressure onto an upper film **6**. The film **6** being tracked center and stretched tight by the two fixed rollers **121** and a single traversing roller **122**. Further with activation of the motor **123**, the upper unwind system **40** unwinds film **6** from the core **125**. The upper unwind system **120** may also comprise a gas shock or a compression spring **126** and guide rollers **127**.

[0055] The upper unwind system **120** may function in a substantially similar manner as described with respect to the lower unwind system **40**. Yet, The top film **6** may be pulled along without the use of a gripper chain. For example, the top film **6** may be welded, either in conduction with sealing by the sealing system **160** or in an independent step, to the lower film **2** so that the lower film **2** pulls the top film **6** with it when the machine **600** advances one index. When the top film **6** is pulled along the machine **600**, a portion of the film **6** within the upper unwind system **120** moves to the upper forming system **140**. Further, the upper unwind system **120** may also comprise the guide rollers **127** for supporting the film **6** and guiding the film **6** from a horizontal direction to a vertical direction on the way of the film **6** to the upper forming system **140**.

[0056] [Upper Forming System **140**]

[0057] With reference to FIG. **4**C, the upper forming system **140** may comprise a form bucket **155**, a form bucket actuator **145**, a form head **150**, a form head actuator **142**, a support framework **143**, and a film guide roller **144**. The actuators may be, for example, electric or fluid-based actuators. The upper forming system **140** may, form a pouch **7** in the upper film **6**, via the form bucket **155** and the form head **150**, before the pouch **7** is pulled through the upper film guide roller **144** and under the seal head **170** for a sealing process.

[0058] The upper forming system **140** may function with an internal process substantially similar to the internal process described with respect to the lower forming system **80**. That is, both the upper forming system **140** and the lower forming system **80** may use the "air over vacuum forming" process. In other words, the internal structure of the form head **150** and the form bucket **155** may be substantially similar to the internal structure of the form head **90** and the form bucket **95**, respectively.

[0059] However, the upper forming system **140** may be horizontally mounted, as opposed to being vertically mounted like the lower forming system **80**. When the upper form system **140** is mounted horizontally, as shown in FIG. **4**C, a different lift system for both the form head **150** and the form bucket **155** may be used, as compared to the lower forming system **80**. In particular, the form head **150** may be a tilt-back form head and may be actuated by the form head actuator **142** to tilt towards and away from the film **6** and the form bucket **155**. The form bucket **155** may be actuated by the form bucket actuator **145** to move towards and away from the film **6** and the tilt-back form head **150**.

[0060] Further, the upper form system **140** may comprise the film guide roller **144** to guide the second pouches **7** of the film **6** from between the form head **150** and the form bucket **155** to the sealing system **160**. The film guide roller **144** may also guide the second pouches **7** of the film **6** to be each placed on top of a respective first pouch **3** of the film **2**.

[0061] [Sealing System **160**]

[0062] With reference to FIG. **4**C, the sealing system **160** may comprise a seal head **170**, a seal bucket **175**, a seal head lifting system framework **161**, and a sealing actuator **162**. The actuator may be, for example, electric or fluid-based actuator. The sealing system **160** may further comprise a seal bucket lifting system that includes, for example, a lifting rail **165**, lifting arms **166**, lifting shaft & bearing **167**, lifting system pulley & timing belt **168**, and a motor **169**.

[0063] The seal head **170** may lower down to the film line where second pouches **7** of the film **6** are located on top of the first pouches **3** of the film **2**, and the seal bucket **175** may lift up to the seal head **170**, creating a sealed cavity with both a second pouch **7** of the film **6** and a first pouch **3** of the film **2** sandwiched in the middle. Sealing System **160** may then begin a seal process. That is, for example, a vacuum may introduced to both the seal head **170** and the seal bucket **175** for a determined amount of time based on a value set on the touch-screen display **220**. After that set time and/or a vacuum level is reached, a heated seal bar (not shown) of the sealing system **160** may be energized (fired) for a predetermined amount of time. During this time both the second pouches **7** of the film **6** and the first pouch **3** of the film **2** are sealed together, only around the product placed within the first pouch **3** and the second pouch **7**. This area in which the may be referred to as a seal area. Typical seal widths range between 3 mm wide up to 15 mm wide.

