United States Patent

Rousseau et al.

[15] **3,664,085**

[45] **May 23, 1972**

[54] PACKAGING MACHINE

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[22] Filed: **Nov. 24, 1969**

[21] Appl. No.: **879,338**

[52] **U.S. Cl.** .....**53/112 R,** 99/171

[51] **Int. Cl.**.....**B65b 31/02**

[58] **Field of Search**.....53/112 R, 112 A

[56] **References Cited**

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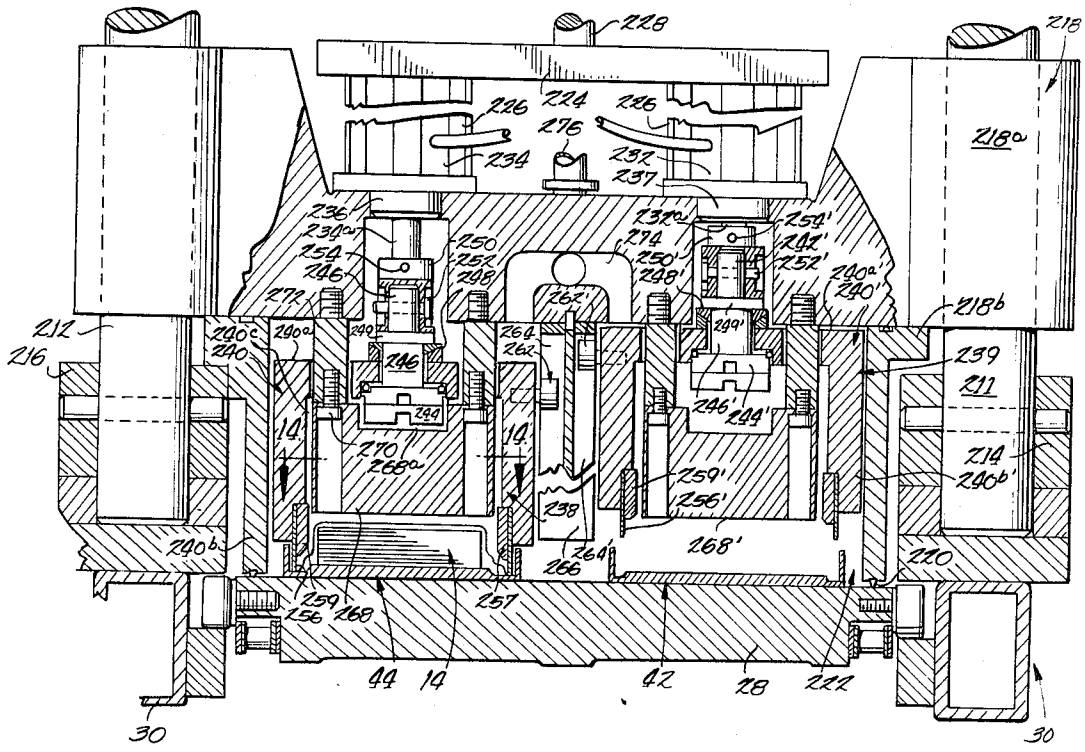
Primary Examiner—Travis S. McGehee

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[57] **ABSTRACT**

Apparatus and method are disclosed for vacuum packaging of a product in a two element package consisting of a preformed rigid base element and a preformed rigid cover element. The apparatus preferably includes a plurality of platens carried on a conveyor through a number of operating stations where the package is assembled with the base element disposed downwardly. The loosely assembled package is moved into sealing station where a concave housing placed over the package elements forms a vacuum chamber with the platen. The chamber is vacuumized, and an annular sealing member carried within the concavity of the housing moves downwardly to press the peripheral portions of the package elements together while a vacuum is maintained within the chamber.

25 Claims, 19 Drawing Figures



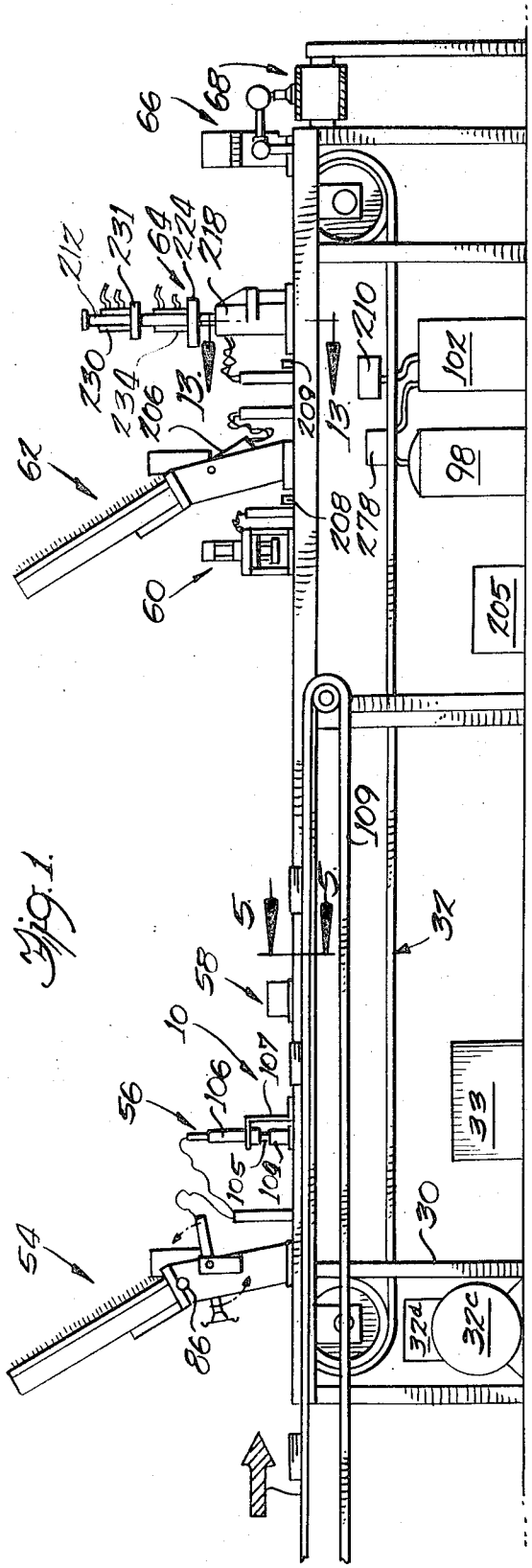


Fig. 1.

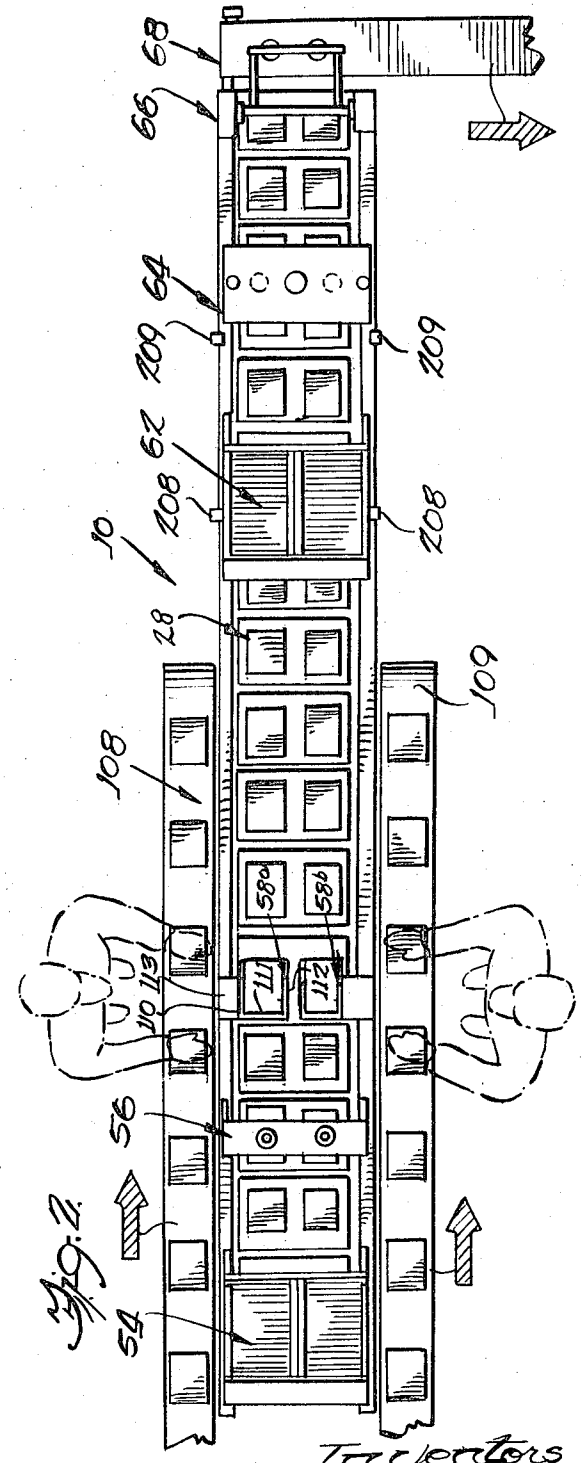


Fig. 2.

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Fig. 3.

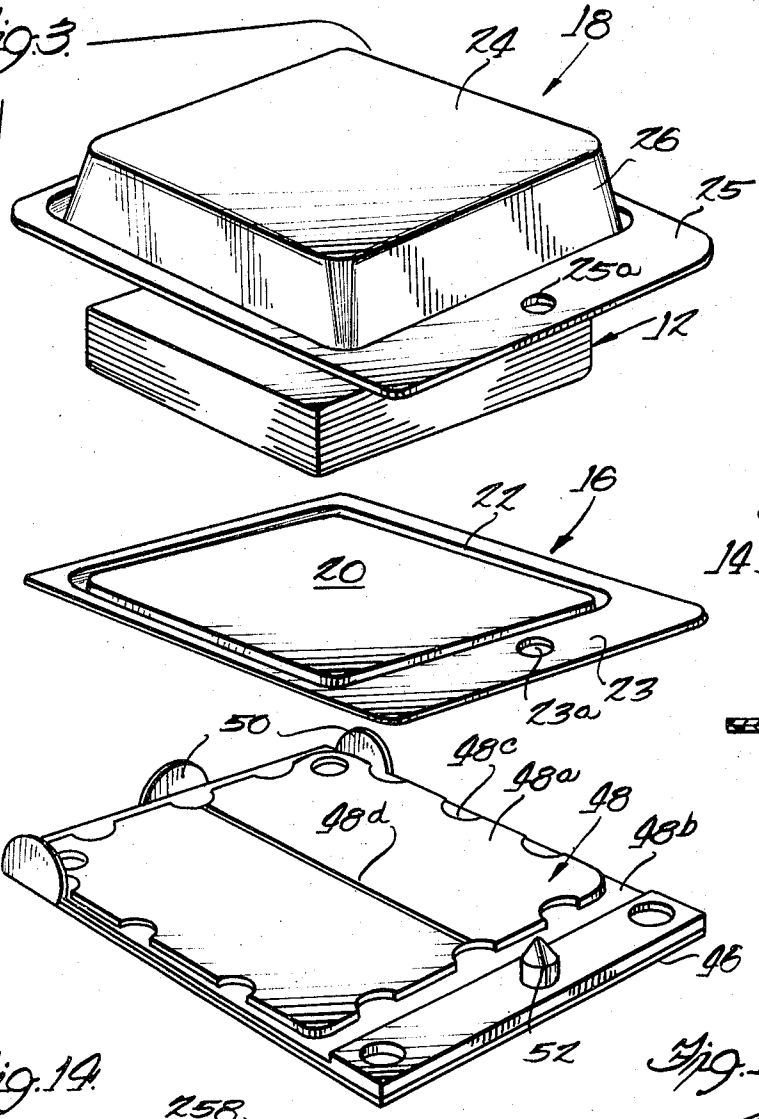


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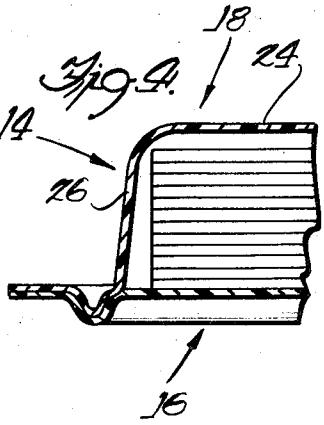


Fig. 14.

