

APPLICATION FOR
UNITED STATES LETTERS PATENT

FOR
SYSTEM AND METHOD FOR MONOLAYER ALIGNMENT
SNACK CHIP TRANSFER

By:
**Brian Keith Bell,
Steven Theodore Chandler,
Eric P. Farabaugh,
Joseph H. Gold,
Terry Dale Klockenga,
John Curtis McConn,
Daniel Eugene Orr,
Edward Leon Ouellette,
Scott L. Robinson,
Heinz Roel, and
Richard James Ruegg**

BACKGROUND OF THE INVENTION

1. **Technical Field**

The present invention relates to an improved system and method for aligning a snack chip and, in particular, to a system and method that transports a snack chip while maintaining a substantially flat formation. The system allows snack chip preforms to be processed while maintaining a substantially flat shape for later processing to form a shaped snack chip

2. **Description of Related Art**

Snack chips and other food products are frequently made to assume a desired shape. Often, these shapes are merely ornamental in design to assume an interesting shape that appeals to consumers. Sometimes, snack product shapes assume a utilitarian function. One such function is to retain liquid mixtures such as dip, salsa, bean dip, cheese dip, and the like.

When a consumer chooses to eat a chip with dip, the consumer typically holds a

single chip and immerses a portion of the chip into the dip. The consumer then transfers the dipped chip to his mouth for eating. Often though, the desired quantity of dip fails to adhere sufficiently to the chip or is lost during the transfer process. This problem is particularly noticeable when the chip is flat or relatively flat. Additionally, round or triangular flat chips are often too large to insert into a jar or fail to retain a sufficient quantity of dip on the chip surface during removal of the chip from the jar. With traditional chips, some are too large to consume in one bite. When this occurs, the dip on the uneaten portion of the chip frequently slides off creating a mess and a dissatisfied consumer.

To help retain dip, snack chips have been made with curved surfaces. Shaped snack chips allow the consumer to scoop up a desired portion of dip without losing a significant quantity during transfer to the mouth for eating. Further, shaped chips are more maneuverable for insertion into a jar or can of packaged dip such as salsa. The utilitarian shapes known include for example ridges, scoops, taco-shaped, spoon-shaped, and bowl-shaped. Of these, a bowl-shaped chip is particularly desirable as it has a retaining wall or edge surrounding the entirety of the chip.

The system and method for making a shaped chip, especially a bowl-shaped chip, is more complex as compared to traditional flat chip manufacturing processes. With traditional chip production, the dough or masa is extruded or sheeted into a desired chip shape. After extrusion, the chips are transported towards and through a toaster. For this, the chips are deposited onto a moving belt. After toasting, the shaped chips have increased stiffness for insertion into a fryer. To convey the chips into the fryer for dehydration, the chips are removed from the toasting belt or conveyor. To do this, a doctor blade is commonly used to lift the chips from the surface of the belt. Upon contact with the doctor blade, the chips are forcefully lifted from the belt and transported onward into the fryer. As such, the chips are often deformed from being relatively flat into a chip have wraps, curls, waves, and other

structural deformities. Particularly to tortilla chips, this is not a substantial problem as tortilla chips are typically not molded. For a molded chip however, a uniform preform chip is needed.

An alternative method is shown in U.S. Patent No. 6,129,939 to Fink et al. for making
5 a shaped snack chip. A form fryer produces a shaped snack chip by placing chips into a bowl-shaped mold cavity and frying the chip therein. Transport of the preform chips to a fryer is achieved with the use of an airslide. An airslide transports the preform chips via a cushion of air. Although a doctor blade is avoided, expensive equipment is needed to maintain the constant airflow. Further, the spatial orientation of the preform chips is not
10 maintained to a high degree.

Consequently, a system and method for transferring preform snack chips that can operate efficiently, effectively, and inexpensively is desired. Such a system and method should be capable of transferring preform snack chips from a toaster on to additional processing while keeping the costs associated with the chip manufacturing and production
15 within industry standards.

