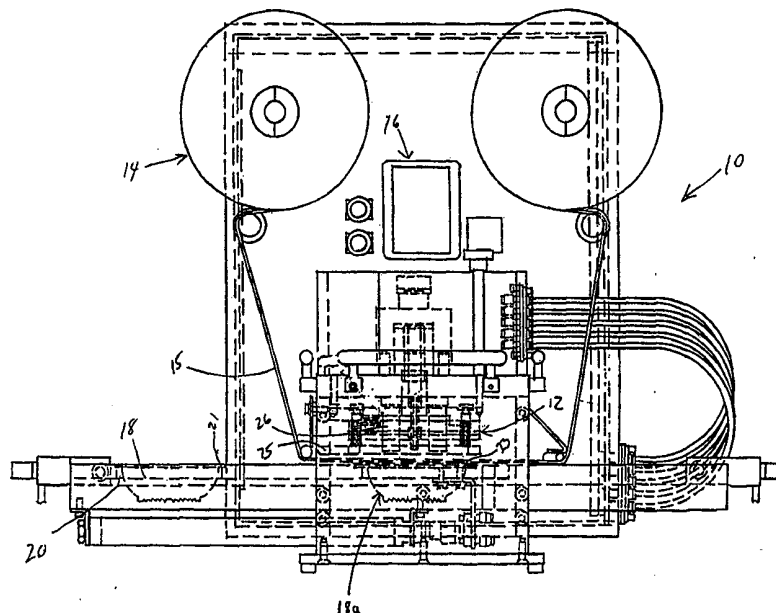




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US99/25498</p> <p>(22) International Filing Date: 29 October 1999 (29.10.99)</p> <p>(30) Priority Data: 09/186,930 6 November 1998 (06.11.98) US</p> <p>(71)(72) Applicants and Inventors: SANFILIPPO, James, J. [US/US]; 807 Plum Tree Road, Barrington Hills, IL 60010 (US). SANFILIPPO, John, E. [US/US]; 707 Plum Tree Road, Barrington Hills, IL 60010 (US).</p> <p>(74) Agent: NICHOLAS, Frank, C.; Baniak Nicholas Pine &amp; Gannon, Suite 2000, 1603 Orrington Avenue, Evanston, IL 60201 (US).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p>

(54) Title: CONTROLLED ENVIRONMENT SEALING APPARATUS AND METHOD



## (57) Abstract

A controlled environment sealing apparatus includes a reciprocating seal head positioned above an intermittent conveyer (20) carrying product-filled trays (18), a film feeder (14) to dispense film between the tray and reciprocating seal head, and at least one seal head gassing assembly (26) positioned in the seal head and oriented to direct a flow of controlled environment gas through a cut-out portion of the film (15) into a product-filled tray (18) positioned beneath the seal head. The seal head gassing assembly (26) may preferably direct a high velocity controlled gas stream surrounded by a lower velocity controlled environment gas stream downward into the tray.

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5 CONTROLLED ENVIRONMENT SEALING  
APPARATUS AND METHOD

10 FIELD OF THE INVENTION

The invention generally relates to a tray sealing apparatus used in sealing plastic film to product filled containers. More specifically the invention relates to an apparatus and method for exposing containers filled with product, including, for example, food product and any product that has an adverse reaction to air, to a controlled environment during the sealing operation.

BACKGROUND OF THE INVENTION

20 Various products including food product, and any other product that has an adverse reaction to air, are packaged in a controlled environment. Various attempts have been made to efficiently package these products in a modified atmosphere using vacuum and/or controlled environment.

25 Various food products, including bakery goods, meats, fruits, vegetables, etc. are packaged under atmospheric conditions. Many of these products are presented in supermarkets, for example, in cartons or cardboard containers with a plastic or cellophane wrap covering the product.

30 One problem with this type of packaging is that the goods have a minimum limited shelf life, which for many products are only several days to a week. With bakery goods, for example, mold may begin to grow after a few days under atmospheric conditions. Such products obviously cannot be sold or consumed and must be discarded.

35 Another problem arises with respect to many fruits and vegetables, which continue to ripen and continue their metabolic process under atmospheric conditions. For example, within a few days a banana can become

overripe and undesirable to the consumer.

The space available for gassing and sealing operations is often limited at many facilities. In general, existing controlled environment sealing systems are often expensive, bulky, and require use of vacuum pumps, and, accordingly are impractical for use at many of these facilities.

In an effort to alleviate these problems, various attempts have been made to package food in a controlled environment by injecting controlled environment directly into filled containers. A high velocity flow is often necessary to penetrate into the food product. In general, these attempts have proved unsuccessful. With bakery goods, for example, the high velocity jets may pull in air and re-contaminate the product, thereby failing to reduce the oxygen to levels that would prevent the normal onset of mold.

Various techniques for removing air in food filling processes are known in the art. Such processes are used, for example, in the packaging of nuts, coffee, powdered milk, cheese puffs, infant formula and various other dry foods. Typically, dry food containers are exposed to a controlled environment gas flush and/or vacuum for a period of time, subsequent to filling but prior to sealing. The product may also be flushed with a controlled environment gas prior to filling, or may be flushed after the filling process. When the oxygen has been substantially removed from the food contents therein, the containers are sealed, with or without vacuum. Various techniques are also known for replacing the atmosphere of packaged meat products with a modified atmosphere of carbon dioxide, oxygen and nitrogen, and/or other gases or mixtures of gases to extend shelf life.

Many existing modified atmosphere tray sealing systems use an indexing conveyer to allow the tray and product to enter into a vacuum chamber and be exposed to reduced pressure, and then sealed within the vacuum chamber. In some applications, inert gas is used to back flush as the pressure is returned to atmospheric. The tray may then be permanently sealed with plastic film, which is heat sealed to the tray flange with a vertically reciprocating seal bar.

One drawback to these existing systems is that the vacuum chambers may be expensive to operate and take up additional space on the line. Other drawbacks in rapid vacuum applications include pulling product into the seal area causing leakers, as well as, the necessity that the lidstock or film must be  
5 extra wide to cover the entire chamber, increasing overall scrap. It would be desirable to have a controlled environment tray sealing system for use with a non-continuous or indexing conveyer system and vertically reciprocating tray sealers that would efficiently seal product within trays.