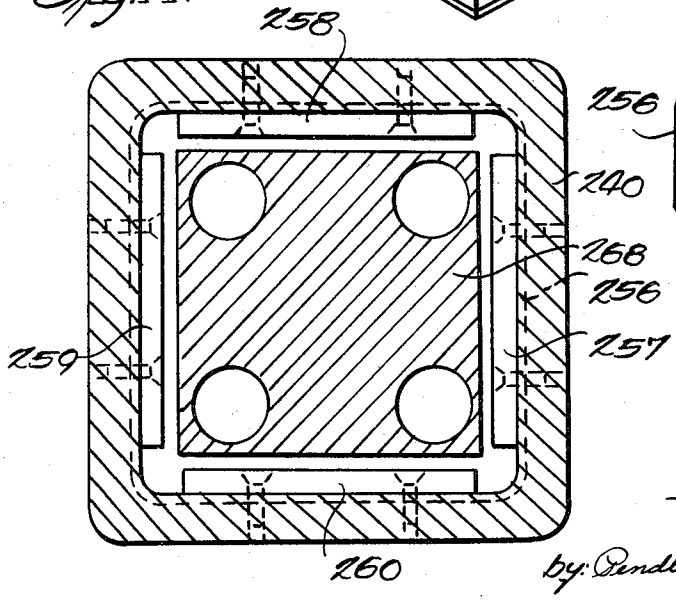
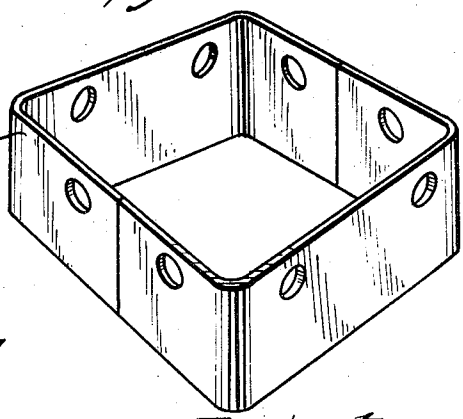


Fig. 15.



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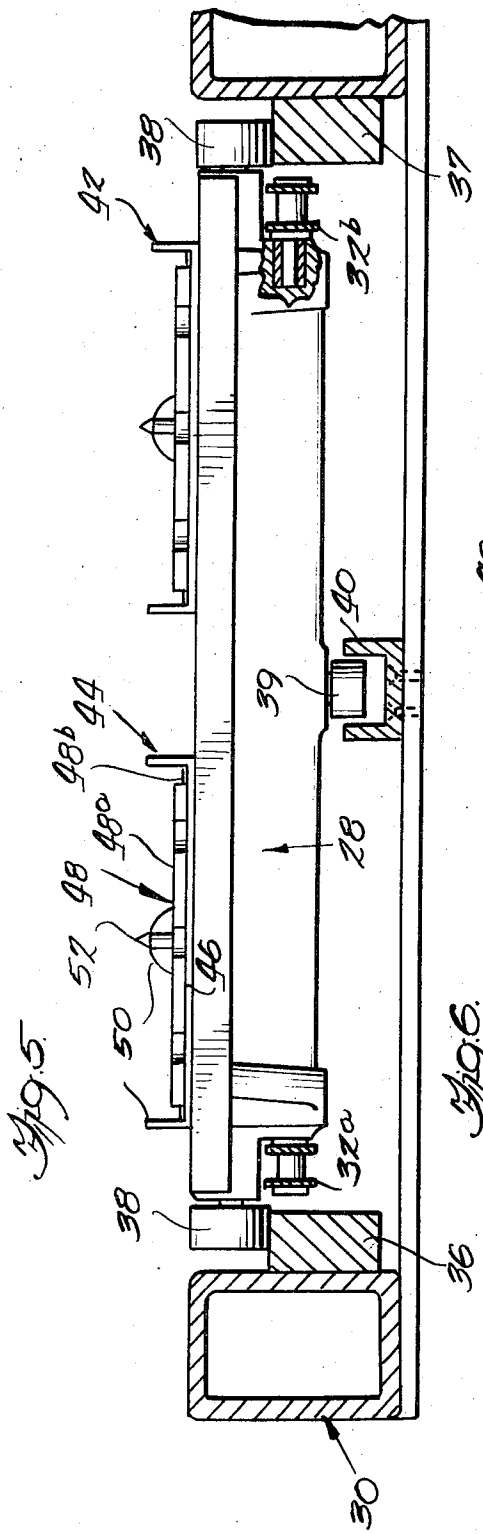


Fig. 5.

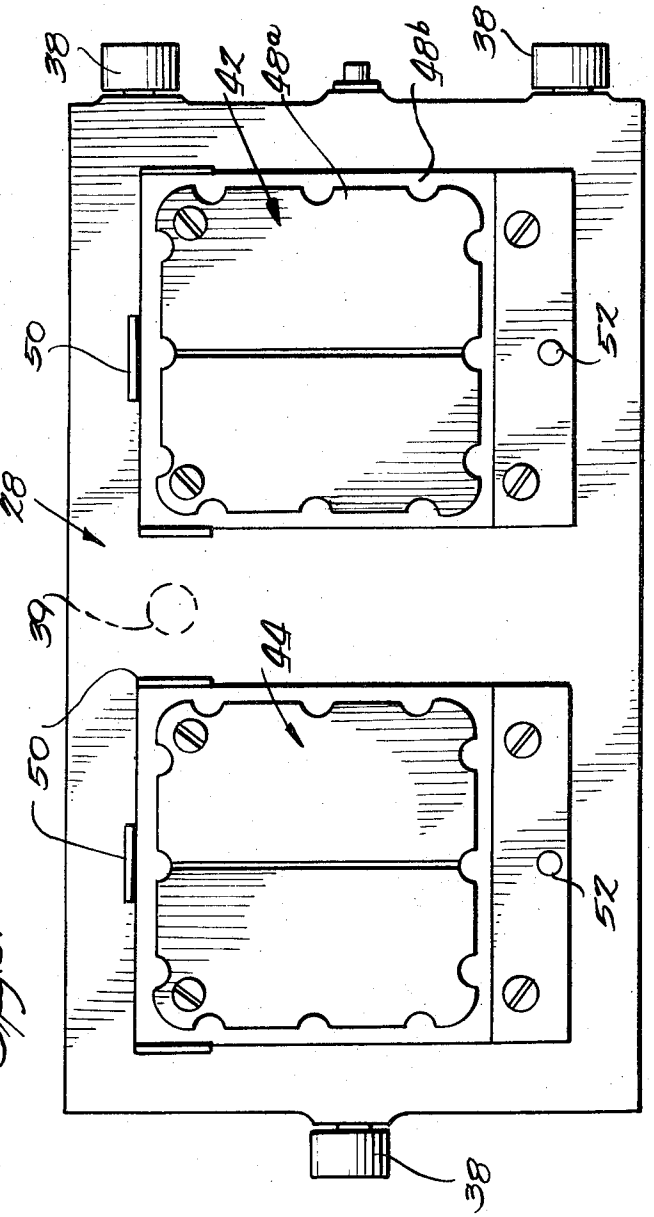


Fig. 6.

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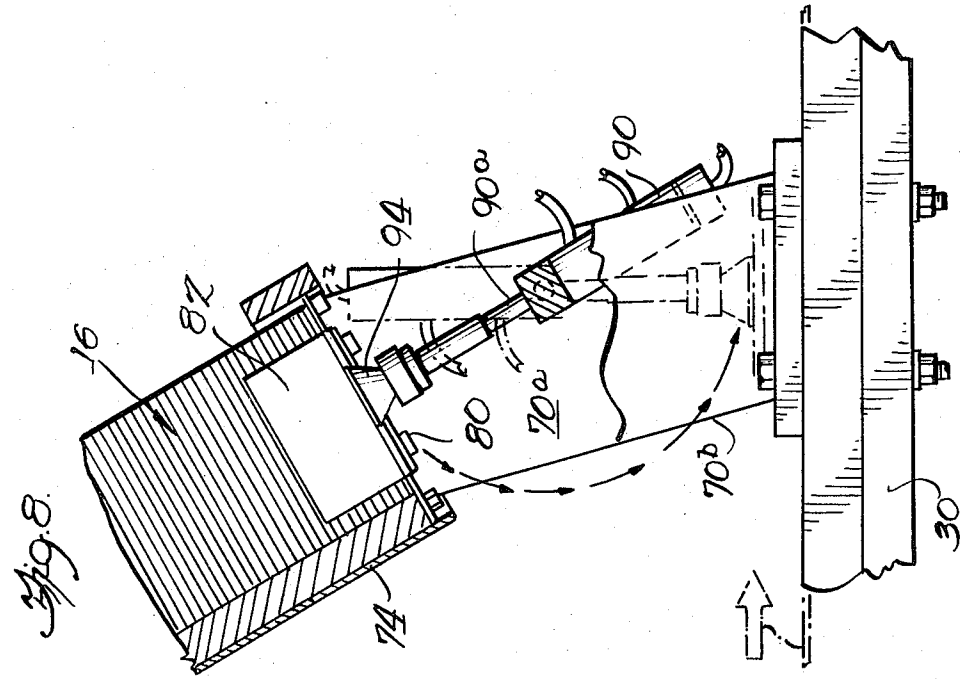


Fig. 8.

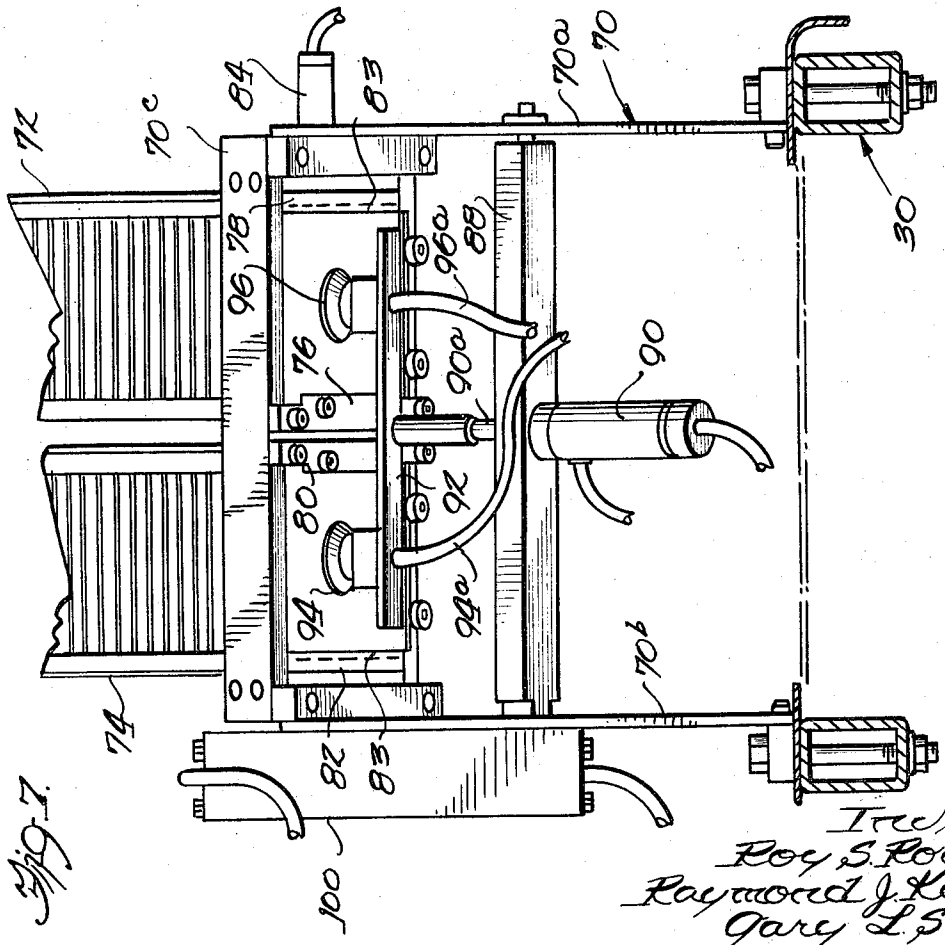


Fig. 7.