SUMMARY OF THE INVENTION

The present invention is an improved system and method for transferring preform snack chips from a toaster on to additional processing for producing a shaped snack product such as bowl-shaped tortilla chips. The invention utilizes a sheeter for forming a sheet of dough (masa) into pieces that is fed to a toaster via a conveyor. The essentially flat shaped pieces, which for example could be hexagonal shaped pieces are fed into one or more high temperature toasting ovens to add rigidity to the chips for the steps to follow. After toasting, the partially dried preform chip is conveyed to a piece alignment system.

For the transfer to the piece alignment system, toasted preform chips are transferred from a toaster belt to a transfer belt of the piece alignment system with the use of the improved system for transferring preform snack chips. This system involves using a toaster discharge roll that has a substantially reduced diameter of about 4 inches as compared to prior art rolls having about 16 to about 18 inch diameter. Adjacent to the discharge roll of the toaster belt, a pickup roll of the transfer belt of the piece alignment system has about a 0.75 inch diameter. Further aiding the transfer, the transfer belt is positioned slightly lower than the toaster belt, **about 0.2 to about 0.5 inches**. By using a smaller roll at the toaster discharge, the preform chips are transferred without the use of a doctor blade or other mechanical aid. By avoiding the use of a doctor blade, the registration or positioning of the preform chips is essentially maintained. Also, the disadvantages of using a doctor blade, which include mechanical wear, product jamming between the blade and belt, product deformation, and the like, are avoided. The transferred preform chips are then further aligned with a piece alignment system to ensure proper molding of the chips to form shaped snack chips.

Following the transfer from the toaster, the piece alignment system aligns the chips prior to a plunger and mold conveyor system, which provides shape to the chips. The piece alignment system comprises a series of belts whereby the ranks (rows) of chips can be adjusted for proper placement for the plunger and mold conveyor. After the product is plunged in the mold conveyor, the chips pass through at least one oven for reducing chip moisture and providing additional rigidity for frying. Thereafter, the chips are ejected from the molds and are inputted into a fryer where the chips attain their final packaging moisture. Following frying, the chips are passed through an optional salter where salt and/or flavoring is added. The chips are then passed along for packaging for consumers. With the system for transferring preform snack chips, preform snack chips can be transferred efficiently, effectively, and inexpensively. The above as well as additional features and advantages of the present invention will become apparent in the following written detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a schematic perspective view of a system for making shaped snack products;

FIGURE 2 is a side elevation view of a shaped snack chip produced in accordance
5 with the invention;

FIGURE 3 is a schematic side elevation view of the toaster and piece alignment system portion of the system shown in **Figure 1**;

FIGURE 4 is a schematic elevation view of the toaster, piece alignment system, and plunger and mold conveyor portion of the system shown in **Figure 1**;

10 **FIGURE 5** is a schematic plan view of the alignment belt of the piece alignment system of the system shown in **Figure 1**;

FIGURE 6 is a schematic perspective view of a sensor array of the piece alignment system of the system shown in **Figure 1**;

FIGURE 7 is a schematic perspective view of the piece alignment system and
15 plunger and mold conveyor portion of the system shown in **Figure 1**;

FIGURE 8 is a schematic perspective view of the plunger and mold conveyor of the system shown in **Figure 1**;

FIGURE 9 is a schematic perspective view of mold racks in accordance with the invention;

20 **FIGURE 10** is a schematic elevation view of a plunger belt in accordance with the present invention;

FIGURE 11 is a schematic perspective side view of a plunger in accordance with the present invention; and

FIGURE 12 is a schematic perspective bottom view of a plunger in accordance with
25 the present invention.