## 10 SUMMARY OF THE INVENTION

One aspect of the invention provides a controlled environment sealing apparatus comprising a reciprocating seal head positioned above a conveyer carrying product-filled trays, a film feeder to dispense film between the tray and the reciprocating seal head, and at least one seal head gassing  
15 assembly positioned in the seal head and oriented to direct a flow of controlled environment gas through a cut-out portion of the film into a product-filled tray positioned beneath the seal head. The seal head gassing assembly may preferably direct a high velocity controlled environment gas stream surrounded by a lower velocity controlled environment gas stream  
20 downward into the tray positioned below the seal head. A programmable controller may preferably be used to control the timing of the high velocity and low velocity gas flow through the seal head gassing assembly. Preferably, the seal head gassing assembly includes a housing including a low velocity gas inlet opening and a high velocity gas inlet opening. The housing may  
25 preferably include a body and a cap with the inlet openings formed in the cap. A flow guide member is preferably positioned in the body of the housing. The flow guide member preferably includes a low velocity flow opening to communicate with the low velocity gas inlet opening, and includes a high velocity flow opening to communicate with the high velocity gas inlet opening.  
30 The high velocity flow opening of the flow guide member is preferably slotted and communicates with a centrally located high velocity gas orifice, which

extends through the flow guide member. A distribution member may preferably be positioned within the body of the housing and below the flow guide member. The distribution member may preferably include a spout and at least one opening formed therein and surrounding the spout. The spout preferably communicates with the high velocity gas flow and the distribution member opening communicates with the low velocity gas flow. Preferably, the distribution member includes a plurality of openings formed therein and surrounding the spout. A baffle may preferably be positioned between the flow guide member and the distribution member. A gassing element may preferably be positioned in a bottom portion of the housing body. A second gassing element may preferably be positioned in a bottom portion of the housing body. The second gassing element is preferably in contact with the first gassing element to allow a dual laminarized flow of controlled environment gas to exit from the housing body. Preferably the conveyer may be a shuttle plate including two tray openings.

A further aspect of the invention provides a method of operating a controlled environment sealing apparatus. A reciprocating seal head positioned above an intermittent conveyer carrying product-filled trays is provided. At least one seal head gassing assembly is positioned in the seal head. A film feeder to dispense film is also provided. A product-filled tray is conveyed to a position below the seal head. A gas stream is flowed through a cut-out portion of a film dispensed through a film feeder into the product-filled tray positioned beneath the seal head. Preferably, a high velocity stream of controlled environment gas is flowed through the seal head gassing assembly. A low velocity stream of controlled environment gas may also simultaneously be flowed through the seal head gassing assembly. Preferably, the high velocity stream is stopped prior to advancing film from the film feeder. The seal head is preferably next moved downward to seal the film against a flange portion of the tray. As the seal head is moved upward, a top portion of the film is contacted by a simultaneous flow of high velocity gas. A programmable controller may be used to program a timing sequence to

synchronize the high velocity and low velocity gas flow with the conveyer movement, the film advancement and the seal head actuation. Depending on the size of the tray being gassed, a plurality of seal head gassing elements may be positioned in the seal head and controlled environment gas flowed through the seal head gassing assemblies.

A further aspect of the invention provides a controlled environment sealing apparatus comprising a reciprocating seal head, and at least one seal head gassing assembly positioned in the seal head. The seal head gassing assembly includes a housing with a high velocity gas inlet opening and a low velocity gas inlet opening. A spout communicates with the high velocity gas flow, which is supplied through the high velocity gas inlet opening. At least one gassing element communicates with the low velocity flow exiting the seal head assembly, and the low velocity flow surrounds the high velocity flow exiting the seal head assembly. A plurality of seal head gassing assemblies may be positioned in the seal head. A plurality of gassing elements may preferably be positioned to surround the spout and provide a dual laminarized flow. Depending on the application, the seal head gassing assembly may be made of a high or low heat conductive material.

The foregoing and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**FIG. 1** is a side elevational view of a preferred embodiment of a controlled environment sealing apparatus made in accordance with the invention;

**FIG. 2** is a plan view of the embodiment of **FIG. 1** with the seal head, film cut-out and tray shown in phantom;

**FIG. 3** is an enlarged sectional view taken through line 3-3 of **FIG. 2** in the up position;

**FIG. 4** is a partial sectional view of **FIG. 3** in the down position;

**FIG. 5** is an enlarged partial side elevational of the embodiment of **FIG. 1**;

**FIG. 6** is a preferred embodiment of a seal head gassing member made in accordance with the invention;

**FIG. 7** is a top view of a preferred embodiment of a seal station side gassing rail;

**FIG. 8** is a side view of the embodiment of **FIG. 7**;

**FIG. 9** is a sectional view of the embodiment of **FIG. 8**;

**FIG. 10** is a top view of a preferred embodiment of the distribution member; and

**FIG. 11** is a side view of a preferred embodiment of the spout.

#### DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

Referring to **FIGS. 1-5**, a preferred embodiment of a controlled environment sealing apparatus is generally shown at **10**. The sealing apparatus **10** generally includes a tray sealer **12**, a film feeder **14** and a programmable controller **16**. Trays **18** filled with food product travel along conveyer **20** to position the trays **18** beneath the tray sealer **12**. The tray sealer **12** preferably includes a seal head assembly **22**, which receives one or more seal head gassing assemblies **26**. Controlled environment gas is preferably flowed through the seal head gassing assemblies **26** and through a cut-out portion **130** of the film **15** into the tray **18**.

The conveyer **20** may preferably be a manually operated shuttle plate which includes two openings **21, 23** for receiving trays **18, 18a**. While one tray **18a** is being gassed and sealed beneath the seal head assembly the operator may remove the sealed tray and insert a new food-filled tray **18**. As described in U.S. Patent Application No. 08/886,963, the entire disclosure of which is



incorporated herein by reference, the conveyer 20 may alternatively be an intermittent conveyer and the trays 18 are preferably flushed with controlled environment gas using stationary and/or reciprocating gassing rails prior to entering the seal station. Controlled environment gas may include, for  
5 example, inert gas, combinations of gases and other aromas, mists, moisture, etc. used in providing a controlled environment within the sealed trays 18.

Referring to FIG. 3, the seal head assembly 22 may preferably include a seal head 106, mounting plate 108, air cylinder 110 seal head bushing 24, and spring 120. A knife assembly 112 may preferably include knife 114, knife  
10 cylinders 116, knife cross-bar 117, return spring 119, knife base plate 121 and knife frame 123. The seal head 106 preferably includes openings 107 to receive the seal head gassing assemblies 26. The seal head spring 120 may be provided to hold up the seal head during power shut down.

Referring to FIG. 6, the seal head gassing assembly 26 preferably  
15 includes an outer housing 28 including a high velocity gas inlet opening 30, a low velocity gas inlet opening 32, and a manifold opening 34. Preferably, the housing 28 includes a body 36 and a cap 38. The housing body 36 and cap 38 may preferably be made of a rigid durable material. The housing body 36 may preferably have a cylindrical shape. The gas inlet openings 30, 32 are  
20 preferably formed through the cap 38. The housing body 36 includes an inner chamber 29, and the manifold opening 34 is formed through a bottom portion of the body 36. The housing body 36 preferably includes an upper threaded portion 43, which receives a threaded portion 45 of cap 38. A gasket 47 is preferably positioned within the cap 38 to allow the cap 38 to securely seal with  
25 the body 36 to prevent gas leakage. The cap 38 also preferably includes a guide pin 55 (shown in phantom) which extends through the cap 38 and is received in a locator opening 57 formed in a flow guide member 40. The location pin 55 aids in aligning the inlet openings 30, 32 with the openings formed in the flow guide member 40. The cap 38 also includes O-rings 135  
30 which surround inlet openings 30, 32 and allows high velocity and low velocity controlled environment gas supply lines to be securely attached to the seal

head gassing assembly 26.