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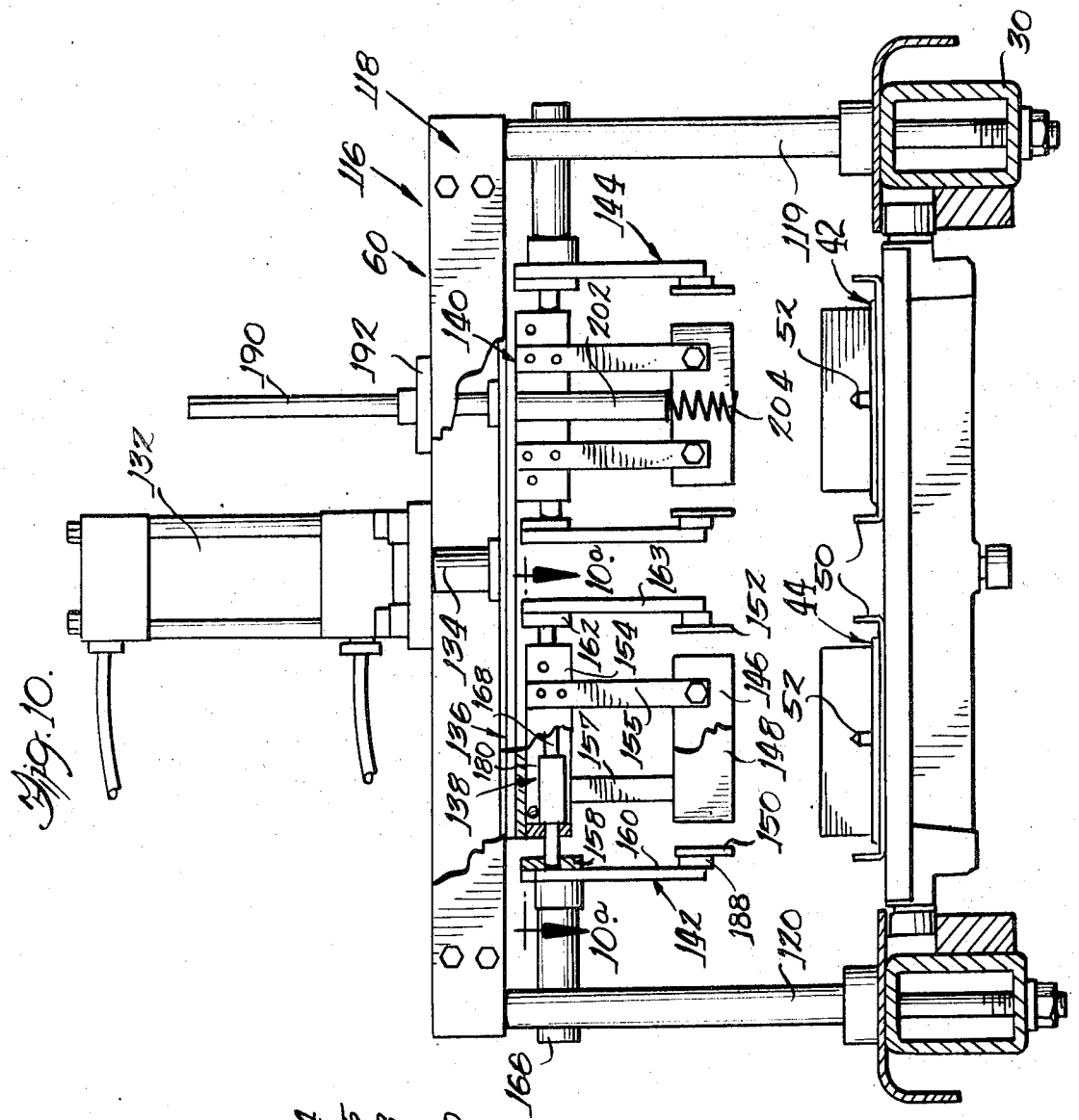


Fig. 10.

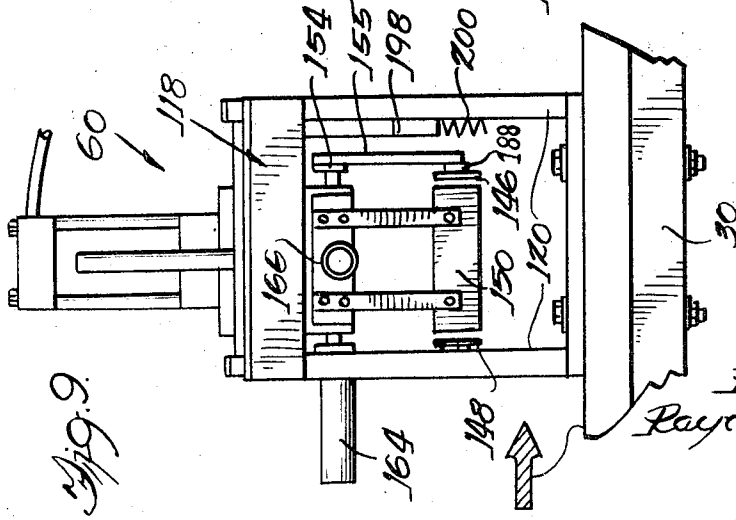


Fig. 9.

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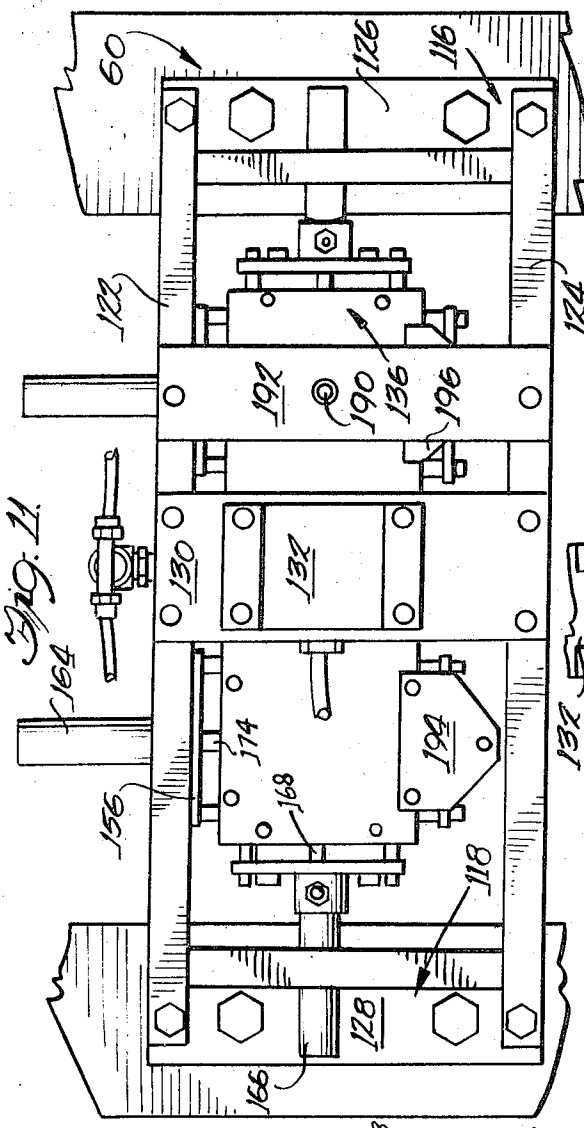


Fig. 11.

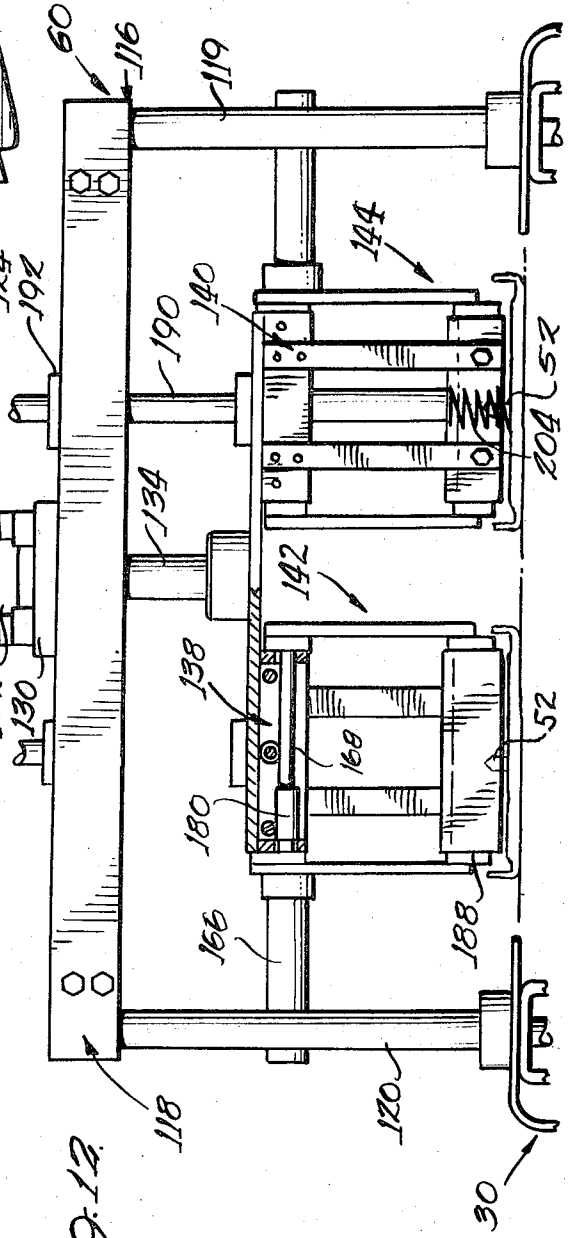


Fig. 12.

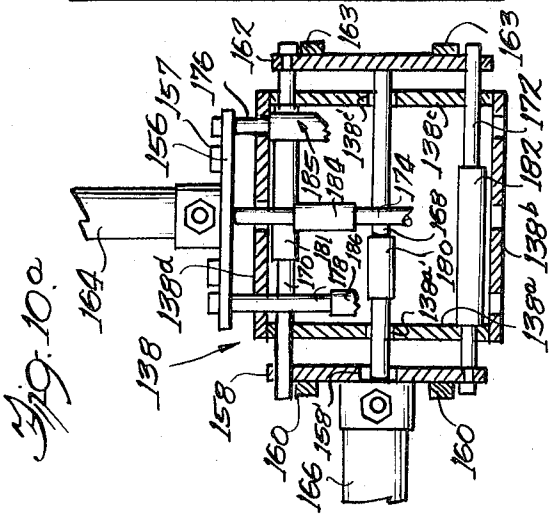


Fig. 10a.