[0064] After both the second pouch **7** of the film **6** and the first pouch **3** of the film **2** are sealed, the vacuum may be turned off and neutral air pressure may be reintroduced back between the seal head **170** and the seal bucket **175** for

ventilation and the seal head **170** and the seal bucket **175** may be separated. Accordingly, a package **300** may be formed.

[0065] [Programmable Logic Controller & Input Device]

[0066] With reference to FIG. **6**, a form-fill-seal package system may comprise the machine **600**, the PLC **180**, and the touch screen display **220**. All functions of the machine may be controlled via the PLC **180** which may be located in, for example, a water resistant stainless steel cabinet. All electrical components other than safety switches and servo motors may be located inside this cabinet. Attached to the cabinet may be a swing arm system that has a smaller stainless enclosure attached to it. Housed in this smaller enclosure may be an input device such as the touch-screen display **220**. The touch-screen display **220** may be the primary interface for controlling all functions of the machine **600** and may communicate with the PLC **180**.

[0067] The PLC **180** may control the machine **600** and comprise at least one processor and memory. For example, the PLC **180** may control all air manifolds, servo amplifiers, relays, and contactors of the machine **600**. The air manifolds of the machine **600** may comprise valves that control air supplies to lifting systems, cutting systems, unwind systems of the machine **600**. Accordingly, the PLC **180** may control air supply to the systems.

[0068] In the above embodiment, the seal head **170** may join the first pouch **3** of the film **2** and the second pouch **7** of the film **6** by heat, such that the shrinkable films are attached to each other. However, another means, such as an adhesive, may be used to join the films **2**, **7**. Because the films **2**, **7** may be joined together at a later stage of the production line, only one of the films **2**,**7** may require driving in order to convey the films **2**,**7**. For example, in the above embodiment, the film **2** may be pulled off the core **10** by the motor **43**. The core **125** may not be driven, yet the film **6** may still be pulled off the core **125** by being pulled by the film **2** because the film **2** and the film **6** become joined. Nevertheless, one or more motors may be provided to drive both cores **45**, **125** and either, or both could be operated.

[0069] Furthermore, the sealing occurring at the sealing system **160** may serve to join the films **2**, **6** together. However, a separate joining step may be provided before the sealing system **160** to independently join the films **2**, **6** together. For example, a step of tacking the films **2**, **6** together by welding may be performed prior to the sealing step in order to maintain proper timing between the top and bottom forming steps. Such tacking may occur at a location in the films **2**, **6** spaced apart from the forming systems **80**, **140** where the pouches **3**, **7** are formed.

[0070] The package **300** may be sealed such that it can be opened by peeling. Therefore, a cutting step may be employed where peel tabs are formed at appropriate locations around the sealed package **300**. Furthermore, additional sealing techniques may be added, such as using re-sealable adhesive, adding a zipper, and double sealing, for example.

[0071] It should be noted that although a few embodiments have been described, those skilled in the art will readily appreciate that many modifications are possible to the embodiments without materially departing from the novel teachings and advantages of the embodiments. For example, heat may be applied to the film in the form process by directly contacting the film with a heating element, or may be applied by injecting heated air or steam into the form bucket. Accordingly, all such modifications are intended to be included within the scope of the embodiments as discussed herein.

1. A machine comprising:
- a first film dispenser which dispenses a first film;
- a second film dispenser which dispenses a second film;
- a first form system configured to form a first shape in the first film, the first form system comprising:
  - a bucket configured to hold a form plate, and
  - a form head configured to form a cavity between the form head and the bucket, the cavity configured to receive the first film;
- a second form system configured to form a second shape in the second film; and
- a seal system configured to form a package by joining the first film to the second film after the first shape is formed in the first film and the second shape is formed in the second film.