Referring to FIG. 6, the flow guide member 40, which may also be preferably cylindrical-shaped slidably fits within the chamber 29 formed in the housing body 36. The flow guide member 40 may also preferably be made of a rigid durable material. The flow guide member 40 preferably includes high velocity flow opening 42, which is slotted to communicate with a centrally located high velocity flow orifice 95. Controlled environment gas at high velocities is supplied through high velocity gas opening 30 and flows into high velocity flow opening 42 and through the high velocity flow orifice 95 which extends through the length of flow guide member 40. The flow guide member 40 also preferably includes a low velocity flow opening 44 which communicates at an upper end with low velocity gas opening 32 and communicates at its lower end with a recessed area 46 formed in a bottom portion of the flow guide member 40.

The high and low velocity gas preferably flows through baffle 48. The baffle 48 is preferably circular-shaped and has a diameter approximately the same as an inner diameter of the housing body 36. The baffle 48 may preferably be made of 5-ply, 75 micron stainless steel mesh. Positioned beneath the baffle 48 is a distribution member 49, which preferably includes a center spout 50 which channels the high velocity flow through the seal head gassing assembly 26.

As shown in FIGS. 6 and 10 the distribution member 49 may also preferably include a plurality of distribution openings 52 which receive low velocity gas flow and channel the flow into a recessed area 54 formed in a bottom portion of the distribution member 49. The distribution member 49 may also preferably be made of a rigid, durable material. The distribution openings 52 are positioned to channel the low velocity flow around the centrally located spout 50. The distribution openings 52 are preferably equally spaced and encircle the spout 50. One or more elongated slots may alternatively be used in place of the distribution openings 52. As shown in FIGS. 6, 10 and 11, the distribution member 49 may preferably have a 0.938 inch diameter to allow it to

slidably fit within the chamber 29 of housing body 36. The distribution member 49 preferably includes an opening 51 with chamfered edge 53 to receive spout 50. In the embodiment, shown the distribution openings 52 may have a 0.156 inch diameter and are spaced on a 0.563 inch diameter circle 55 (shown in phantom). The opening 51 may have a 0.1285 inch inner diameter and 0.192 inch outer diameter. The spout 50 may, for the embodiment shown, include the following dimensions: V = 0.055 inch, W = 0.674 inch, X = 0.058 inch, Y = 60 degrees, and Z = 0.192 inch.

In the embodiment of FIG. 6, the seal head gassing assembly 26 may include, for example, the following dimensions: A = 3.222 inches, B = 1.251 inch dia., C = 0.50 inch, D = 2.232 inches, E = 0.813 inch dia., F = 0.957 inch dia., and G = 1.125 inch dia. The seal head gassing assembly 26 is designed for quick removal and disassembly for cleaning purposes. An opening 100 is preferably formed in cap 38 to receive a flat head cap screw 102. Referring to FIG. 5, the cap screw 102 is received in an opening 104 formed in a plate portion 108 of the seal head assembly 22. A notch 97 may be formed in the bottom of the body 36 to allow an operator to quickly remove the seal head gassing assembly 26 with a wrench.

Referring to FIG. 6, the low velocity flow exits the distribution member 49, it most preferably flows through a top gassing element 56 and a bottom gassing element 58, which are positioned to surround the spout 50. The top gassing element 56 may preferably be made of a 5-ply stainless steel wire screen having a hole size of between about 10-100 microns. The top gassing element 56 preferably has an opening 60, which has a diameter larger than the diameter of the spout 50. The bottom gassing element 58 may preferably include an opening 62 formed therein which preferably is substantially the same size as the outer diameter of the spout 50 to allow the spout 50 to pass through the opening 62. The bottom gassing element 58 may preferably be made of a 2-ply stainless steel screen having a hole size of about 80 microns. The top gassing element 56 and bottom gassing element 58 both preferably have a circular-shape with a diameter substantially the same as the inner diameter of

the housing body 36. A perimeter region of the bottom gassing element 58 preferably contacts with a retaining portion 64 of the housing body 36.

As shown in FIG. 6, the spout 50 preferably does not extend below the housing body 36 to avoid damages to the spout 50 during handling and/or other operations. The top and bottom gassing elements 56, 58 may preferably be positioned to provide a dual laminarized flow, which completely surrounds the accelerated or high velocity flow 68 exiting the spout 50. The gas stream from the spout 50 is preferably in the range of, for example, 100-1100 ft./sec., or from 100 ft./sec. up to sonic speeds (speed of sound). The high velocity flow 68 is designed to impinge upon the product 19 within the tray 18. The high velocity flow 68 will preferably penetrate into the product 19 to replace air entrapped within and around the product 19. The lower velocity and preferably laminarized flow surrounding the high velocity flow 68 substantially prevents outside air from being pulled into the tray 18 and/or product 19.

Referring to FIG. 6, a preferred flow profile 65 of controlled environment gas exiting the seal head gassing assembly 26 includes a first or outer region of flow 66 having the lowest velocity (indicated by arrows) because the controlled environment gas passes through both the top and bottom gassing elements 56, 58. Preferably, an inner or second region of flow 67 passes through only the bottom gassing element 58 and has a slightly higher flow velocity. The high velocity flow 68 exiting the spout 50 is accordingly surrounded by the outer region 66 and inner region 67 of flow. Various other flow profiles, which provide for a lower velocity flow 66 surrounding a high velocity flow 68, may also alternatively be created by altering the number of gassing elements and openings formed in the gassing elements. For example, the opening 62 in the bottom screen 58 may alternatively be made slightly larger than the outer diameter of spout 50 to allow a slightly higher velocity than the second region and provide a tri-laminarized flow. In a preferred embodiment, for example, the outer diameter of the spout 50 is 0.125 inch and the opening 62 in the bottom screen is 0.156 inch.

Referring to **FIGS. 1-5**, the programmable controller **16** may be programmed to time the preferred sealing operation. The programmable controller **16** may be any of a number of commercially available computers and/or logic controllers. The programmable controller **16** may be used to independently control the conveyer **20**, film feeder **14**, which are preferably servo-driven. The programmable controller **16** is also used to program the timing of supply of high and low velocity gas to the seal head gassing assemblies **26**. Once the tray **18** is indexed forward on the conveyer **20** to the sealing station and positioned beneath the seal head assembly **22**, high and low velocity controlled environment gas is timed to flow through the seal head gassing assemblies **26**, through the cut-out **130** of the film **15**, and into the tray **18**. The film feeder **14** may preferably be synchronized with the gassing and conveyer movement. The controlled environment gas is preferably flowed through a cut-out portion of the film **15**, which was created when the previous tray was sealed and the film cut with a knife which slides within a clamping plate located on tray sealer **12**. Prior to the film advance, the high velocity gas is preferably turned off. The low velocity and/or laminarized flow may preferably continue to assure that the head space of the tray **18** is repurged to acceptable levels. The low velocity flow may be programmed to remain on while the film **15** is advanced, and may be timed to turn off when the film **15** is directly above and covering the tray opening **18**. Alternatively, the low velocity flow may remain on throughout the sealing process.