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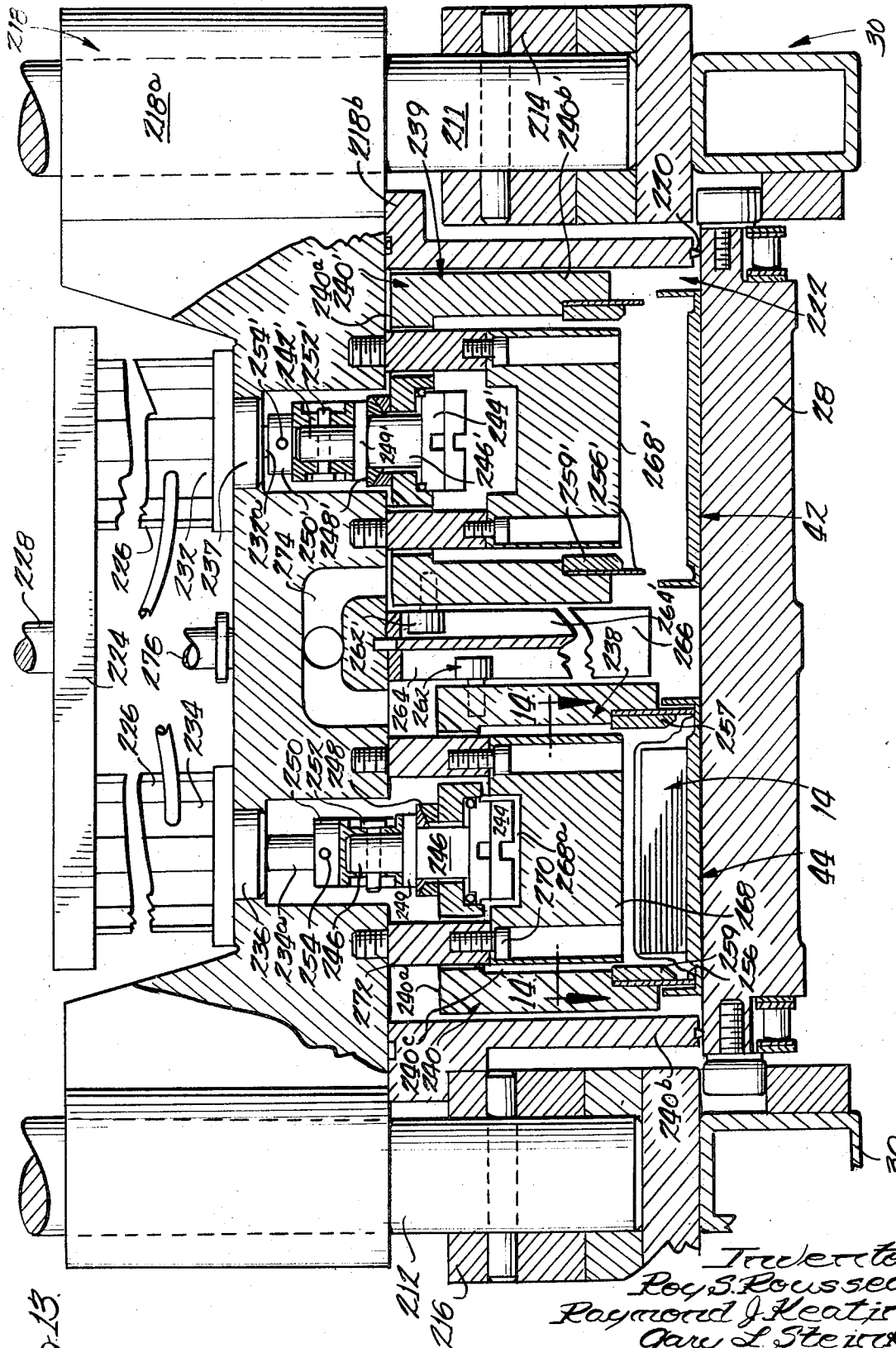


Fig. 13

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Fig. 16.

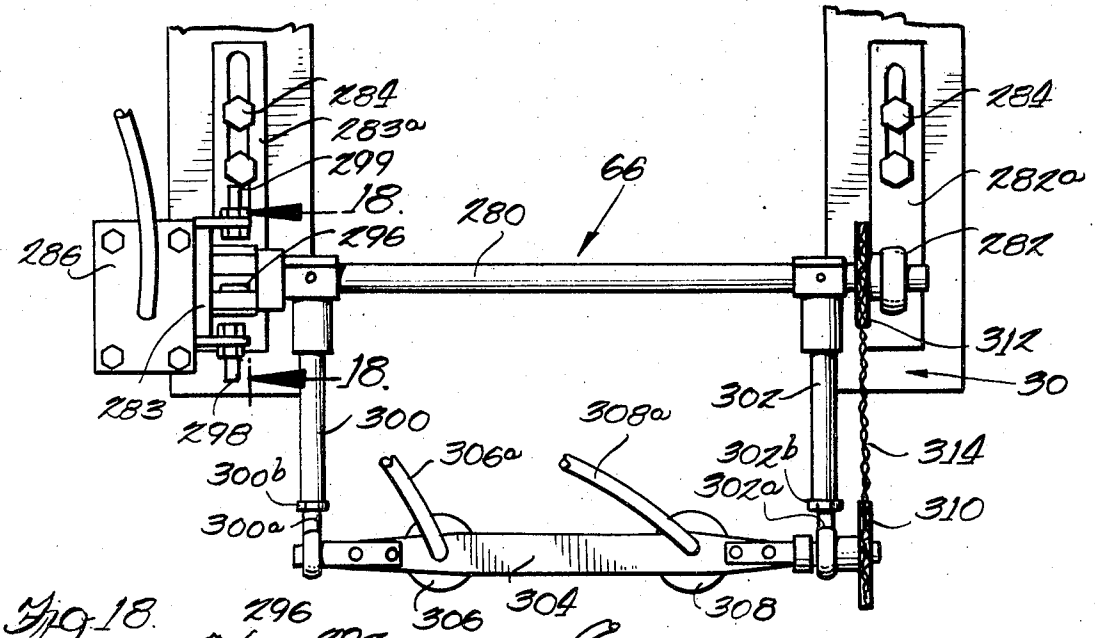


Fig. 18.

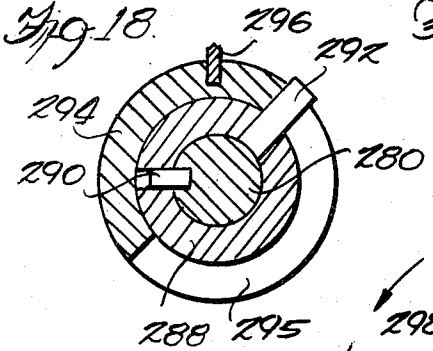


Fig. 17.

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PACKAGING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to an apparatus and method for vacuum packaging of a product such as luncheon meat, cheese, frankfurters, or the like within a hermetically sealed, self-supporting container. The method and apparatus are particularly adapted to assemble the two element container or package illustrated and described in Tigner U.S. Pat. No. 3,454,158. This package consists of a preformed, relatively flat, rigid base element and a preformed inwardly concave rigid cover element. As employed herein the term "rigid" is intended to mean that the package element maintains its own shape without internal or external supports and thus is distinguishable from the types of packages wherein one or both of the package elements is merely a thin pliable film. As described herein the package elements or parts are adhesively joined together in the manner described in the Tigner patent, although it will be appreciated that under certain conditions heat sealing equipment could be incorporated into or employed in conjunction with the disclosed apparatus. In the preferred embodiment no thermal forming or heat sealing equipment is needed, since the parts are preformed and the adhesive applied before the parts are handled by the machine.

The method and apparatus of the present invention feature a novel lid or base down assembly technique which permits the product to be aligned on the base and, thus, assures a uniformly neat package. Moreover, by aligning the product on the base prior to the positioning of the cover or shell, the danger of the product coming into contact with the peripheral edge of the shell is greatly minimized thereby assuring a clean surface for contact with the adhesive and providing a strong hermetic seal between the package parts.

SUMMARY OF THE INVENTION

The apparatus vacuum packages a product such as sliced luncheon meat in a two element package consisting of a preformed rigid base element and a preformed rigid cover element. In accordance with one embodiment of the invention the apparatus includes a plurality of platens and means, such as conveyor chains, for moving the platens through a plurality of operating stations. Each of the platens has a package element holding means or nest thereon adapted to receive and hold the package elements in substantially aligned superposed relation on a predetermined portion of the platen. There are preferably two or more such holding means on each platen. At the first operating station of the apparatus there is means for placing a base element on each package element holding means, and at the second station there is means for guiding the product into position on the base element.

After the product has been placed on the base element and before the cover element is positioned, it is preferred that there be means at a third station for aligning the product on the base element. This product alignment means is intended to assure that the product, particularly if it is a stacked sliced product such as sliced meat or cheese, will be packaged neatly and that the product will not contact the peripheral or sealing edge of the cover element before that edge engages the adhesive which preferably has been deposited in a peripheral mating groove on the base element.

At the third operating station of the apparatus there is means for placing a cover element over the product and base, and, finally, there is a sealing station wherein a concave housing is moved into sealing engagement with the platen surrounding the package element holding means. The cavity within the housing and the platen define a package-accommodating vacuum chamber, and means is provided for applying a vacuum to this chamber. An annular sealing member, which is carried by the housing within the cavity, is normally held in an upwardly disposed or retracted position. Power means is provided for moving the sealing member downwardly toward the platen while the housing is in sealing engagement with the platen, thereby forcing the peripheral or sealing portions of the package element into sealing engagement while the vacuum is maintained within the chamber.

Means is preferably provided for removing the sealed package from the platen after the platen has been moved from the sealing station. This means may be in the nature of a suction transfer device which transfers the sealed package from one conveyor to another.

The preferred method of the invention includes the steps of placing a relatively flat rigid base element onto an imperforate platen, placing a product in proper alignment on the base element, loosely applying the concave rigid cover element over the product with the peripheral portions of the cover element in close proximity with the peripheral portions of the base element, placing a concave housing over the cover and base elements with the portions thereof surrounding said elements being in sealing engagement with the platen to form with the platen a vacuum chamber surrounding the loosely assembled package elements, drawing a vacuum within the chamber, and while the vacuum is being held, forcing the peripheral portions of the cover element downwardly into sealing engagement with the peripheral portions of the base element and then raising the pressure within the chamber to ambient.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of an apparatus constructed in accordance with this invention, schematically showing the various mechanisms and operating stations of the apparatus;

FIG. **2** is a top plan view of the apparatus illustrated in FIG. **1** showing the platens on which the package elements are assembled and sealed;

FIG. **3** is a exploded view of the package element holding means, the two element package and the product, showing the manner in which these are assembled;

FIG. **4** is a sectional elevational view of a portion of a package assembled by means of the apparatus and method of this invention;

FIG. **5** is a sectional elevational view taken substantially along line **5—5** of FIG. **1** showing the construction of the platens, the platen guide means and the conveyor;

FIG. **6** is a top plan view of the platen illustrated in FIG. **5**;

FIG. **7** is an end elevational view partially in section showing a portion of the mechanism for loading base elements onto the platens at the first station;

FIG. **8** is a side elevational view of the base element loading mechanism, a portion of which has been broken away to show the manner in which the mechanism operates to place a base element onto the package element holding means of each platen;

FIG. **9** is a side elevational view of the product alignment mechanism showing the position of the parts thereof as a platen is being moved into position at this station;

FIG. **10** is an enlarged end elevational view of the product alignment mechanism looking toward the front of the apparatus in the direction opposite the movement of the platens;

FIG. **10A** is an enlarged sectional view taken substantially along line **10A—10A** of FIG. **10**.

FIG. **11** is a top plan of the product alignment mechanism;

FIG. **12** is an end elevational view of the product alignment mechanism looking in the same direction as in FIG. **10** and showing the position of the parts as the mechanism engages the product to effect alignment thereof;

FIG. **13** is a sectional view taken substantially along line **13—13** of FIG. **1** and showing the vacuum sealing mechanism;

FIG. **14** is a sectional view taken substantially along line **14—14** of FIG. **13** showing the sealing member carried by the housing within the cavity and the elements carried by the sealing member for engaging and centering the cover element with respect to the base element as the sealing member is moved downwardly toward the platen;

FIG. **15** is a perspective view of the sealing member;

FIG. **16** is a top plan view of the package unloading mechanism which removes the sealed packages from the apparatus;

FIG. 17 is a side elevational view of the package unloading mechanism; and

FIG. 18 is an enlarged sectional view taken substantially along line 18—18 of FIG. 17.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method of this invention is particularly adapted to be carried out on the apparatus **10** illustrated in FIGS. **1** and **2** of the drawings. This apparatus operates to vacuum package a product **12** in a two element package **14** of the type disclosed in the Tigner U.S. Pat. No. 3,454,158 and illustrated in FIGS. **3** and **4** of the drawings herein. The product **12** may, for example, be sliced luncheon meat or sliced cheese, although it will be understood that the package is adapted to hold a number of other products including such food products as, for example, frankfurters and chili.