PAGE INTERNATIONALLY LEFT BLANK

DETAILED DESCRIPTION

In **Figure 1**, a system and method for forming a shaped snack chip is shown. Sheeter **10** forms a sheet of dough that is fed to toaster **30** via conveyor **20**. Conveyor **20** transfers the essentially flat shaped raw chips, which for example are hexagonal shaped chips. The flat
5 shaped dough or chip is then fed into a high temperature toasting oven **30** for adding rigidity for the following steps. The partially dried chip is thereafter fed to a piece alignment system **40**. The piece alignment system **40** aligns the product for feeding to a plunger and mold conveyor **60**. Plunger and mold conveyor **60** imparts a shape to the chips. After the product is plunged to the mold shape, the chips pass through a multizone dryer **100** for reducing chip
10 moisture. Thereafter, the chips are ejected from the molds and are fed into a fryer **110** where the chips attain their final packaging moisture. Following frying, the chips are passed through an optional salting drum **116** where salt and/or flavoring is added. Thereafter, chips **200** shown in **Figure 2**, capable of retaining a liquid mixture are passed along for packaging for consumers.

15 In one embodiment, sheeter **10** has sheeter rollers and a conveyor **20** mounted in a common frame as a single unit (not shown). Sheeter **10** receives the dough at an inlet. The dough can be comprised of corn, wheat, rice, or other grains and mixtures thereof. For the preferred embodiment, the dough is comprised of white dent corn. As the sheet is formed in sheeter **10**, a cutter within sheeter **10** having the initial chip shape, which for example is an
20 essentially flat hexagon, is provided. As dough passes by a cutter within sheeter **10**, the initial chip shape is formed so that essentially flat chips **202** being produced have approximately the same shape and thickness upon exiting sheeter **10**. Chips **202** are conveyed over conveyor **20** towards toaster **30**. Optionally, conveyor **20** has a pneumatic lift system to raise the conveyor to provide access to toaster **30** as needed. This is beneficial
25 because as formed product exits sheeter **10** the product essentially drops a small distance onto

conveyor **20**. As the physical properties of the product being sheeted may change such as the coarseness and particle size of the dough, the adhesive properties, and the moisture content, the ability to adjust the need for adjusting this drop is beneficial to maintain product uniformity.

5 After the dough is sheeted into the chip product's initial shape, chips **202** are fed to toaster **30** for reducing the product moisture. The chip moisture leaving the sheeter is typically about 50 to about 52% and is reduced to about 30 to about 40% by toaster **30**. Chips **202** are dropped onto a rotating transfer belt **32** for passage through toaster **30**. Toaster **30** toasts chips **202** through heating with infrared (IR), radio frequency, convective, ribbon
10 burners, direct gas fired, conductive, impingement, and microwave heating for example. In a preferred embodiment, a series of IR burners or direct flame belt heaters are used. After toasting, chips **202** are transported to piece alignment system **40**.

Preferably, the product coming forth from toaster **30** just prior to a piece alignment system **40** utilizes a bladeless monolayer transfer system as shown in **Figure 3 and 4**.

15 Generally, an assist is needed to lift product from a toaster belt after passing because the product tends to become adhesive or sticky due to the physical nature involved in heating a moist and starchy mixture. Previously, doctor blades, air slides, or other mechanical devices were used to lift products such as chips from a belt. Blade assisted transfer though has an inherent tendency for the blade to fail due to sticky residue buildup thereon creating a jam or
20 blockage, nicks in the blade from high force contact with the toaster oven belt, blade replacement, or the blade losing contact with the belt causing chips to be captured between the blade and toaster oven belt. Other means of transfer such as an air slide employ mechanical devices that add additional cost to production and do not readily maintain product registration or formation that is beneficial to a molding process.