As shown in **FIGS. 7-9**, side gassing rails **75** may preferably be used to provide a blanket of laminarized controlled environment gas flow into and around the tray **18** to assure that the tray **18** and its contents **19** are not re-contaminated during the sealing process. The side gassing rails **75** are preferably made of stainless steel and/or plastic, for example, Delrin. The side rails **75** preferably includes a housing **76**, controlled environment gas inlets **78**, distribution baffle **80**, and thick gassing element **82** and thin gassing element **84**. The gassing elements **82** and **84** are configured to provide a dual laminar flow. The distribution baffle **80** is preferably made of a 5-ply, 75-micron

stainless steel mesh screen. The thick gassing element **82** is preferably made of a 5-ply, 75-micron stainless steel mesh screen, and the thin gassing element **84** is preferably made of a 2-ply, 80 micron stainless steel mesh screen. The baffle **80** and gassing elements **82**, **84** are longitudinally positioned along manifold opening **90**. Thick element **82** includes an elongated slot **91** formed therein to provide a dual laminarized flow through the gassing elements **82**, **84**. As shown in FIG. 5, the side rails **75** are preferably positioned parallel to the conveyer **20**, on both sides of the conveyer **20** and aligned with the tray sealer **12**. The face of the manifold opening **90** may be substantially perpendicular to the top face of the carrier plate **92**. In the embodiment shown, the gassing rails **75** have two manifold openings **90**. The rail **75** may have a length of, for example, 10.0 inches.

During the heat sealing process, the side gassing rails **75** may be programmed with the programmable controller **16** to turn off. Once the tray **18** is sealed, it is indexed forward and the next tray is gassed using the seal head gassing assemblies **26** through the cut-out area of the film **15**. After gassing, the film **15** is advanced. This sequenced gassing and film feed operation allows for efficient purging operation of the trays **18** and is an efficient use of space.

During the sealing operation, the seal head **106** may be in the down or seal position for approximately  $\frac{1}{2}$  -  $1\frac{1}{2}$  seconds to effect a hermetic seal. The up stroke of the seal head **106** may take 150-200 milliseconds, which may tend to draw or create a partial vacuum and pull the tray from the conveyer **20** and/or carrier plate **92**. The programmable controller **16** may be programmed to deliver a burst of high velocity gas through the spout **50** just prior to the up stroke to cause a positive pressure and ensure that the tray **18** is not dislodged out of the carrier plate **92**, which may disrupt the packaging operation by breaking the film **15**.

In sealing a variety of food products, for example, corn chips, oxygen levels of less than 1 percent have been consistently achieved with seal cycle times of approximately 6 seconds using the controlled environment sealing

apparatus 10.

The seal head gassing assembly 26 may be configured differently for various applications. The seal head 106 preferably includes a cal rod to heat the seal head 106. In applications where it is desired to produce a negative  
5 pressure within the tray 18, the seal head gassing assembly components, including the cap 38, body 36, flow guide member 40, and distribution member 49 may preferably be made of a material having low heat conductivity properties, including, for example, stainless steel or plastic. This allows the heat from the seal head to be transferred to the seal head gassing assembly 26  
10 to heat the gassing elements 56, 58. The gassing elements 56, 58, will, in turn, heat the controlled environment gas passing through the gassing elements. In applications where heated gas is not desired, the cap 38, body 36, flow guide member 40, and distribution member 49 may be made of a material having higher heat conductivity properties, including, for example, aluminum to keep  
15 the gassing elements cooler.

While the embodiments of the invention disclosed herein are presently considered to be preferred, various changes and modifications can be made without departing from the spirit and scope of the invention. The scope of the invention is indicated in the appended claims, and all changes that come within  
20 the meaning and range of equivalents are intended to be embraced therein.

## WE CLAIM:

1. A controlled environment sealing apparatus comprising:  
a reciprocating seal head positioned above a conveyer carrying  
5 product-filled trays;  
a film feeder to dispense film between the tray and the  
reciprocating seal head; and  
at least one seal head gassing assembly positioned in the seal  
head and oriented to direct a flow of controlled environment gas through a  
10 cut-out portion of the film into a product-filled tray positioned beneath the seal  
head.
2. The apparatus of claim 1 wherein the seal head gassing  
assembly directs a high velocity controlled environment gas stream  
15 surrounded by a lower velocity controlled environment gas stream downward  
into the tray positioned below the seal head.
3. The apparatus of claim 2 further comprising a programmable  
controller to control the timing of the high velocity and low velocity gas flow  
20 through the seal head gassing assembly.
4. The apparatus of claim 1 wherein in the seal head gassing  
assembly includes a housing including a low velocity gas inlet opening and a  
high velocity gas inlet opening formed therein.  
25
5. The apparatus of claim 4 wherein the housing includes a body  
and a cap, the low velocity and high velocity inlet openings formed in the cap.



6. The apparatus of claim 5 further comprising a flow guide member positioned in the body of the housing, the flow guide member including a low velocity flow opening to communicate with the low velocity gas inlet opening, and including a high velocity flow opening to communicate with the high velocity gas inlet opening.

7. The apparatus of claim 6 wherein, the high velocity flow opening of the flow guide member is a slotted opening that communicates with a centrally located high velocity gas orifice which extends through the flow guide member.

8. The apparatus of claim 6 further comprising a distribution member positioned within the body of the housing and below the flow guide member, the distribution member including a spout and at least one opening formed therein and surrounding the spout, the spout communicating with a high velocity gas flow, the distribution member opening communicating with a low velocity gas flow.

9. The apparatus of claim 8 wherein the distribution member includes a plurality of openings formed therein and surrounding the spout.

10. The apparatus of claim 8 further comprising a baffle positioned between the flow guide member and the distribution member.

11. The apparatus of claim 10 further comprising a gassing element positioned in a bottom portion of the housing body.

12. The apparatus of claim 11 further comprising a second gassing element in contact with the first gassing element to allow a dual laminarized flow of controlled environment gas to exit from the housing body.

13. The apparatus of claim 1 wherein the conveyer is a shuttle plate including two tray openings.

5 14. A method of operating a controlled environment sealing apparatus comprising:

providing a reciprocating seal head positioned above an intermittent conveyer carrying product-filled trays, at least one seal head gassing assembly positioned in the seal head; and a film feeder;

10 conveying a product-filled tray to a position below the seal head; and

flowing a gas stream simultaneously through a cut-out portion of a film dispensed from the film feeder into the product-filled tray positioned beneath the seal head.

15 15. The method of claim 14 further comprising:

flowing a high velocity stream of controlled environment gas through the seal head gassing assembly; and

20 flowing a low velocity stream of controlled environment gas through the seal head gassing assembly.

16. The method of claim 15 further comprising:

stopping the high velocity stream prior to advancing film from the film feeder.

25 17. The method of claim 16 further comprising:

moving the seal head downward to seal the film against a flange portion of the tray.

18. The method of claim 17 further comprising:  
moving the seal head upward while simultaneously flowing high  
velocity gas against a top portion of the film.

5 19. The method of claim 15 further comprising:  
providing a programmable controller; and  
programming a timing sequence to synchronize the high velocity  
and low velocity gas flows with the conveyer movement and film  
advancement.

10

20. The method of claim 19 further comprising programming the  
timing sequence to further synchronize seal head actuation.