The package **14** is a two element package consisting of a preformed, relatively flat, rigid, i.e., self-supporting, base element **16** and a preformed, inwardly concave, rigid, i.e., self-supporting, cover element **18**. The base element **16** is preferably formed of a polystyrene foam sheeting with a lamination of barrier film. The base element **16** has a generally flat portion **20** adapted to receive and support the product **12** and a marginal groove **22** adapted to securely receive the cover element **18**. An integral extension panel **23** may be provided as a convenient place for printing the date code or the like. An aperture **23***a* in this panel provides a convenient means for hanging the sealed package for consumer display, and this aperture also facilitates alignment of the base element on the apparatus **10** as will be described herein.

The cover element **18** is preferably formed of a plastic web material by usual pressure-forming techniques, the plastic being of a thickness and of a nature to form a moistureproof and gastight barrier. The cover element **18** may be transparent to allow viewing and inspection of the product **12**, and this cover includes a top **24** and a peripheral side wall **26** integral with the top and depending downwardly and outwardly therefrom to engage the marginal groove **22** of the base element **16**. It is preferred that a soft tack adhesive be placed in the marginal groove **22** of the base element **16** so that when the bottom edge of the side wall **26** of the cover element comes into contact therewith, the two package elements will be hermetically sealed.

An integral extension flange **25** may be provided, this flange corresponding in size and shape to the extension panel **23** of the base element. This provides a convenient location for a label and a means for grasping of the cover by the consumer when opening the adhesively sealed package. An aperture **25***a* in this flange aligns with the aperture **23***a* in the base element when the elements are assembled.

In accordance with this invention the method for packaging the product **12** in the two element package **14** comprises the steps of placing the relatively flat rigid base element **16** onto an imperforate surface such as the platen **28** of the apparatus **10**, placing the product onto the base element, aligning the product on the base element, loosely applying the concave cover element **18** over the product **12** so that the peripheral portions are in close proximity with the corresponding peripheral portions of the base element **16**, forming with the platen a vacuum chamber surrounding the loosely assembled package elements, drawing a vacuum within the chamber, and while the vacuum condition exists forcing the peripheral portions of the cover element downwardly into sealing engagement with the peripheral portions of the base element. Thereafter, the pressure within the chamber is raised to atmospheric whereby the package will be sealed by a combination of the reduced pressure within the package and the adhesive between the package elements.

As best illustrated in FIGS. **1** and **2** the apparatus **10** of this invention has a frame **30** on which is mounted an endless conveyor **32**. The conveyor **32** may, for example, include a pair of spaced, parallel chains **32***a* and **32***b*, illustrated in cross section in FIG. **5**. The chains are driven by a suitable electric motor **32***c* and commercially available index drive unit **32***d*. The motor also drives a cam timer **33**. Extending between the chains **32***a* and **32***b* are a plurality of platens **28**. At the top portion of the chain run the platens **28** ride upon and are guided by means of horizontal rails **36** and **37** affixed to the frame **30**. Each platen carries three rollers **38**, two of which engage and roll along the rail **37** and the other roller of which engages and rolls along the rail **36**. The three roller contact on the rails **36** and **37** provides a nonrocking movement of the platen along the upper run of the conveyor. Each platen **28** may also be guided in its movement along a rectilinear path by means of a bottom roller **39** which rides within a longitudinal track **40** affixed to the frame **30**.

Carried on the top surface of each of the platens **28** are two package-holding elements **42** and **44**. These package-holding elements are identically constructed, each having a base plate **46**, the top surface of which is covered with a resilient rubber-like cushion **48** having a raised central portion **48***a* and a recessed peripheral portion **48***b*. The cushion **48** is thus shaped to accommodate the bottom of the package base element **16**. The recessed peripheral portion of the cushion **48** is adapted to receive the marginal groove **22** of the base element, and the central portion may include recesses **48***c* in order to accommodate stacking or anti-jamming lugs molded on the bottom side of package base element **16**. A longitudinally extending central groove **48***d* is also preferably provided in the central portion **48***a* to assure quick separation of the base element **16** from the central portion of the holding element after vacuum sealing.

In order to maintain the base element **16** in proper position on the cushioned package-holding element **42** or **44**, as the case may be, a plurality of upstanding peripheral members or tabs **50** are provided. These tabs are high enough not only to position the base element **16** but also the cover element **18**. In the preferred embodiment these tabs are disposed along three sides of the base plate at one end thereof. At the other end of the package-holding element is an upstanding tapered protuberance or spike **52**. The spike **52** is adapted to engage in the holes **23***a* and **25***a*, respectively, of the base element extension **23** and cover flange **25**.

The package-holding elements **42** and **44** are adapted to hold the package elements in position as the assembly operations are carried out by the apparatus **10**. The conveyor **32** indexes the platens **28** through a number of operating stations, the platen remaining in each station a sufficient length of time for the assembly operation at that station to be carried out. In the illustrated embodiment of the apparatus **10** a base element loading mechanism **54** loads the package base elements **16** onto the package-holding elements **42** and **44** of the platens at the first operating station. At the second station a coding mechanism **56** stamps a suitable code on the base element. At the third station a product guide **58** guides the product into position on the base elements. In the fourth station a product alignment mechanism **60** aligns the product on the base elements **16**. At the fifth station a cover element loading mechanism **62** places a cover element over the aligned product in such a manner that the package elements are loosely assembled. At the sixth station a sealing mechanism evacuates the package and seals it, and at the seventh and final station an unloading mechanism **66** unloads the assembled package with the product therein from the package-holding elements of the platens, and preferably places this package on a take-off conveyor **68** or the like.

In the drawings the direction of platen movement is indicated by the arrows and is from left to right as viewed in FIGS. **1** and **2**. For purposes of description the left-hand end of the apparatus **10** is called the forward or front end of the machine, and the right-hand end is called the rearward or discharge end of the machine. Directions described as "upstream" and "downstream" are given with respect to the direction of platen movement.

The structure of the base element loading mechanism **54** is best illustrated in FIGS. **7** and **8** of the drawings. The base ele-

ment loading mechanism **54** includes a support structure **70** connected to the frame **30** of the apparatus. The support structure includes two upstanding side members **70***a* and **70***b* and a top cross member **70***c*. Connected to and extending upwardly from the cross member **70***c* of the support structure are two hoppers **72** and **74** of substantially rectangular cross section adapted to accommodate a stack of package base elements **16**. The hoppers **72** and **74** are open along one side, preferably their downstream side, with the tops of the hoppers being tilted upstream or away from the open side. Thus, a stack of base elements **16** may be inserted easily into each of the hoppers as shown in FIGS. **7** and **8**, and there will be no tendency for them to fall through the open side.

Below the hopper **72** at the cross member **70***c* are mounted a pair of grippers **76** and **78**, and a similar pair of grippers **80** and **82** are mounted beneath the hopper **74**. The grippers are merely plates having a small inwardly disposed flange **83** along the bottom edge thereof. The grippers **76** and **80** are fixedly connected to the top cross member **70***c* of the support structure **70**. However, the grippers **78** and **82** are movable. The gripper **78** is movable inwardly toward and away from gripper **76**, this movement being effected by means of an air cylinder **84**. A second air cylinder **86** (see FIG. **1**) is provided for moving the gripper **82** toward and away from the fixed gripper **80** beneath the hopper **74**. Pivotally mounted between the upstanding members **70***a* and **70***b* of the support structure **70** is a bar **88** at the center of which is affixed an air cylinder **90**. At the end of the operating shaft (piston arm) **90***a* of the cylinder **90** is affixed a crosshead **92** carrying a pair of resilient suction cups **94** and **96**. These suction cups **94** and **96** are operatively connected to a vacuum source **98** (see FIG. **1**) by means of flexible conduits **94***a* and **96***a*, respectively.

The bar **88** is rotated by means of a fluid operated rotary actuator **100**, which may be an air cylinder, the normal linear reciprocal output motion of the piston of which is converted to rotary motion through a rack and pinion arrangement. Operation of the rotary actuator **100** will thus result in the rotation of the bar **88** and of the apparatus carried thereby including the crosshead **92** and the suction cups **94** and **96**. The cylinders **84**, **86** and **90** and the rotary actuator **100** are operated from a source of fluid pressure such as an air compression unit **102**, schematically illustrated in FIG. **1**. The timing of the operation of these cylinders and the actuator may be controlled by means of the timing mechanism **33**, also schematically illustrated in FIG. **1**.

The grippers **76** and **78** below the hopper **72** and the grippers **80** and **82** below the hopper **74** are normally disposed inwardly toward each other just sufficiently to prevent the stack of base elements **16** stored therein from falling through the bottom. When a platen **28** has moved into the first station the timing mechanism **33** actuates the air piston cylinders **84** and **86** to move the movable grippers apart so that the stack of base elements will move downwardly and rest on the resilient suction cups **94** and **96** carried by the crosshead **92**. At this time a vacuum or suction is applied to the cups through the conduits **94***a* and **96***a* causing the cups to attach by suction to the lowermost base element in the stack. At this point the air cylinders **84** and **86** are again actuated to move the movable grippers **78** and **82** toward the fixed grippers **76** and **80**, gripping the edges of the package base elements in the two hoppers **72** and **74**.

The air cylinder **90** then is actuated (reversed) to retract the operating arm **90***a*, drawing the crosshead **92** and the suction cups **94** and **96** downwardly with the lowermost base elements **16** in the two stacks **72** and **74** attached thereto. Thus, the lowermost base elements will be stripped from the stack, and the rest of the base elements in the stack will be held in position by means of the grippers. At this point the bar **88** is rotated by means of the rotary actuator **100** moving the two base elements to a position above the package-holding elements **42** and **44** on the platen in the first station. This position is illustrated by broken lines in FIG. **8**. The cylinder **90** is then actuated to extend the operating arm outwardly and position the base elements **16** on the package-holding elements of the platens, and at this time the vacuum in the cups **94** and **96** is released by suitable valving mechanisms (not shown). In fact, a slight positive pressure may be applied to the conduits **94***a* and **96***a* in order to assure separation of the base elements from the suction cups. The cylinder **90** is then reversed to retract the arm **90***a* and crosshead **92**. The rotary actuator **100** is reversed to return the bar **88** and the crosshead **92** to its original position illustrated in FIGS. **7** and **8**, and the cylinder **90** is operated to extend the crosshead and cups **94** and **96** upwardly into position for attaching to the next base elements in the hoppers **72** and **74**. The platen **28** with the two base elements **16** being carried thereon is then indexed to the next station.

At the next station there may be a coding mechanism **56**, although this is optional with the user of the machine. Frequently it is desirable to stamp on the package a code indicating perhaps the date or other identification of the packaging run. The illustrated coding mechanism shown in FIG. **1** includes two standard endless band stamping devices **104** such as are commonly used in offices for stamping dates. The handle of each stamping device is operatively connected to the operating rod **105** of an air cylinder **106**, the air cylinder being mounted on a support **107** attached to the apparatus frame **30**. The cylinder **106** and stamping devices **104** may be operated by means of the timing mechanism **33**. The platen **28** with the stamped elements **16** carried thereon is then indexed to the next station.