25 With the bladeless transfer, the spatial alignment of a monolayer of product leaving

toaster 30 is maintained more readily than with using a conventional blade assisted transfer. To achieve bladeless transfer, the terminal end of toaster oven belt 32 has a discharge roll 38 that is disposed higher, about 0.2 to about 0.5 inches higher, than a transfer conveyor or belt 42. The leading edges of the toasted chips 202 essentially lift off of toast oven belt 32 at discharge roll 38 and convey onto transfer belt 42 at a nosebar roll 44. This is enabled by discharge roll 38 being about 25% of the size of a prior art discharge roll. In a preferred embodiment, discharge roll 38 has a diameter of about 3 to about 6 inches, more preferable of about 4 inches. Further, transfer belt 42 is supported by at least one roll 44 which has a relatively small diameter, for example of about 0.75 inches. By having the diameters of the rolls supporting belts 32 and 42 closer together in size, the preform toasted chips 202 are able to maintain their structural integrity between the transfer from toaster oven belt 32 to transfer belt 42. To further aid the transfer of the snack chips, discharge roll 38 is positioned about 0.2 to about 0.5 inches higher than transfer belt 42 onto where the snack chips are deposited. Additionally, any debris such as extraneous dough will either pass between the narrow gap between belts 32 and 42 or simply continue along with the preform chips. This is unlike with a bladed transfer. Using the monolayer alignment transfer system eliminates the need for a blade or other mechanical transfer aid.

Figures 3 and 4 show transfer belt 42 which is the first of several conveyors or belts of the piece alignment system 40. The speed of transfer belt 42 operates at essentially the same rate as belt 32 to facilitate the bladeless transfer. With the product essentially aligned as a monolayer of partially dried chips 202, these chips 202 are transferred to a phasing conveyor or belt 46. Phasing belt 46 has an adjustable speed for transferring chips 202 from the speed on transfer belt 42 to the speed and position needed for mold alignment conveyor or belt 50. Once at proper speed, the product is fed to alignment belt 50.

With alignment belt 50, the chips are aligned by rank (rows) and file (columns) for

eventual feeding to a plunger and mold conveyor **60**. Alignment belt **50** has a system for conveying the chips into essentially even ranks. Although the chips entering alignment belt **50** have essentially distinct and even files, the ranks are not sufficiently aligned for eventual feeding to the plunger and mold conveyor **60**. Therefore in one embodiment, alignment belt

5 **50** is outfitted with a series of cleats **52** that extend upwards from alignment belt **50** as shown in **Figure 5**. These cleats **52** are moving slightly faster than alignment belt **50** and are traveling on a cleat conveyor **56** disposed beneath cleat conveyor (not shown) disposed beneath alignment belt **50**.

As such, most chips are eventually pushed along the moving alignment belt **50** so that

10 at the exiting from alignment belt **50** the chips have essentially even ranks. To maintain even files, it is preferable that at least two cleats **52** be provided per chip **202**. Thereby, a trailing edge of chip **202** will end up disposed between at least two cleats **52**. To catch each chip **202**, the distance between two cleats **52** in a rank is smaller than the width of the chip. Upon exiting alignment belt **50**, chips **202** are deposited on a discharge conveyor or belt **54** for

15 transfer to mold belt **68** of plunger and mold conveyor **60**.

To ensure that the majority of chips **202** passing onwards to the plunger and mold conveyor **60** are in proper alignment, a position control system is utilized with piece alignment system **40**. Further the control system is used to insure that chips **202** are deposited onto alignment belt **50** such that chips **202** will be between rows of cleats **52**. The

20 control system compensates for the differences of the incoming speed of chips **202** being fed into the piece alignment system **40** and the positioning needed for the plunger and mold conveyor **60**. If not positioned properly within a determined acceptable range for the plunger and mold conveyor **60**, then a number of chips **202** will not be positioned properly into the molds of the plunger and mold conveyor **60**.

25 Therefore, a chip sensor **48** is positioned to operate in conjunction with piece

alignment system **40**. In a preferred embodiment, chip sensor **48** is positioned above phasing belt **46** and/or discharge belt **54**. However, chip sensor **48** can be positioned at a number of locations along the system for forming a shaped snack chip **202**. An optical sensor such as a photocell array can detect chips **202** to effectively determine their relative position. Other sensors can be employed however such as laser, ultrasonic, cameras, and color contrast.