15 21. The method of claim 14 further comprising a plurality of seal  
head gassing elements positioned in the seal head, flowing controlled  
environment gas through the seal head gassing assemblies.

20 22. A controlled environment sealing apparatus comprising:  
a reciprocating seal head; and  
at least one seal head gassing assembly positioned in the seal  
head, the seal head gassing assembly including a housing, the housing  
including a high velocity gas inlet opening and a low velocity gas inlet  
opening, a spout communicating with high velocity gas flow which is supplied  
through the high velocity gas inlet opening, at least one gassing element  
25 communicating with the low velocity flow, wherein the low velocity flow exiting  
the seal head assembly surrounds the high velocity flow exiting the seal head  
gassing assembly.

30 23. The apparatus of claim 22 wherein a plurality of seal head  
gassing assemblies are positioned in the seal head.

24. The apparatus of claim 22 further comprising a plurality of gassing elements positioned to surround the spout and provide a dual laminarized flow.

5           25. The apparatus of claim 22 wherein the seal head gassing assembly comprises a material having high heat conductivity properties.

26. The apparatus of claim 22 wherein the seal head gassing assembly comprises a material having low heat conductivity properties.

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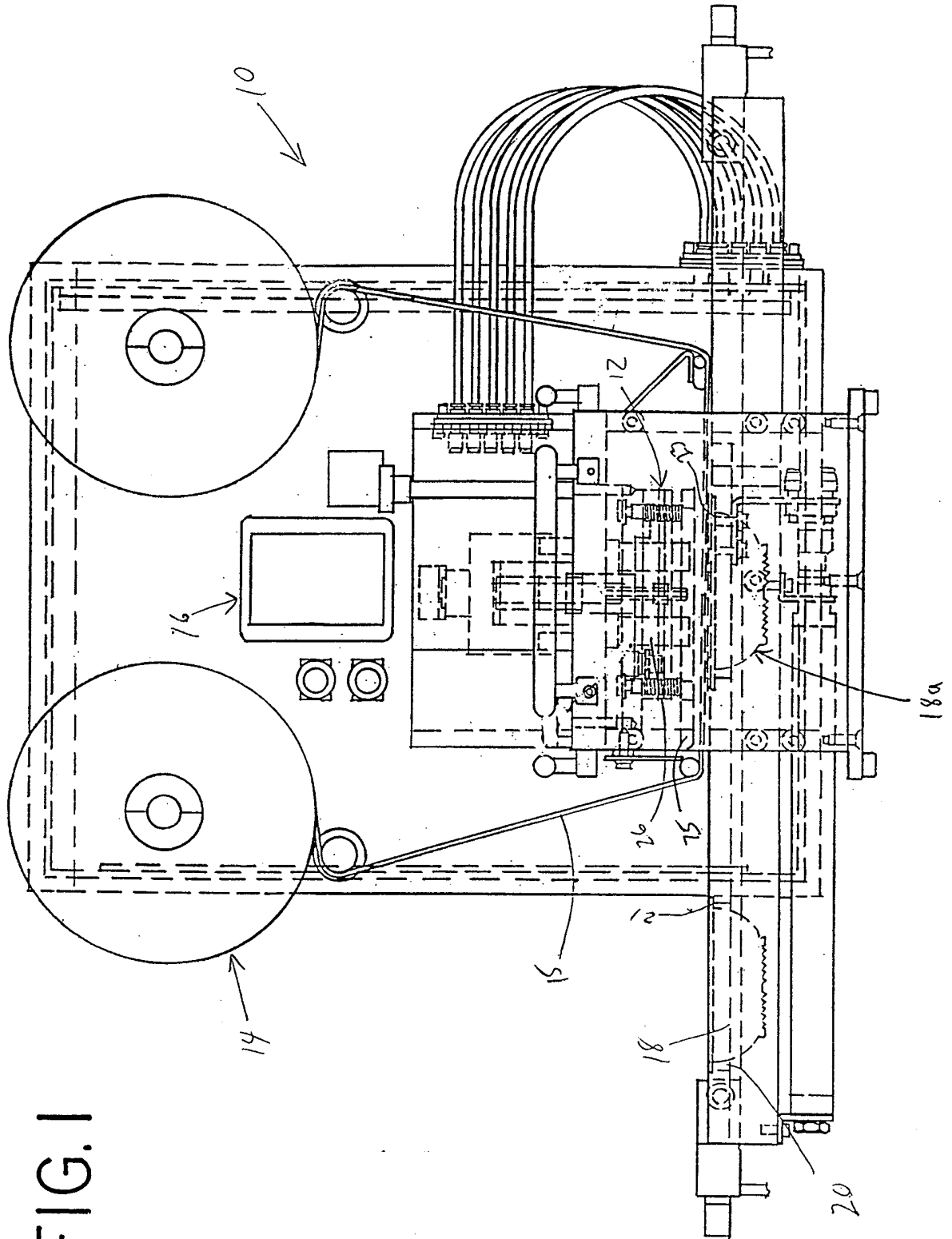
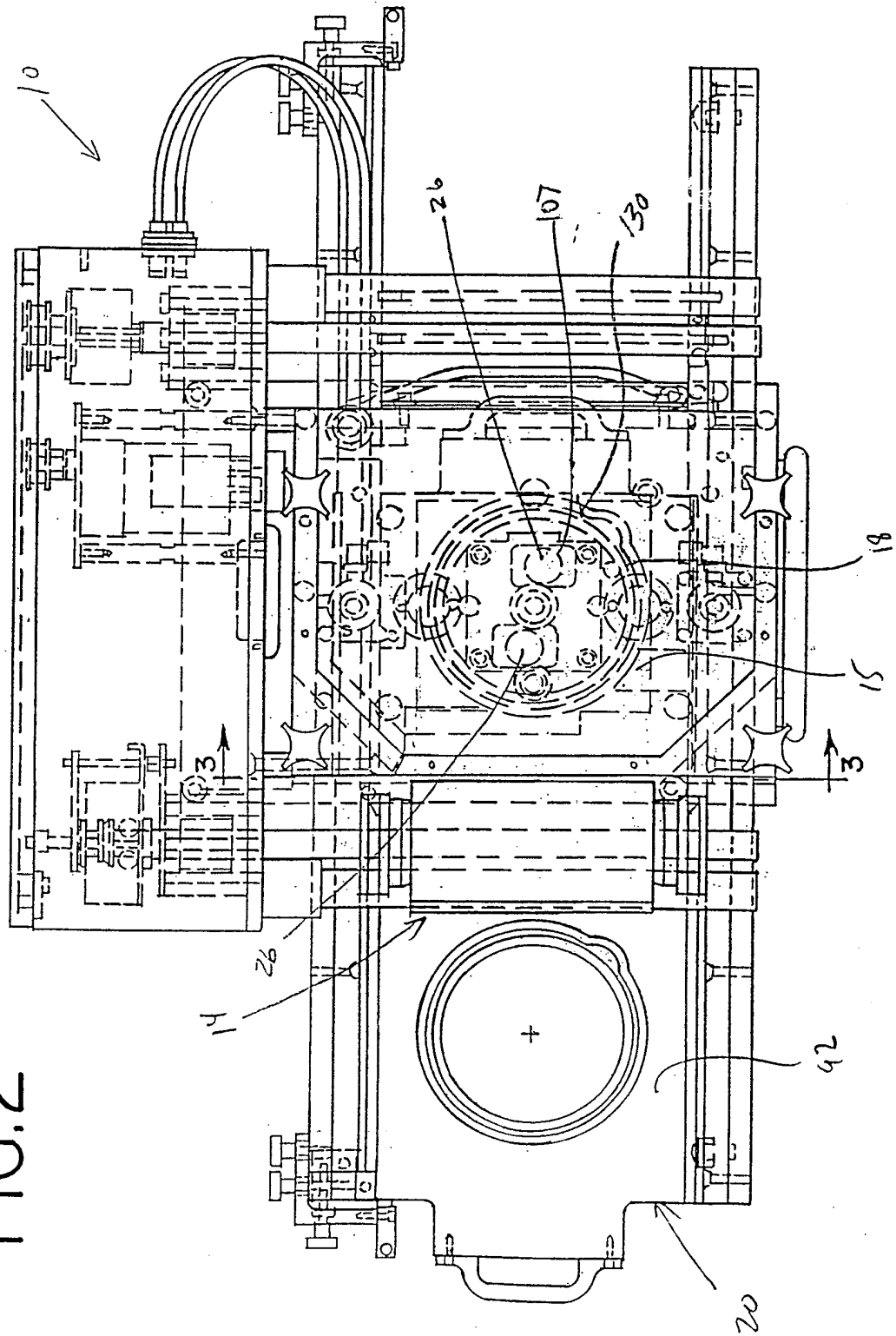
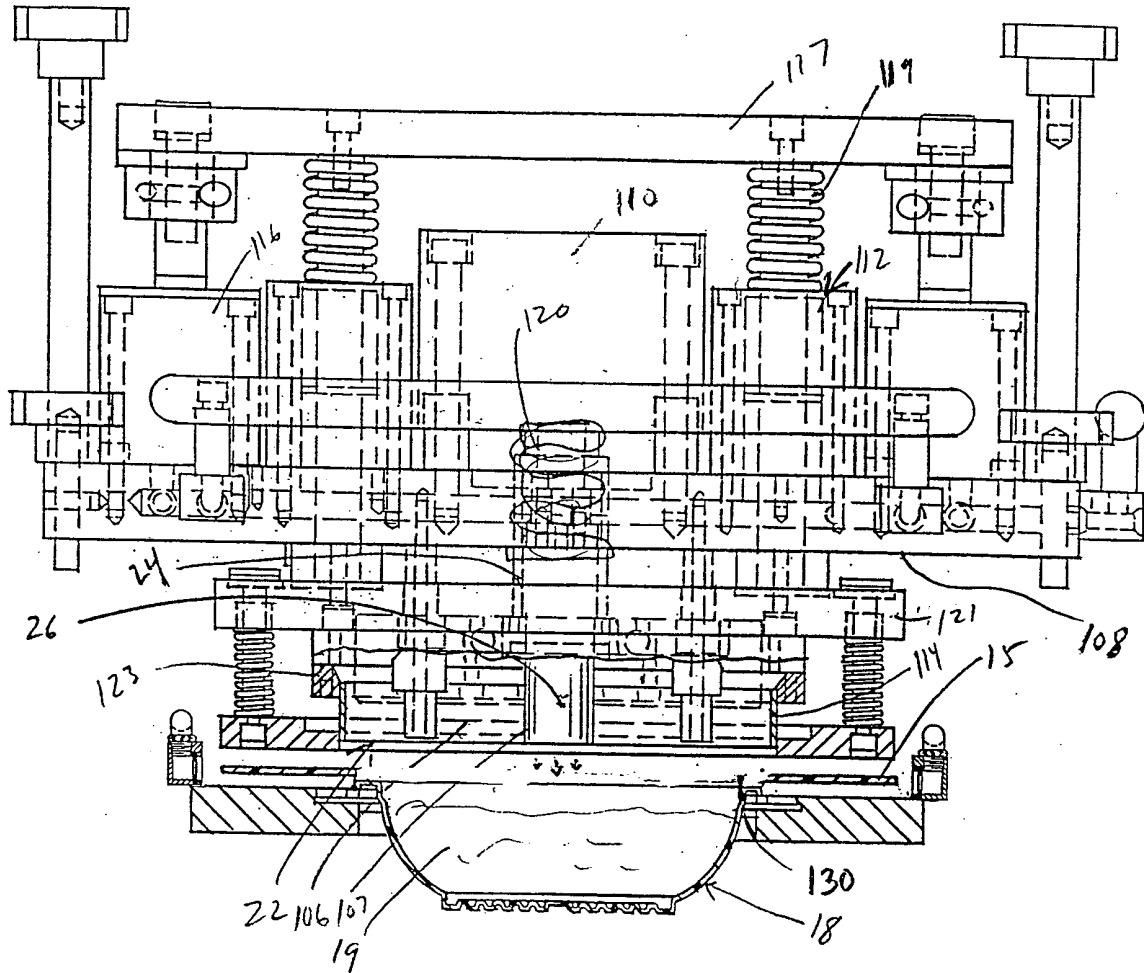