The next station is preferably the product loading station where a product guide **58** is positioned for guiding the product onto the base element **16**. If desired, an automatic mechanism may be utilized for placing the stack of meat or other product which is being packaged onto the base element **16** of the package. However, in the illustrated embodiment this is done manually as best illustrated in FIG. **2**. Two auxiliary conveyors **108** and **109** may be employed for this purpose, these auxiliary conveyors being located on opposite sides of the apparatus **10**. The platen **28** with the two base elements thereon is indexed to and comes to rest in the loading station in underlying alignment with a product guide **58**. The product guide **58** includes two identically constructed sections **58***a* and **58***b*. Each guide section may be formed of sheet metal having three integral vertically extending sides including a pair of spaced, parallel,longitudinally extending sides **110** and **112** and a transverse side **111** which extends between and interconnects the sides **110** and **112**. Each guide section is thus open along its top, bottom and downstream sides. A web **113** connects the side **110** of each guide section to the apparatus frame **30**. The spacing between the sides **110** and **112** of each product guide section is just sufficient to accommodate the product which in this case is a stacked meat product. The operator simply inserts the meat stack into the guide section and onto the underlying base element **16**. The two product guide sections **58***a* and **58***b* are shown in transverse alignment; however, if desired these may be positioned in longitudinally staggered relation, in which case there would be two consecutive product loading stations, one for one side of the platen **28** and the other station for the other side of the platen. Whether staggered or aligned the sections may be interconnected if desired, although in the illustrated embodiment they are separate.

The product alignment mechanism **60** located at the next operating station of the platen is shown in detail in FIGS. **9** through **12**. In the illustrated embodiment the product alignment mechanism **60** includes a mechanism frame **116** comprising a rectangular support structure **118** and two pairs of depending posts **119** and **120** which are fixed to the apparatus frame **30**. The rectangular support structure **118** includes a pair of transverse members **122** and **124** which are interconnected by means of longitudinal members **126** and **128**, the longitudinal members being supported on the post pairs **119** and **120**, respectively. Mounted atop the support structure **118** between the transverse members **122** and **124** is a plate **130** on which is mounted an air cylinder **132**. The operating

shaft or piston rod **134** of the cylinder **132** extends downwardly through the plate **130**, and a subframe **136** is affixed to this shaft, so that the cylinder **132** may be operated in one direction to raise the subframe **136**, and in the other direction to lower the subframe.

Attached to and depending from the subframe **136** are two guide boxes **138** and **140** which support the guide two product alignment devices **142** and **144** of the product alignment mechanism **60**. Two alignment devices are required for the illustrated embodiment of the invention in view of the fact that two packages are being assembled on each platen **28** simultaneously. The two product alignment devices **142** and **144** are identically constructed. Each device includes a first pair of spaced, parallel, vertically disposed, relatively movable product-engaging plates **146** and **148** and a second pair of spaced, vertically disposed, relatively movable product-engaging plates **150** and **152** which are parallel to each other and are perpendicular to the first pair of plates. Since the illustrated product **12** is a rectangular stack having two pairs of parallel vertical sides, the product-engaging plates in each pair of plates **146** and **148**, and **150** and **152**, are also parallel. If the product **12** were round, the plates could be arcuate and perhaps only one pair of plates would be required for alignment. As a practical matter, however, the plates do not have to conform to the shape of the product. All that is necessary is that they conform to the size of the product, and this is a matter of simple adjustment as will be described. Thus the present arrangement of plates will handle both round and rectangular shaped products.

The plate **146** of the first pair of plates is connected to a horizontal bar **154** by means of the vertical arms **155**, and the plate **148** is connected to a horizontal bar **156** by the vertical arms **157**. The bars **154** and **156** are parallel to each other. In like manner, plate **150** of the second pair of product-engaging plates is connected to a bar **158** by means of vertical arms **160**, and the product-engaging plate **152** is connected to the bar **162** by means of the depending arms **163**. Each of the product alignment devices **142** and **144** is operated by a pair of air cylinders **164** and **166**. The air cylinder **164** is connected to the bar **156** from which the product-engaging plate **148** depends, and the air cylinder **166** is connected to the bar **158** from which the product-engaging plate **150** depends.

The interconnection of the bars from which the pairs of product-engaging plates depend is best illustrated in FIG. **10A**. The guide box **138** which is illustrated in FIG. **10A** has side portions **138***a*, **138***b*, **138***c* and **138***d*. As previously stated the air cylinder **166** connected to the bar **158** has a piston rod **168** which extends through an aperture **158'** in the bar. The piston rod also extends through an aperture **138***a'* in the side **138***a* of the guide box, and through an aperture **138***c'* in the opposite wall **138***c* of the guide box. The end of the operating arm **168** is connected to the bar **162**. A pair of guide rods **170** and **172** are also provided. The guide rod **170** is affixed to the bar **162** and extends through and is disposed for sliding movement within apertures in the side walls **138***c* and **138***a* of the guide box and an aperture in the bar **158**. In like manner the guide rod **172** affixed to the bar **158** extends through and is disposed for sliding movement within apertures in the side walls **138***a* and **138***c* of the guide box and an aperture in the bar **162**.

The transverse parallel sides **138***b* and **138***d* of the guide box **138** are similarly apertured for slidingly accommodating the piston rod **174** of the cylinder **164** and the guide rods **176** and **178**. The air cylinder **164** is connected to the rod **156**, and the piston rod **174** of that cylinder is connected to the rod **154**. The guide rods **176** and **178** are respectively connected to the rods **154** and **156**.

Each of the operating rods and guide rods carries a stop which may be in the form of a turned shoulder and which is larger in diameter than the apertures in the guide box side walls. Thus the stop **180** is carried on the piston rod **168**, the stop **181** is carried on the guide rod **170**, and the stop **182** is carried on the guide rod **172**. In like manner the stop **184** is carried on the piston rod **174** of the air cylinder **164**, the stop **185** is carried on the guide rod **176**, and the stop **186** is carried on the guide rod **178**. The location of the stops on the rods governs the position of the movable members in their open and closed positions. The stops **180** and **184** on the piston rods of the air cylinders **166** and **164** govern the position of the bars **158** and **162** and the bars **156** and **154** in their closed positions illustrated in FIG. **12**, where the product-engaging plates are in engagement with the product **12** on the package base plate **16**. In similar manner the stops **181** and **182** on the guide rods **170** and **172** and the stops **185** and **186** on the guide rods **176** and **178** will govern the position of the bars and the product-engaging plates in the open position illustrated in FIG. **10**. While these stops can be made to be adjustable it is preferred that any adjustment be made by means of spacer elements **188** between the product-engaging plates and their vertical arms. The location of the stops is preferably such that when the product-engaging plates are in their open position, they will align with the outer extremity of the marginal groove **22** in the package base element **16**, and when these plates are in their closed position they will just slightly compress the product **12**.

As previously stated the subframe **136** which carries the two alignment devices **152** and **144** is moved upwardly and downwardly on the piston rod **134** of the cylinder **132**. Affixed to and extending vertically upward from the movable subframe **136** in spaced parallel relationship with the piston rod **134** of the cylinder **132** is a rod **190**. The rod **190** extends through an aperture in a plate **192** affixed to the mechanism frame **116** above the subframe **136**. The sliding movement of the vertical rod **190** in the aperture of the plate **192** thus serves to guide the vertical movement of the subframe.

Means is preferably provided on the alignment mechanism **60** for pressing the base element **16** flat on the package-holding elements **42** and **44** while the product is being centered or aligned. Affixed to the subframe **136** are two extension plates **194** and **196**. Affixed to and depending from the plate **194** is a bar **198** (see FIG. **9**), and at the lower end of this bar is a coil spring **200**. The bar **198** and coil spring **200** are vertically aligned with the spike **52** on the package-holding element **44**. In like manner a bar **202** is affixed to and depends downwardly from the extension plate **196** and carries a coil spring **204** at its lower end. The bar **202** and coil spring are vertically aligned with the spike **52** on the package-holding element **42**. The coil springs **200** and **204** are adapted to be moved over the spikes **52** and to resiliently press the flanges **23** of the base elements **16** flat on the package-holding elements **42** and **44** when the subframe is moved downwardly to its lowered position as illustrated in FIG. **12**. This insures proper placement of the two package base elements **16** while the two products are being centered thereon by the mechanism **60**.

The dimensions of the parts of the alignment mechanism **60** and length of the stroke of the piston rod **134** are such that when the subframe is in its raised position (as in FIG. **10**), the product-engaging plates will be above the level of the product **12** as the package base element **16** and the product are moved into the alignment station on the platen **28**, and when the subframe is in its lowered position (as in FIG. **12**) the plates will be spaced just above the package base element **16** so that all slices or portions of the product **12** will be engaged during alignment.

In operation, when the platen with the product such as a sliced meat or cheese on the package base element **16** is moved into position beneath the product alignment mechanism **60**, this mechanism is actuated by the timer **33** which operates an air control unit **205** (such as a solenoid valve) operatively connected to the pressure tank **98** (see FIG. **1**). The air control unit first actuates the cylinder **132** to move the piston rod **134** and the subframe **136** downwardly. As the product-engaging plates **146**, **148**, **150** and **152** of each of the product alignment devices **142** and **144** carried on the subframe **136** approach the platen **28**, the springs **200** and **204** will press the flanges of the base elements **16** over the spikes **52**, flattening and assuring proper alignment of the base ele-

ments on the package-holding elements **42** and **44**. When the subframe reaches the position illustrated in FIG. **12**, the cylinders **164** and **166** of each of the product alignment devices **142** and **144** are actuated (also by means of the timer **33** and control unit **205**), causing the product-engaging plates to move inwardly toward each other to engage the product on the package base element **16**.

It is preferred that the cylinders **164** and **166** be cycled twice, that is, actuated in each direction twice, so that the product-engaging plates will engage the product twice, because it has been found that the best alignment of the product is accomplished in this manner. This is particularly true of a sliced meat or cheese product where it may not only be necessary to align a product on the base element **16**, but it may also be necessary to make sure that all of the slices are aligned with one another. After the product-engaging plates have moved inwardly twice, the cylinder **132** is actuated in the opposite direction to raise the subframe and the product alignment devices **142** and **144**. The platen **28** is then indexed by the conveyor mechanism **32** to the next station which is the cover loading station.

The cover element loading mechanism **62**, best shown in FIG. **1**, is preferably constructed exactly like the base element loading mechanism **54** previously described and illustrated in FIGS. **7** and **8** of the drawings. Since, however, the configuration of the cover element **18** is slightly different from the base element, the stroke of the cylinder **206** will be slightly longer, and the hoppers and gripping elements may be slightly different to accommodate the difference in shape of the cover elements. The operation of the cover element loading mechanism **62** is by the timer **33**; however, in addition to the timer it is preferred that photoelectric sensing units **208** be employed to detect the presence of product on the base elements **16** carried by the package-holding elements **42** and **44** of the platen. Each sensing unit is of standard construction employing a light source and a photocell. If desired, two photoelectric units **208** may be employed for this purpose so that the cover element loading mechanism will only deposit one cover element **18** if there is only one product stack on the platen. Thus the suction lines to the suction cups could be individually controlled by a respective one of the photoelectric units. It also may be desired to employ vacuum switches **210** in the line to the suction cups to sense whether a cover is actually in contact with the vacuum cup. If no cover is transported by the cover element loading mechanism **62**, then the vacuum switch would shut off the machine at the end of the cycle, and the platen would not index. In such case a suitable warning such as a bell, buzzer or light could be controlled by the vacuum switch **210**. The same type of vacuum switch control may be employed with the base element loading mechanism **54** to signal when either or both of the vacuum cups **94** and **96** are not in contact with a base element **18** when the suction is applied through the lines **94***a* and **96***a*.

The cover element loading mechanism **62** is adapted to place a cover element **18** over the stacked and aligned product **12** on the base element **16** with the lower depending edges of the cover element in close proximity with the corresponding peripheral edges of the base element **16** as previously described. The cover element loading mechanism **62** loosely applies the cover so that there is no hermetic seal between the base and cover elements at this stage of the assembly operation.

Following delivery of the cover element by the cover element loading mechanism **62**, the conveyor **32** is indexed to the next station which is the sealing station, and in passing from the cover element loading mechanism **62** to the sealing mechanism **64** at the sealing station, the loosely assembled package elements will pass in front of a second set of photoelectric detection units **209**. Again, if desired, there may be more than one such unit **209** in order to detect the presence of the package on each of the package-holding elements **42** and **44** of the platen.