The control system uses the information gathered from chip sensor **48** to determine the average rank position of chips **202** as to whether chips **202** are approaching on target, too early, or too late. Based upon this average computed position, an adjustment to the overall system is made if needed to insure that piece alignment system **40** is delivering essentially uniform ranks of chips to plunger and mold conveyor **60**. To adjust the positioning of the chips, the control system could optionally adjust one or more of the speeds of transfer belt **42**, phasing belt **46**, cleats **52**, and/or discharge belt **54** for optimal chip delivery to plunger and mold conveyor **60**. As to positioning of the sensor, chip sensor **48** could be situated above transfer belt **42**, phasing belt **46**, alignment belt **50** at the chip entry, and/or discharge belt **54**.

For example, a photocell array **56**, utilizing chip sensors **48**, is arranged to measure the front wall of the passing chips **202** as they pass on phasing belt **46** as shown in **Figure 6**.

The first and last files of these are typically not measured because these end chips **202** tend to accumulate scrap material from upstream processing. Sensing the remaining chips **202**, the average position of chips **202** in that rank can be determined. The speed of phasing belt **46** is then adjusted if necessary to assure that the following ranks of chips **202** will be fed to plunger and mold conveyor **60** at the proper speed to assure maximum alignment of chips **202** being deposited onto molds **64**.

Figure 7 shows plunger and mold conveyor **60** receiving the flat chips **202**. The moisture of chips **202** is at approximately the same moisture as upon their departure from

toaster **30**. At this moisture, the chips have enough cohesive integrity for molding.

Chips **202** are passed from discharge belt **54** to mold racks **62**. Ranks of mold racks **62** are comprised of a series of connected individual chip molds **64** for imparting the desired shape to each chip **202**. With proper sequencing, each mold **64** receives a chip properly
5 aligned from piece alignment system **40**. Although molds **64** can be of any practical shape for a snack chip, molds **64** preferably have a bowl-shape.

Figures 8 and 9 show molds **64** that are formed by the juxtaposition of two racks of mold racks **62**. Each mold rack **62** has a series of halves of molds **64** positioned along in ranks. Ranks of mold racks **62** travel continuously about mold belt **68**. Mold belt **68** is timed
10 to ensure that mold racks **62** are properly positioned for receiving the chips into molds **64** and for plunging. For example, a servo driver can properly control the timing of mold racks **62**. In a preferred embodiment, mold belt **68** is a continuous chain belt disposed around rolls as shown in **Figure 7**. As mold racks **62** begin to travel upwards around roll **66**, the top portions of mold racks **62** begin to separate apart due to the physics of having rectangular-like mold
15 racks **62** traveling about a roll. As mold racks **62** reach the top of mold belt **68**, the top portions of mold racks **62** close together thereby forming molds **64**. Similarly, after passing through dryers **100**, molds **64** separate and open for discharging the chips.

As shown in **Figure 8**, molds **64** have a bowl-shape. Other shapes are possible however such taco, oval taco, hexagonal taco, round saucer, canoe, spoon, oval, round, and
20 more. Molds **64** are preferably only semi-enclosed in order to maximize the exposed surface area of the chip as it is further dried in dryers **100**. Mold racks **62** contain a number of halves of molds **64** such that the juxtaposition of two mold racks **62** on mold belt **68** forms full molds **64**. In the embodiment shown, six halves are disposed within a single mold rack **62** in a rectangular three by two scheme although other schemes are possible. Each half of mold **64**
25 has its closed end towards the middle of mold rack **62**. Linking the mold halves together on

mold rack **62** is a mold rack support structure **120**. As depicted in a preferred embodiment, mold rack support structure **120** is a solid mesh structure. This allows now molded chips **200** disposed in mold racks **62** to be exposed to a greater amount of air and heat in dryers **100** as compared to a solid mold rack. Also, less material is required to form mold rack **62** which
5 reduces costs and weight. Typically, mold racks **62** can be formed from any moldable, heat resistant material such as plastic and metal. In the preferred embodiment, mold racks **62** and, therefore, molds **64** are made from stainless steel.