2. The machine according to claim **1**, wherein
- the first form system presses the first film in a first direction,
- the second form system presses the second film in a second direction, and
- the first direction is perpendicular to the second direction.

3. The machine according to claim **2**, wherein
- the first film advances in the machine along a direction perpendicular to the first direction, and
- the second film advances in the machine along a direction perpendicular to the second direction.

4. The machine according to claim **1**, wherein
- the first form system further comprises an air port configured to supply positive air pressure and to draw a vacuum within the cavity.

5. The machine according to claim **4**, wherein
- the first form system further comprises a form bar configured to heat a portion of the first film inside the cavity when the air port supplies the positive air pressure within the cavity.

6. The machine according to claim **5**, wherein the first form system is configured to form the first shape in the first film with the form plate when the air port draws a vacuum within the cavity after the form bar heats the portion of the first film.

7. The machine according to claim **1**, further comprising
- a gripper chain system configured to draw the first film to the seal system, wherein the seal system is configured to join the first film to the second film such that the second film advances through the machine by being pulled by the first film.

8. The machine according to claim **1**, wherein
- the first shape of the first film is a first pocket and the second shape of the second film is a second pocket, and
- the seal system comprises seal head that is configured to form the package by joining the first film to the second film such that the first pocket and the second pocket are directly opposing, the package comprising the first pocket and the second pocket with a cavity formed therebetween.

9. The machine according to claim **8**, wherein
- the first pocket of the first film has a same shape of the second pocket of the second film, and

the seal system is configured to form a seam along a longitudinal axis of the package, the first pocket and the second pocket being symmetrical to each other around the longitudinal axis.

10. A method of forming a package with a machine, the method comprising:

dispensing a first film;

dispensing a second film;

forming a first pocket in the first film by pressing the first film with a first form head;

forming a second pocket in the second film by pressing the second film with a second form head; and

forming a package comprising the first pocket and the second pocket by joining the first film with the second film such that the first pocket aligns with the second pocket.

11. The method of claim **10**, wherein

the forming the first pocket includes pressing the first film with the first form head in a first direction,

the forming the second pocket includes pressing the second film with the second form head in a second direction, and

the first direction is perpendicular to the second direction.

12. The method of claim **11**, further comprising:

advancing the first film in the machine along a direction perpendicular to the first direction, and

advancing the second film in the machine along a direction perpendicular to the second direction.

13. The method of claim **10**, wherein

the forming the first pocket includes performing an air-over-vacuum process comprising supplying positive air pressure and drawing a vacuum within a cavity that receives the first film, the cavity formed between the first form head and a first bucket.

14. The method of claim **13**, wherein

the air-over-vacuum process further comprises heating a portion of the first film inside the cavity when the positive air pressure is supplied within the cavity.

15. The method of claim **14**, wherein

the air-over-vacuum process further comprises forming the first shape in the first film with a form plate when drawing a vacuum within the cavity after heating the portion of the first film.

16. The method of claim **10**, wherein

the forming the package includes joining the first film with the second film such that first pocket and the second pocket are directly opposing.

17. The method of claim **16**, wherein

the forming the package includes forming a seam along a longitudinal axis of the package, the first pocket and the second pocket being symmetrical to each other around the longitudinal axis.

18. The method of claim **10**, wherein

the forming the package includes welding the first film to the second film.

19. The method of claim **10**, further comprising

inserting a product into the first pocket before forming the package.

20. The method of claim **10**, further comprising

inserting the product into the first pocket before forming the package such that a portion of the product rests above a top edge of the first pocket, wherein

the forming the package includes forming such that the portion of the product rests within the second pocket.

* * * * *