The sealing mechanism **64** is illustrated schematically in FIG. **1** and in more detail in FIG. **13** with parts thereof being shown in FIGS. **14** and **15**. This mechanism includes a pair of vertical posts **211** and **212** fixed in sockets **214** and **216**, respectively, the sockets **214** and **216** being welded or otherwise firmly anchored to the apparatus frame **30**. Mounted for sliding vertical movement on the posts **211** and **212** is a bell housing **218**. In the illustrated embodiment the bell housing **218** is formed in two parts, a top part **218***a* and a lower part **218***b*, the two parts being joined together by means of suitable bolts or the like not shown in the drawings. The lower portion **218***b* of the housing is a rectangular annulus having slightly smaller dimensions than the platen **28**. Thus the housing **218** is concave and adapted to fit over the central portion of the platen **28** where the package-holding elements **42** and **44** are mounted. The lower edge of the lower portion **218***b* of the bell housing has a resilient seal **220** which when the bell housing is lowered onto the platen **28**, will peripherally engage the platen and effect an airtight seal between the platen and the housing. When lowered into the position illustrated in FIG. **13** the bell housing **218** and the platen **28** form a vacuum chamber **222** surrounding the package-holding elements **42** and **44**, and the package elements **16** and **18**, and product **12** which has been placed therebetween.

The bell housing **218** is rigidly connected to a carriage plate **224** by means of suitable structure such as the vertical braces **226**. The plate **224**, in turn, is connected to the piston or operating rod **228** of a fluid cylinder **230** illustrated in FIG. **1**. The fluid cylinder **230**, in turn, is affixed to a stationary plate **231** which is attached to the posts **211** and **212** near the tops thereof. Mounted atop the bell housing **218** between the bell housing and the carriage plate **224** are two fluid cylinders **232** and **234**. The piston rods **232***a* and **234***a* of these cylinders extend into the interior of the housing upper portion **218***a* through the cylinder end portions **237** and **236**, respectively. The seal between the respective cylinder end portions **236** and **237** and the housing upper portion **218***a* is such that there is no passage of air therebetween even under conditions of relatively high vacuum within the concavity of the housing **218**.

Within the concavity of the housing **218** are two sealing devices **238** and **239**. The sealing device **238** is disposed to the left as viewed in FIG. **13** (looking upstream of the conveyor), this device being connected to the piston rod **234***a* of the cylinder **234**. The sealing device **239** is disposed to the right in FIG. **13** and is connected to and operated by the piston rod **232***a* of the cylinder **232**. The sealing device **238** includes a substantially rectangular ring holder **240** having a top portion **240***a*, a depending skirt portion **240***b* and a central concavity **240***c*. The ring holder **240** is operatively connected to the piston rod **234***a* of the fluid cylinder **234** by means of an attaching rod **242** having a head portion **244** and a shank portion **246**. The rod shank portion **246** extends upwardly through the ring holder top **240***a*, a two-piece spherical self-aligning washer **248**, and a tightening nut **249**. The upper end of the rod **242** extends into and is locked in a connector **250** by means of a pin **252**, the connector, in turn, being affixed to the output shaft **234***a* of the hydraulic cylinder **234** by means of a pin **254**.

Affixed to the skirt portion **240***b* of the ring holder **240** and extending downwardly therefrom is a pressure ring **256**. Attached to the inside of the pressure ring **256** are four cover element centering plates **257**, **258**, **259**, and **260** shown in FIG. **14** of the drawings. The pressure ring **256** is illustrated in FIG. **15** of the drawings.

The pressure ring holder **240** carries a roller **262** disposed within the guideway **264** of the I-shaped guide member **266** as shown in FIG. **13**. Disposed within the central concavity **240***c* of the ring holder **240** is a knockout member **268** which is affixed to the upper portion **218***a* of the bell housing by suitable fasteners **270** and spacers **272** which extend downwardly from the upper portion of the bell housing **218***a* into the concavity defined by the rectangular annular lower portion **218***b* of the bell housing. The knockout **268** which is thus fixed to the

housing **218** has a top recess **268***a* for accommodating the head portion **244** of the ring holder attaching rod **242** which is attached to and reciprocates with the piston rod **234***a* of the cylinder **234**.

On the right-hand side of the bell housing cavity **222** (as viewed in FIG. **13**), the sealing device **239** is connected to and carried by the piston rod **232***a* of the cylinder **232**. The corresponding parts have been given prime numbers corresponding to the parts of the sealing device **238** just described. Thus, for the sealing device **238** the ring holder **240'** is connected to the output shaft **232***a* by means of an attaching rod **242'** having a head portion **244'** and a shank portion **246'** which extends through the ring holder top portion **240***a'*, through a two-piece self-aligning washer **248'**, a tightening nut **249'** and into a connector **250'**. A pin **252'** locks the upper end of the rod **242'** within the connector **250'**, and a pin **254'** locks the connector **250'** to the piston rod **232***a* of the cylinder **232**. The ring holder **240'** has a depending skirt portion **240***b'* which carries a pressure ring **256'** and a set of centering plates (only plates **257'** and **259'** being shown in FIG. **13**). A roller **262'** attached to the ring holder **240'** is disposed within the vertical guideway **264'** of the I-shaped guide member **266**.

In the upper portion **218***a* of the housing is a manifold **274** to which a conduit **276** is connected. The conduit **276**, in turn, is connected to a valve **278** controlled by the timer **33** (see FIG. **1**). In one position of actuation the valve **278** connects the conduit to the vacuum tank **102**, and in the other position of actuation the valve connects the conduit to the pressure tank **98**. If desired, two separate valves may be employed, a vacuum valve for controlling air evacuation from the chamber and an air vent valve for controlling restoration of pressure within the chamber.

From the foregoing it will be apparent that the housing **218** with the sealing devices **238** and **239** carried therewithin is raised and lowered by actuation of the fluid cylinder **230** which raises and lowers the carriage plate **224** rigidly connected to the housing. The sealing devices **238** and **239** within the housing cavity are operated by means of the cylinders **234** and **232**, respectively.

It is preferred that the photoelectric detection units **209**, located just upstream from the sealing mechanism **64**, be utilized in conjunction with the timer **33** to control the operation of the cylinders **232** and **234** of the sealing mechanism.

When the housing **218** is first lowered into sealing engagement with the platen **28**, both sealing devices **238** and **239** will be in their vacuum or raised positions. The housing is lowered just sufficiently to obtain a face seal between the resilient peripheral seal **220** and the platen **28**. When the vacuum is drawn, the platen **28** will actually be raised slightly, increasing the seal at the periphery of the housing and removing the loading on rollers **38**. If the unit **209** has detected a package on only one of the package element holding means **42** or **44**, only the particular sealing device **238** or **239** as the case may be will be lowered to effect sealing of the package elements.

In the illustrated embodiment there are package elements on the holding means **44**, but there is not package on the holding means **42**. Consequently, the sealing unit **239** has remained in its raised or vacuum position while the sealing unit **238** has been lowered to its sealing position to effect sealing of the package elements.

As was previously described the package base element **16** has a marginal groove **22**, and it is preferred that there be a deposit of pressure-sensitive adhesive in this groove. It is the function of the pressure ring **256** to force the side wall of the package cover element **18** downwardly into engagement with the deposit of adhesive in the marginal groove of the base element **16**, thereby effecting a hermetic seal between the two package elements. When the package elements **16** and **18** are first moved into the sealing station and the housing **218** is lowered into sealing engagement with the platen **28**, these two elements are not hermetically sealed, and when the vacuum is drawn in the chamber **222**, a vacuum condition will be formed not only on the outside of the package elements but also on the inside of the package which is being formed. Thus, the sealing units **238** and **239** are in the raised or vacuum position when the vacuum is first drawn. After the vacuum has been drawn, if the detection means **209** has detected the presence of a package on both of the package element holding means **42** and **44**, then both of the sealing devices will be actuated to move the pressure rings **256** and **256'** downwardly and force the bottom of the side wall **26** of each of the two cover elements **18** into the marginal groove **22** of their respective base elements **16**, thereby effecting a hermetic seal under vacuum conditions.

As the pressure ring **256** is moved downwardly the centering plates **257–260**, which will just accommodate the cover element **18**, assure that the cover element is precisely aligned with the pressure ring **256** and with the package element holding means **42** and **44**. The centering plates are slightly tapered at their leading edge, and should the cover be off-center slightly, the leading edge will engage the cover element **18** and cam it into a precisely centered position, thereby assuring the alignment of the side wall **26** of the cover element with the marginal groove **22** of the base element and assuring proper sealing of the two elements when the pressure ring is in its lowered position. Precise alignment between the package base element **16** and the package cover element **18** is accomplished by a combination of the holding means **42** and **44** (which position the base element **16**) and the centering plates **257–260** (which align the cover element **18**).

As has been stated, the pressure ring **256** is brought downwardly as a vacuum condition is maintained within the chamber **222**. Once the package has been sealed the sealing devices **238** and **239** are returned to their raised position, and the vacuum is released within the chamber **222** to bring the pressure within the chamber at least to ambient. This vacuum release may be accomplished by venting the interior of the chamber to the atmosphere, but in order to speed the operation of the machine it is preferred that this be pressure vented by connecting the conduit **276** to the air pressure tank **98** through the valve **278** or a separate air vent valve. The venting of the chamber to restore ambient pressure may be done immediately after sealing the package elements without waiting for the sealing devices to be raised.

If desired, the system may employ a gas flush by providing for the injection of, for example, an inert gas into the chamber **222** after the vacuum has been drawn and before sealing the package elements. Thus, in effect, the chamber and the package are flushed with the inert gas. This may be desirable for some products including certain food products, and for greatest efficiency a separate gas inlet could be provided in the housing **218**.

After the pressure ring has been moved downwardly to effect sealing of the package elements as has been described there may be a tendency in view of the rather tight fit between the centering plates **257–260** and the cover element **18** for the package to retract with the sealing device **238** and be lifted off of the package element holding means **44**. However, this is prevented by the knockout device **268** which remains stationary and prevents the package from moving upwardly into the cavity when the pressure ring and sealing plates are raised to their initial retracted position. The knockout **268**, in effect, strips the package from the pressure ring and centering plates, and the package thus remains on the package element holding means **44**.

When the chamber **222** has been brought at least to ambient and preferably slightly pressurized the housing **218** may be raised by actuation of the cylinder **230**. The conveyor with the sealed package or packages thereon is then moved to the final operating station which is the unloading station.

The unloading mechanism **66** is best illustrated in FIGS. **16**, **17** and **18**. This mechanism includes a horizontal shaft **280** journaled in two supports **282** and **283** having bases **282***a* and **283***a* which are adjustably connected to the frame **30** of the apparatus by means of suitable threaded connectors or bolts **284**. One end of the horizontal shaft **280** is connected to a fluid operated rotary actuator **286**.

Adjacent the rotary actuator **286** the horizontal shaft **280** carries a first or inner collar **288** fixed to the shaft by means of a set screw **290** (see FIG. **18**). The collar carries a pin **202**. Surrounding the inner collar **288** is a second or outer collar **294** having a slot **295** therein. The fit between the inner collar **288** and the outer collar **294** is such that free rotation is permitted between these with the pin **292** carried by the inner collar **288** disposed within the slot **295** of the outer collar **294**. This, in effect, is a lost motion connection between these two collars. Affixed to the outer collar **294** is an arm **296** which extends upwardly between two resilient abutments **298** and **299** affixed to the support **283**. From this it is apparent that the rotation of the shaft **280** is limited by the length of the slot **295** in the outer collar **294**. It will be noted that the slot **295** extends approximately 180° so that the shaft **280** will be permitted to rotate approximately 180°. The resilient abutments **298** and **299** serve as cushions to absorb the shock when the shaft **280** is stopped at the end of the 180° swing.