FIG. 1

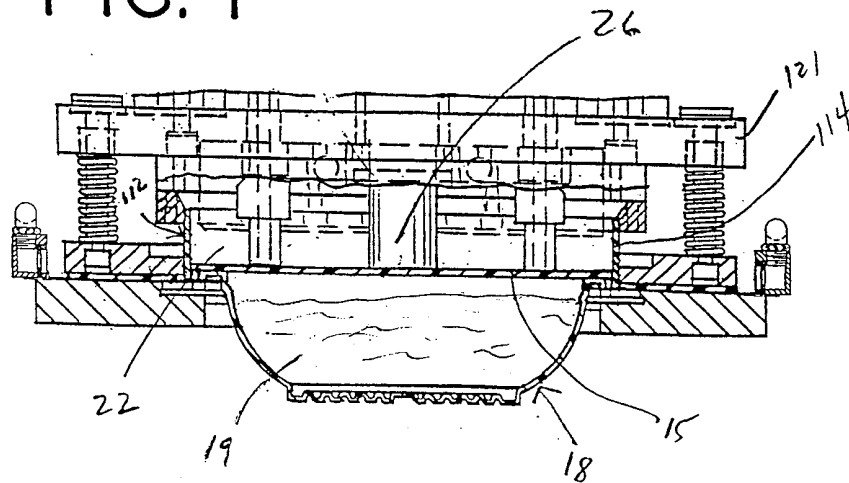
FIG.2



# FIG. 3



# FIG. 4



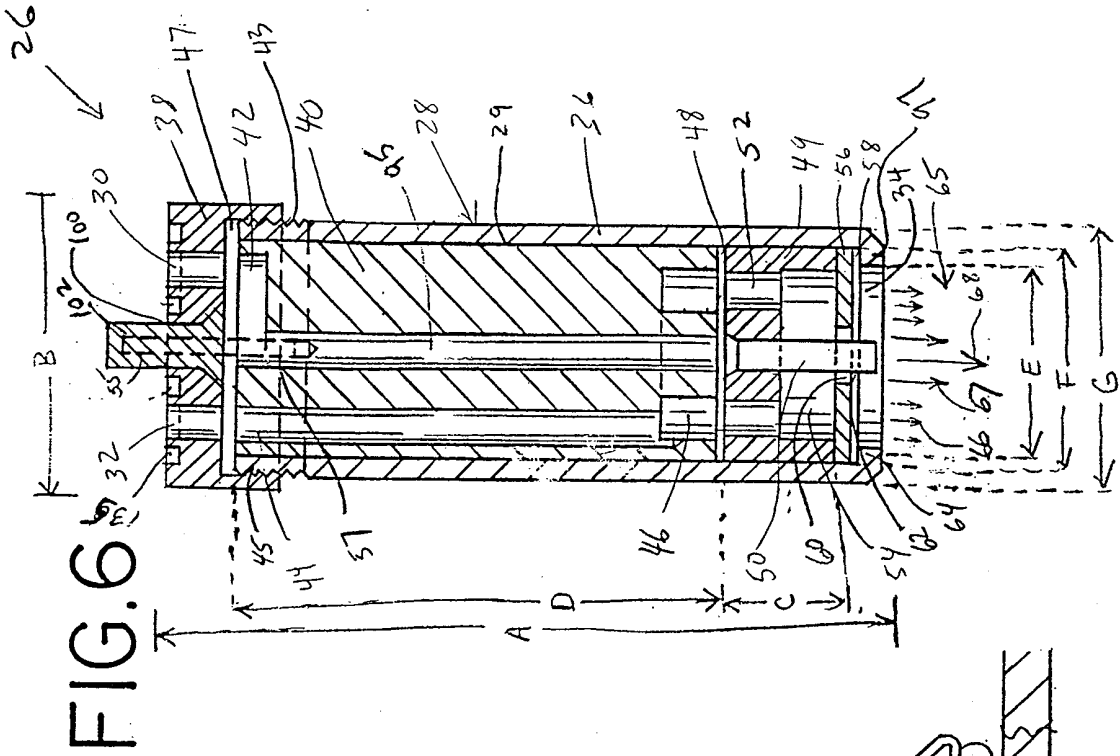


FIG. 6

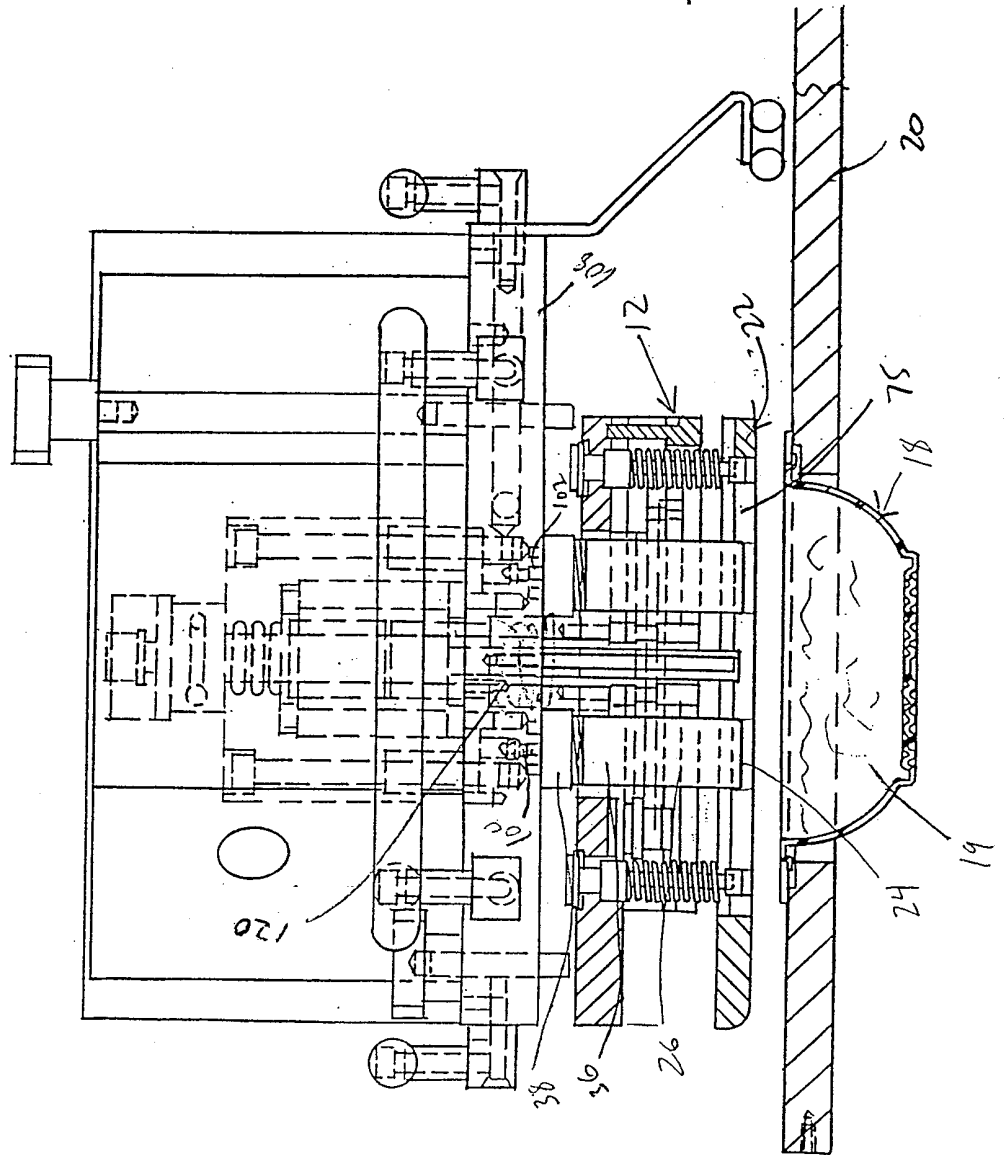


FIG. 5



FIG.7

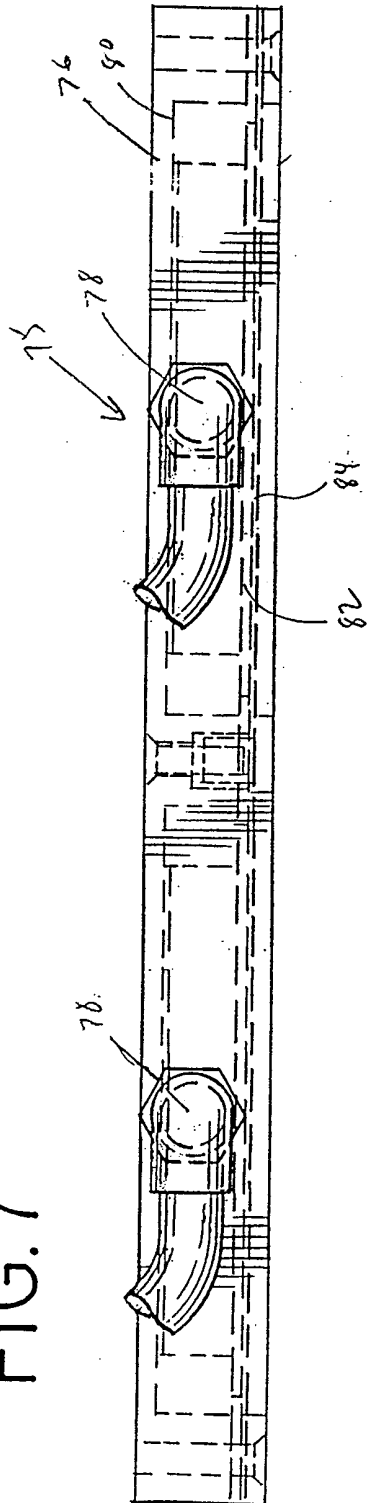


FIG.8

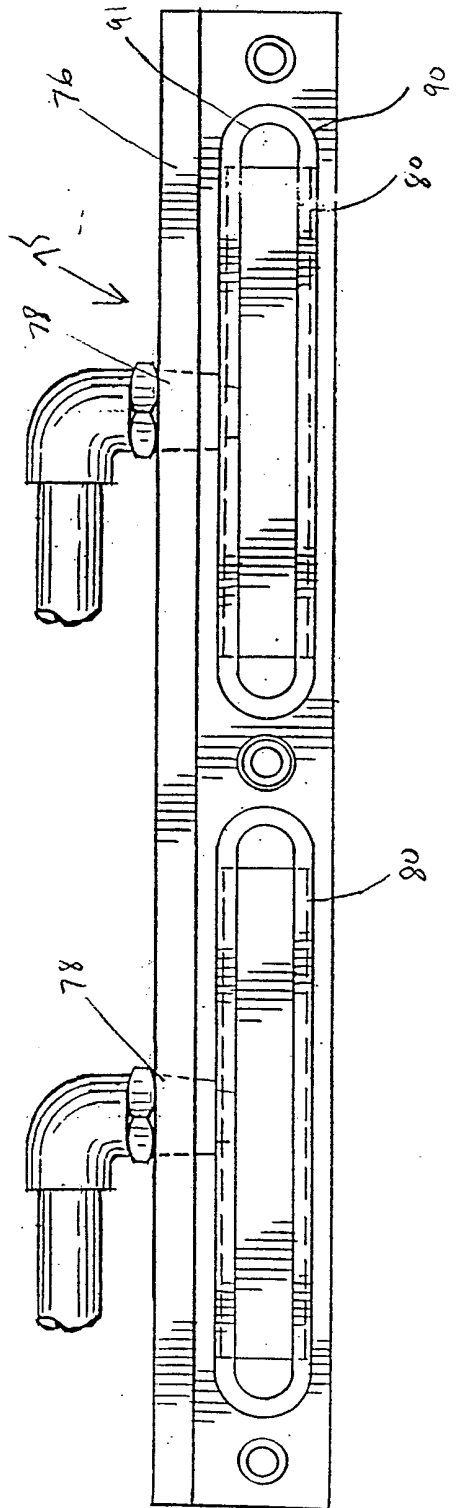
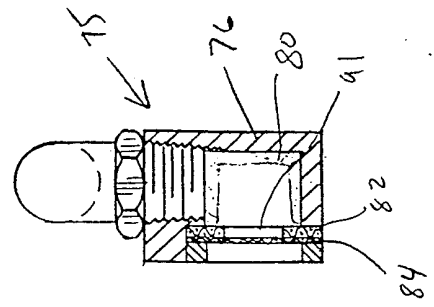


FIG.9



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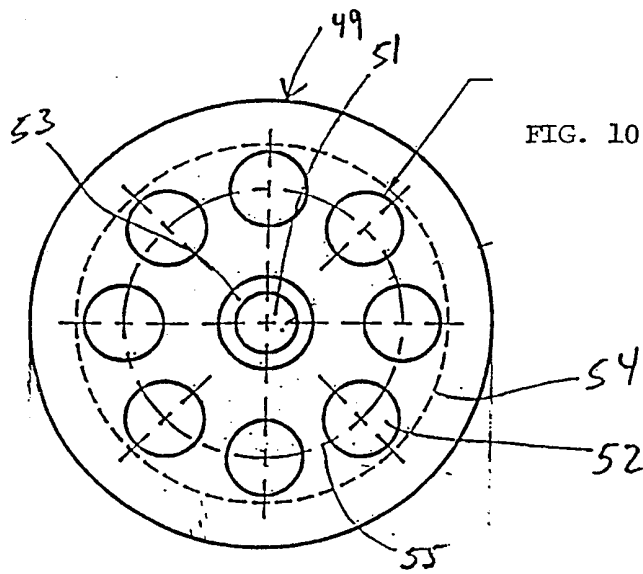
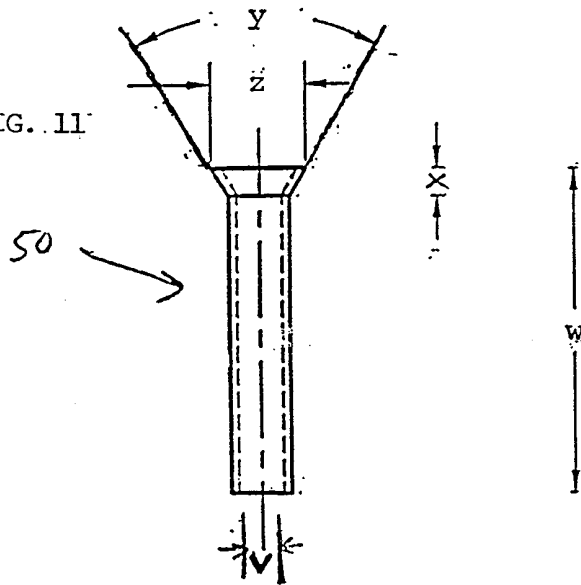


FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/25498

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :B65B 51/10, 31/00  
US CL :53/478, 510

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 53/478, 510, 432, 329.3, 329.5

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,417,255 A (SANFILIPPO ET AL.) 23 May 1995, col. 5, line 8 - col. 6, line 38.	22-26 ----- 1-21
Y	US 4,625,498 A (PARAONS) 02 December 1986, col. 4, line 40 - col. 12, line 40.	1-21
A	US 5,816,024 A (SANFILIPPO ET AL) 06 October 1998, col. 9, line 17 - col. 10, line 32.	1-26
A	US 5,077,954 A (WILLIAMS) 07 January 1992, see entire disclosure.	1-26

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date or another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

28 JANUARY 2000

Date of mailing of the international search report

09 FEB 2000

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
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Washington, D.C. 20231

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Patent Specialist  
Technology Center 3700

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/25498

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/25498

## BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1-21, drawn to a sealing apparatus and method for sealing with a film.

Group II, claim(s) 22-26, drawn to a sealing apparatus with high and low velocity flows.

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group I has the special technical features of a gassing assembly which directs a gas flow through a cut-out portion of film. Group II has the special technical features of a seal head with high velocity flow surrounded by low velocity flow. The claimed apparatus of Group II does not require a film to be placed over a tray, but merely directs a specific gas flow through a "reciprocating seal head".