Figure 9 shows a cross section view of a preferred embodiment of mold **64**. Mold rack support structure **120** confines each mold **64**. Within mold **64**, depending support arms
10 **122** extend from support structure **120** downward and inward towards the center of mold **64** to affix to a bottom edge support **124**. Bottom edge support **124** forms a partially open ring to support the shaped snack chip **200**. At a top portion of depending support arm **122**, a plateau edge **126** provides a resting surface for flat chips **202** yet to be plunged. When flat chip **202** is initially deposited into mold **64**, plateau edges **126** support chip **202** over the open
15 space of mold **64**. To help retain chip **202** within mold **62**, one or more barbs or beveled edges can be provided. As shown, optional upper and lower barbs **130** and **132** are disposed towards the top portion of the each depending support arm **122**. Once the chip **202** is pressed into mold **64**, the top edge will likely abut barbs **130** or **132** on several of depending support arms **122**. As chip **202** is stamped into a mold **64**, it assumes the mold's shape to form chip
20 **200**, which is a bowl-shape as shown in **Figure 2**. Additionally, the chips can be given additional features of shape by modifying the shape of plunger inserts **80**. Should a chip **202** be misaligned and not completely inserted into mold **64** by a plunger insert **80**, the resulting chip produced will still generally have a scoop or bowl shape, although possibly not centered. This is because a portion of chip **202** will still be contacted by plunger insert **80**. The portion
25 of chip **202** contacted is forced into mold **64** which thereby produces a shaped chip **200**.

To reduce the loss of chips not deposited into a mold **64**, an optional feature of retaining chips can be provided. Fingers (not shown) can be provided to prevent a vertically oriented chip **202** from falling through the space between two mold racks **62** should a chip **202** not land into a mold **64**. These fingers are attached to the base portion of mold rack **62** around bottom edge support **124** to extend between mold racks **62**. Thereby, the fingers will support any vertical chips **202** as it travels along plunger and mold conveyor **60** and dryer **100**. While these chips will not be plunged, they are retained to increase the product yield.

Figure 10 shows plunger inserts **80** disposed along plunger belt **82** of plunger mold conveyor **60**. Plunger inserts **80** are typically comprised of a moldable material such as silicone, rubber, plastic, or metal. Softer materials such as silicone, rubber, or plastic are preferred. Insuring that plunger inserts **80** will be aligned above the corresponding opening of mold **64**, mold racks **62** and plungers **80** are carried longitudinally along on mold rack conveyor or belt **68** and plunger conveyor or belt **82**, respectively, and are synchronized to operate together. Once chip **202** is disposed properly on mold **64** at plateau edges **126**, a plunger insert **80** extends downward pushing chip **202** into mold **64**. In operation, an individual plunger insert **80** extends into mold **64** for less than one second, generally only about 0.4 seconds. By minimizing the time that plunger insert **80** extends into mold **64** reduces the likelihood of product shearing effects caused from mechanical wear and thermal expansion. Further, minimizing the time reduces the amount of misalignment between plunger insert **80** and mold **64**.

Figure 11 shows plunger insert **80** has eight fluted edges **84** extending outward from the plunger insert's central support rod **86**. Fluted edges **84** provides ridges to the chip. With eight fluted edges, molded chip **200** will comprise an essentially octagonal shape after being plunged. In other words, each chip will have eight fluted edges. While plunger insert **80** is shown having eight fluted edges, other quantities of fluted edges are possible depending on

the shape of the chip desired. The fluted edges **84** extend from a bottom portion of plunger insert **80** upward towards flange **88** shown clearly in **Figure 12**. Flange **88** is disc shaped and is essentially parallel to plunger belt **82** in operation. The diameter of flange **88** is approximately equal to the inner width of mold **64**. Further, flange **88** extend outward from support rod **86** to approximate the inner width of mold **64**. As shown, fluted edges **84** extend from flange **88** downward towards the bottom of support rod **86**. The bottom periphery of flange, shown in **Figure 12**, approximates that of mold **64** while a top portion does not and extends linearly to provide fluted edges **204** to formed chips **200**. Fluted edges **204** allow for a point of entry and easier dipping of the finished chip. Above flange **88**, support rod **86** protrudes upward with plunger mating adapter **94**. Plunger mating adapter **94** provides for the connection of plunger insert **80** to plunger belt **82**. In one embodiment, plunger mating adapter **94** is a screw bolt which is received by a plunger platform **90** that is affixed to plunger belt **82**.