Mounted on the horizontal shaft **280** are two telescopingly adjustable arms **300** and **302**. The end **300***a* of the arm **300** is locked in its adjustment position by means of a lock nut **300***b*, and the end **302***a* of the arm **302** is locked in its position of telescoping adjustment by means of a lock nut **302***b*. Journaled in the ends **300***a* and **302***a* of the arms **300** and **302** is a bar **304** which carries a pair of suction cups **306** and **308**. The suction cups are connected by means of suction lines **306***a* and **308***a* to the vacuum tank **102** illustrated in FIG. **1**. Keyed to the end of the bar **304** is a pulley **310**, and a similar pulley **312** of the same diameter is affixed to the support **282** as illustrated in FIGS. **16** and **17**. Extending around the pulleys **310** and **312** is a wire **314**. As the bar **304** is swung in the counterclockwise direction from the dotted line position to the solid line position, as illustrated in FIG. **17**, the pulley **312** will remain stationary while the pulley **310** and the bar **304** will be rotated at the same rate in the clockwise direction. Thus the bar **304** will maintain its orientation with respect to the horizontal, and the suction cups **306** and **308** will remain vertically disposed. This arrangement assures that the packages **14** will remain horizontally disposed as they are lifted from the platen **28** and swung onto the auxiliary or take-off conveyor **68**. The operation of the rotary actuator **286** and of the suction cups **306** and **308** is preferably controlled by means of suitable valves such as the valve mechanism **278** which in turn is controlled by the timer **33**.

In operation, when the platen is moved to its final station as illustrated in dotted lines in FIG. **17**, the suction cups **306** and **308** are moved downwardly to engage the cover tops **24** of the two packages **14** which have just been assembled and sealed. A suction is then applied through the lines **306***a* and **308***a* (see FIG. **6**), and the fluid operated rotary actuator **286** is actuated for counterclockwise rotation as viewed in FIG. **17** so that the arm **304** moves in the direction of the arrows in that figure. The arm is swung from the dotted line position to the solid line position as shown in FIG. **17**, the package and the suction cups maintaining the same orientation throughout this swinging movement as previously described. When the arm **296** engages the right-hand adjustable abutment **298** the package **14** will be just above the take-off conveyor **68** as illustrated in FIG. **17**. At this point the suction is released either by valving the lines **306***a* and **308***a* to the atmosphere or connecting them to the pressure tank **98** through a valve such as valve **278**, thereby releasing the package onto the take-off conveyor **68**. The apparatus **10** is thus adapted to package a product quickly, easily and efficiently in a preformed two element package.

It is to be understood that the present disclosure has been made only by way of example and that many modifications and changes in various details may be readily apparent to those skilled in the art. For example, the operation of the various cooperating mechanisms is preferably accomplished by air cylinders as has been described. It would, however, be entirely within the scope of the invention if the power were supplied hydraulically or in some instances even electrically by means of solenoids. Additional changes in the structural details and arrangement of parts may be resorted to without departing from the invention.

What is claimed is:

1. An apparatus for vacuum packaging of a product in a two element package consisting of a preformed rigid base element and a preformed rigid cover element, said apparatus comprising at least one platen, means on said platen for holding the package elements in substantially aligned superposed relation on a predetermined portion of said platen, said holding means including a plurality of upstanding members spaced to engage peripheral portions of the package elements to restrict the lateral movement of the package elements with respect to said platen, a concave housing, means for moving said housing into sealing engagement with said platen surrounding said holding means, whereby said housing concavity and said platen define a package-accommodating vacuum chamber, means for applying a vacuum to said vacuum chamber, an annular sealing member carried by said housing within said concavity, said sealing member being normally held in an upwardly disposed retracted position, and power means for moving said sealing member downwardly toward said platen while said housing is in sealing engagement with said platen, whereby the peripheral portions of said package elements may be forced into sealing engagement while a vacuum is being applied to said chamber.

2. The apparatus of claim **1** wherein said holding means further includes a protuberance positioned to extend through a correspondingly positioned aperture in at least one of the package elements.

3. The apparatus of claim **1** wherein said holding means further includes a plate affixed to said platen, and a resilient cushion on said plate.

4. The apparatus of claim **3** wherein said cushion has a raised central portion and recessed peripheral portions for accommodating the peripheral portions of said package elements when they are forced downwardly by said sealing member.

5. The apparatus of claim **1** wherein there are a plurality of platens, and means is provided for moving said platens sequentially into and through a plurality of operating stations including a sealing station in which each platen is positioned for sealing engagement with said housing.

6. The apparatus of claim **1** and further including means for supplying gas to the vacuum chamber at greater than atmospheric pressure after the peripheral portion of the package elements have been forced into sealing engagement by said sealing member.

7. The apparatus of claim **1** wherein said sealing member carries a plurality of tapered inwardly disposed elements for engaging and centering the cover element with respect to the base element as said sealing member is moved downwardly toward said platen.

8. The apparatus of claim **1** and further including means disposed interiorly of said sealing member and connected to said housing for dislodging the package elements from said sealing member when said sealing member is returned to its retracted position.

9. The apparatus of claim **5** wherein horizontal guide means is provided for maintaining said platens in a substantially horizontal orientation as they are moved into and through said operating stations, and vertical guide means is provided for guiding said platens along a substantially straight path.

10. The apparatus of claim **1** wherein on each platen there are a plurality of means for holding the package elements, whereby a plurality of packages may be assembled and sealed on each platen simultaneously.

11. An apparatus for vacuum packaging of a product in a two element package consisting of a preformed relatively flat rigid base element and a preformed inwardly concave rigid cover element, one of said package elements carrying an adhesive whereby when the package elements are pressed together an hermetic seal will be formed therebetween; said apparatus comprising a plurality of platens, means adapted to

move said platens sequentially along a predetermined path through a plurality of operating stations, each of said platens having package element holding means thereon adapted to receive and hold the package elements in substantially aligned superposed relation on a predetermined portion of the platen, first package element placement means for placing a base element on said package element holding means at a first station, means for guiding the product into position on the base element at a second station, second package element placement means for placing a cover element over the product and base at a third station, a concave housing, means for moving said housing into sealing engagement with said platen surrounding said package element holding means at a fourth station, whereby said housing cavity and said platen define a package-accommodating vacuum chamber, means for applying a vacuum to said vacuum chamber, an annular sealing member carried by said housing within said concavity, said sealing member being normally held in an upwardly disposed retracted position, and power means for moving said sealing member downwardly toward said platen while said housing is in sealing engagement with said platen, whereby the peripheral portions of said package elements may be forced into sealing engagement while a vacuum is being applied to said chamber.

12. The apparatus of claim 11 and further including product alignment means intermediate said product guiding means and said cover placing means for aligning the product on the base element.

13. The apparatus of claim 11 wherein at least one of said package element placement means includes means above said conveyor at the associated station for holding a stack of package elements, an arm mounted for movement relative to said frame and carrying package element attachment means for engaging and releasably attaching to the lowermost package element in the stack, means for moving said arm first to effect removal of the attached package element from the stack and then to effect movement of the package element onto said package element holding means.

14. The apparatus of claim 13 wherein said arm is pivotally mounted on said frame and is movable first radially inwardly to effect removal of the attached package element, then is pivotally moved to a position above said holding means and then is moved radially outward to place the package element in said holding means.

15. The apparatus of claim 13 wherein said means carried by said arm for engaging and releasably attaching to the lowermost package element in the stack is a resilient cup, and means is provided for drawing a vacuum within said cup when said cup is in engagement with the lowermost package element in the stack and for releasing the vacuum when that package element has been moved onto said package element holding means.

16. The apparatus of claim 12 wherein said product alignment means includes a subframe, at least two product engaging members mounted on said subframe for limited movement toward and away from each other, and means for moving said subframe from a raised position above said package element holding means to a lowered position within said package element holding means whereby when said members are moved toward each other they will engage and align the product on the base element within said holding means.

17. The apparatus of claim 12 wherein there are two package element holding means on each platen, and said product alignment means includes a subframe, at least two sets of product alignment plates carried by said subframe, each set comprising two pairs of plates, the plates in each pair being substantially parallel and relatively movable with respect to one another, the pairs of plates in each set being disposed substantially perpendicular with respect to one another, means for moving said subframe from a raised position above said package element holding means to a lowered position, and means for moving the plates in each set toward each other to substantially simultaneously engage and align the products on the base elements within said two package element holding means.

18. The apparatus of claim 17 wherein said product alignment means includes two pairs of product engaging members, said pairs being mounted on said subframe for transverse movement with respect to each other, whereby the product may be aligned on four sides.

19. The apparatus of claim 11 and further including means for removing the sealed package from said platen after said platen has moved from the sealing station.

20. The apparatus of claim 19 wherein said means for removing the sealed package from said platen includes at least one suction cup, means for moving said suction cup between two locations, and means for applying a suction to said suction cup in one location and releasing it in the other location, whereby said suction cup may attach to the package in said one location and the package may be transported to and released in said other location.

21. The apparatus of claim 19 wherein said means for removing the sealed package from said platen includes a support, an arm mounted on said support for pivotal movement about a horizontal axis, package attachment means mounted on said arm for rotational movement about a horizontal axis, and means for rotating said package attachment means relative to said arm at substantially the same angular rate and in the opposite direction as the pivotal movement of said arm with respect to said support, whereby said package attachment means will maintain substantially the same orientation with respect to the horizontal throughout the pivotal movement of said arm.

22. The apparatus of claim 20 wherein said means for rotating said package attachment means relative to said arm includes a first pulley affixed to said support, a second pulley affixed to said package attachment means, and an endless band encircling said pulleys.

23. An apparatus for vacuum packaging of a product in a package consisting of two rigid package elements, said apparatus comprising a plurality of platens, means for moving said platens sequentially along a predetermined path through a plurality of operating stations, each of said platens having package element holding means thereon adapted to receive and hold the package elements in substantially aligned superposed relation on a predetermined portion of the platen, means for holding a supply stack of each of said preformed package elements and for sequentially transferring said elements from the supply stacks to said platens at predetermined operating stations, a concave housing, means for moving said housing into sealing engagement with said platen surrounding said package element holding means after said package elements have been positioned thereon, whereby said housing cavity and said platen define a package-accommodating vacuum chamber, means for applying a vacuum to said vacuum chamber, an annular sealing member carried by said housing within said concavity, said sealing member being normally held in an upwardly disposed retracted position, and power means for moving said sealing member downwardly toward said platen while said housing is in sealing engagement with said platen, whereby the peripheral portions of said package elements may be forced into sealing engagement while a vacuum is being applied to said chamber.

24. An apparatus for vacuum packaging of a product in a two element package consisting of a preformed relatively flat rigid base element and a preformed inwardly concave rigid cover element; said apparatus comprising a plurality of platens, means adapted to move said platens sequentially along a predetermined path through a plurality of operating stations, each of said platens having package element holding means thereon adapted to receive and hold the package elements in substantially aligned superposed relation on a predetermined portion of the platen, first package element placement means for placing one of said elements on said package element holding means at a first station, means for guiding the product into position with respect to said one ele-

ment at a second station, second package element placement means for placing the other of said elements over the product and said one element at a third station, a concave housing, means for moving said housing into sealing engagement with said platen surrounding said package element holding means at a fourth station, whereby said housing cavity and said platen define a package-accommodating vacuum chamber, means for applying a vacuum to said vacuum chamber, an annular sealing member carried by said housing within said concavity, said sealing member being normally held in an upwardly disposed retracted position, and power means for moving said sealing member downwardly toward said platen while said housing is in sealing engagement with said platen, whereby the peripheral portions of said package elements may be forced into sealing engagement while a vacuum is being applied to said chamber.

25. An apparatus for vacuum packaging of the product in a two element package consisting of a preformed rigid base element and a preformed rigid cover element, said apparatus comprising at least one platen, a plurality of means on said platen for holding the package elements in substantially aligned superposed relation on a predetermined portion of said platen, whereby a plurality of packages may be assembled and sealed on each platen simultaneously, a concave housing, means for moving said housing into sealing engagement with said platen surrounding said holding means, whereby said housing concavity and said platen define a package-accommodating vacuum chamber, means for applying a vacuum to said vacuum chamber, an annular sealing member carried by said housing within said concavity, said sealing member being normally held in an upwardly disposed retracted position, and power means for moving said sealing member downwardly toward said platen while said housing is in sealing engagement with said platen, whereby the peripheral portions of said package elements may be forced into sealing engagement while a vacuum is being applied to said chamber.

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