Plunger belt **82** rotates above and at the same speed as mold belt **68** for suitable plunging and molding of shaped snack chips **200**. As plunger inserts **80** rotate around on plunger belt **82**, plunger inserts **80** are pressed into molds **64** at desired intervals. For appropriate timing, plunger belt **82** preferably uses a link conveyor arrangement. However, other arrangements are possible such as a walking beam or air piston plungers. With the conveyor arrangement, the plunger belt **82** is driven by a mechanical linkage powered by a support chain connected to mold belt **68**. As a set of plungers **80** rotates towards the desired interval of plunging, a cam mechanism is depressed causing one or more sets of plungers into corresponding molds **64** in a vertical motion. To actuate the cam mechanism, a plunger actuator assembly **96** is provided. After a brief interval, the tension on the cams is released which thereby releases plungers **80** upward and out of molds **64**. In application, two rows of plungers are retained per plunger platform **90**. By having two or more rows per plunger

platform **90**, the number of mechanical components is reduced and the structural integrity is improved.

Once plunging is complete and chips **200** are passed through plunger and mold conveyor **60**, chips **200** are conducted through a form dryer **100** while still retained within
5 molds. Form dryer **100** is optionally a multizone dryer with four zones that reduces chips **200** down to a desired moisture content so that chips **200** will retain their shape after being ejected from molds **64** into fryer **110**. In a preferred embodiment, the moisture of chips **200** after passing through form dryer **100** will be reduced to between about 23 to about 28%.

Dryer **100** are hot air impingement ovens that utilize hot forced air. Other forms of drying
10 however may be used such as infrared, microwave, or radio frequency. Optionally, a vacuum is provided from beneath mold belt **68** within form dryers **100** to aid in drying the chips.

With the open structure of mold racks **62**, a relatively large surface area of chips **200** will be exposed to the drying currents. In the preferred embodiment, drying is provided at a temperature of about 300 to about 400°F. The chips are reduced from an inlet moisture of
15 about 34 to about 38% to an outlet moisture of about 23 to about 28%. At the end of the form dryers **100**, chips **200** are separated from molds **64** onto a fryer feed conveyor or belt **112**.

To release chips **200**, molds **64** open and separate to allow the chips to continue towards fryer **110**. To assist the release of chips **200**, an air blower beneath mold rack belt **68** can direct a stream of air or other inert fluid towards the bottoms of molds **64**. Since molds
20 **64** are designed to be partially permeable, the air current will push chip **200** from the mold in addition to gravity. The shaped chips **200** are directed onto a fryer feed belt **112** and then into a fryer **110** containing oil.

Fryer **110** is used to bring the product to its final dryness for consumer packaging and to add flavor. The chip moisture upon entering fryer **110** is about 20 to about 24%. After
25 frying, chip **200** has a moisture content of about 0.8 to about 1.3%, more preferably about

1.1%. Also, the oil content of chip **200** is about 23 to about 25%, more preferably about 24%. The process of frying chips **200** involves feeding chips **202** from belt **112** into fryer **110**. Chips **200** are fed into fryer **110** in a random packing order whereby free-frying occurs. After free-frying, chips **200** are introduced into a paddle section for transferring to a submerger for deeper packing of chips. For evacuating chips **200** from the submerger section, multiple cascading conveyors hoist chip **200** out of the oil. Thereby, chips **200** drain any residual oil from any crevices in chips **200** as they are passed from one conveyor to the next. Chips **200** are then placed onto a fryer discharge conveyor or belt **114** for feeding to an optional drum **116** or to packaging. Rotating drum **116** provides any salting and/or flavoring that is desired. Thereafter, shaped chips **200** are sent to product packaging.

The present system and method produces a shaped snack chip more , preform snack chips can be transferred efficiently, effectively, and inexpensively. The present invention is superior to prior art systems and methods of making a shaped snack chip because preform chips are transferred without the use of mechanical assistance such as a doctor blade or air slide. Thereby, the system and method described in detail above facilitates the transfer of essentially flat chip preforms while maintaining the preforms' alignment for processing.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that changes in form and detail may be made therein without departing from the spirit and scope of the invention.

CLAIMS:

What is claimed is:

1. A system for transferring snack products in a monolayer alignment, comprising:
 - a first conveyor supported by at least one roll having a first diameter;
 - a second conveyor supported by at least one roll having a second diameter;
 - and
 - 5 a means for transferring snack products traveling on the first conveyor to the second conveyor wherein the first conveyor's roll having the first diameter is positioned in close proximity to the second conveyor's roll having the second diameter, allowing the snack products to transfer from the first conveyor to the second conveyor.
2. The system of claim 1 wherein the first conveyor passes through a toaster having an entrance and an exit.
3. The system of claim 2 wherein the snack products are toasted in the toaster to increase rigidity of the snack products for additional processing.

4. The system of claim 2, wherein the additional processing comprises a piece alignment system comprising:
 - the second conveyor for transferring the snack products from the toaster;
 - a phasing conveyor for adjusting the velocity of the snack products;
 - 5 an alignment belt having means for positioning the snack products into essentially even ranks; and
 - a discharge conveyor for adjusting the velocity of the snack chips received from the alignment belt and for feeding the snack chips to a mold conveyor.
5. The system of claim 1 wherein the means for transferring the snack chip does not employ any mechanical aids for lifting the snack products from the first conveyor.
6. The system of claim 1 wherein the diameter of the roll having the second diameter is about 75 to about 90% smaller than the diameter of the roll having the first diameter.
7. The system of claim 1 wherein the first diameter is about 3.0 to about 6.0 inches and the second diameter is about 0.75 inches.
8. The system of claim 7 wherein the first diameter is about 4.0 inches.
9. The system of claim 1 wherein the second conveyor is positioned about 0.2 to about 0.5 inches lower than the first conveyor.
10. The system of claim 1 wherein the snack products are preform snack chips comprised of masa.

11. The system of claim 1 wherein the means for transferring snack products essentially maintains the snack products' spatial orientation from the first conveyor to the second conveyor.

12. A method for transferring snack products in a monolayer alignment, comprising:
- conveying the snack products on a first conveyor supported by at least one roll having a first diameter;
- providing a second conveyor supported by at least one roll having a second diameter; and
- transferring the snack products from the first conveyor to the second conveyor wherein the first conveyor's roll having the first diameter is positioned in close proximity to the second conveyor's roll having the second diameter, allowing the snack products to transfer from the first conveyor to the second conveyor.
13. The method of claim 12 wherein the first conveyor conveys the snack products through a toaster to increase rigidity of the snack products for additional processing.
14. The method of claim 12 wherein transferring the snack chip does not employ any mechanical aids for lifting the snack products from the first conveyor.
15. The method of claim 12 wherein the diameter of the roll having the second diameter is about 75 to about 90% smaller than the diameter of the roll having the first diameter.
16. The method of claim 12 wherein the first diameter is about 4.0 inches and the second diameter is about 0.75 inches.
17. The method of claim 12 wherein the second conveyor is positioned about 0.2 to about 0.5 inches lower than the first conveyor.

18. The method of claim 12 wherein the snack products are preform snack chips comprised of masa.
19. The method of claim 12 wherein the transferring snack products essentially maintains the snack products' spatial orientation from the first conveyor to the second conveyor.