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(54) **METHOD OF WRAPPING BOTTLE PACKAGING UNITS, IN A BEVERAGE BOTTLING PLANT, WITH SHRINKWRAP MATERIAL AND SHRINKING THE SHRINKWRAP MATERIAL AROUND BOTTLE PACKAGING UNITS, METHOD OF WRAPPING PACKAGING UNITS WITH SHRINKWRAP MATERIAL AND SHRINKING SHRINKWRAP MATERIAL AROUND PACKAGING UNITS AND MINIMIZING FAULTY PACKAGING UNITS, AND APPARATUS FOR PERFORMING THE METHOD**

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(57) **ABSTRACT**

A method of wrapping bottle packaging units, in a beverage bottling plant, with shrinkwrap material and shrinking the shrinkwrap material around bottle packaging units, method of wrapping packaging units with shrinkwrap material and shrinking shrinkwrap material around packaging units and minimizing faulty packaging units, and apparatus for performing the method. The abstract of the disclosure is submitted herewith as required by 37 C.F.R. §1.72(b). As stated in 37 C.F.R. §1.72(b): A brief abstract of the technical disclosure in the specification must commence on a separate sheet, preferably following the claims, under the heading "Abstract of the Disclosure." The purpose of the abstract is to enable the Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure. The abstract shall not be used for interpreting the scope of the claims. Therefore, any statements made relating to the abstract are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

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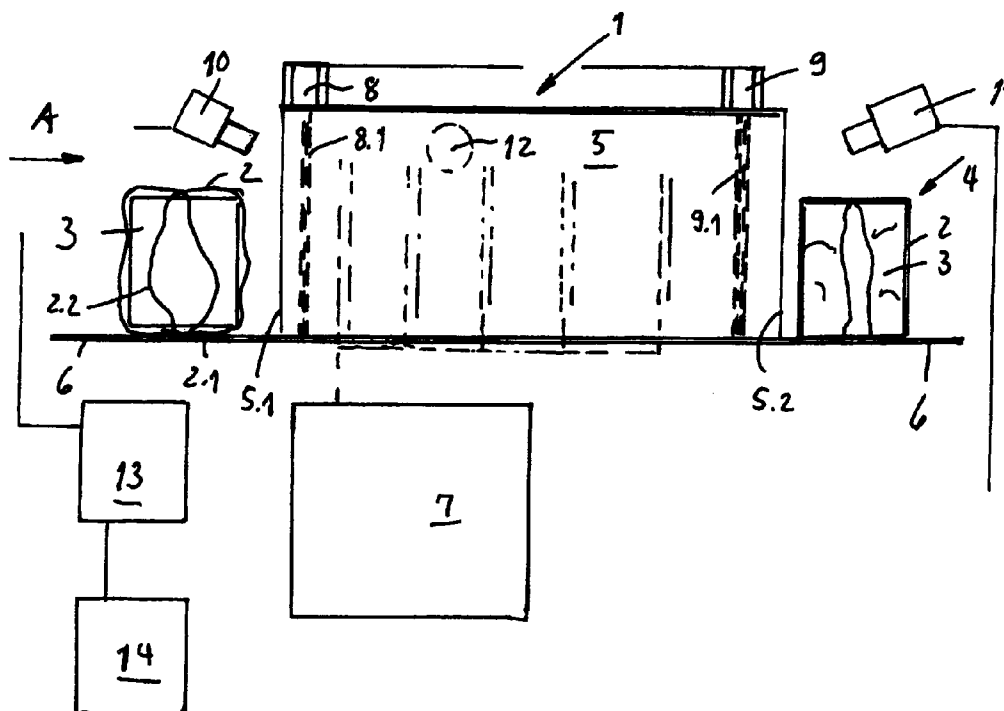
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Related U.S. Application Data

(63) Continuation-in-part of application No. PCT/EP2008/001776, filed on Mar. 6, 2008.



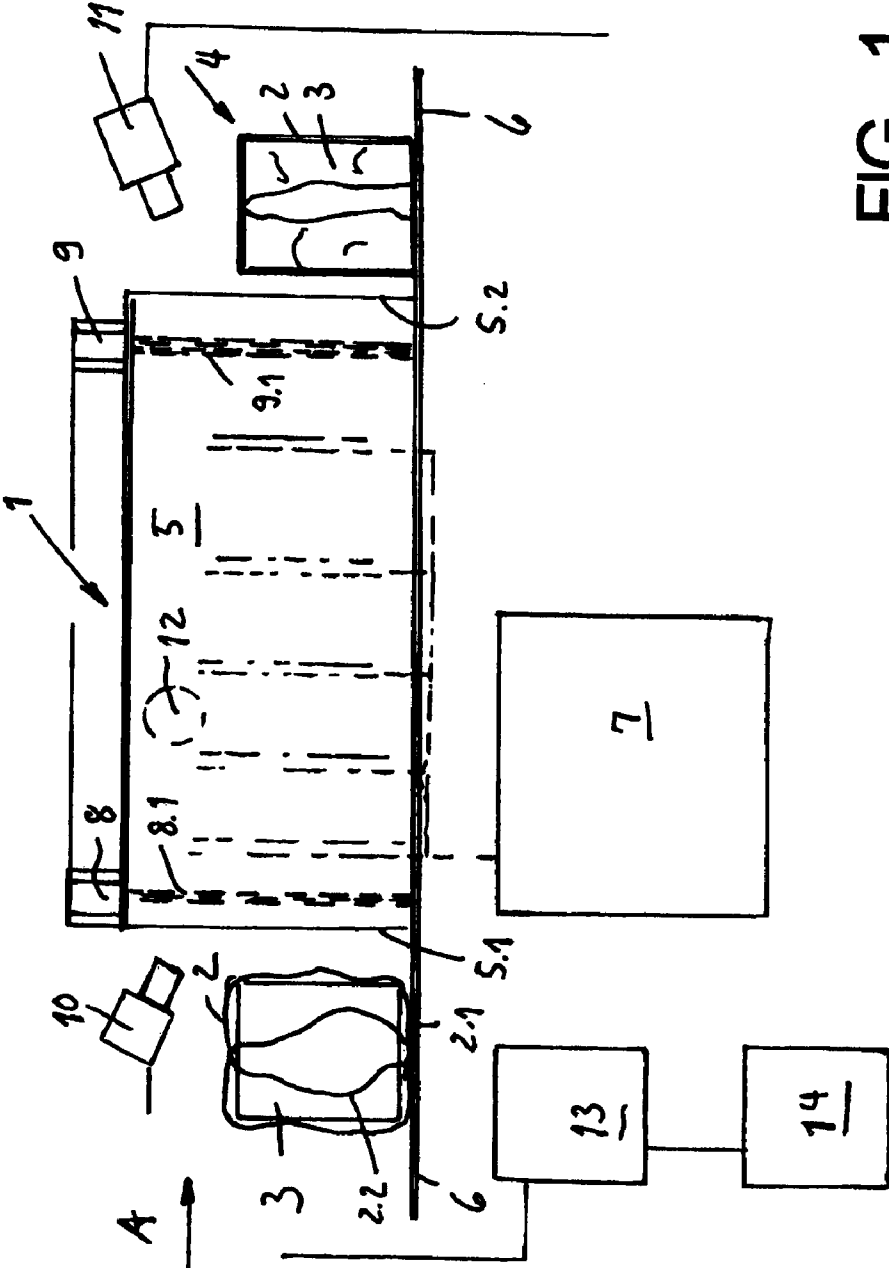


FIG. 1

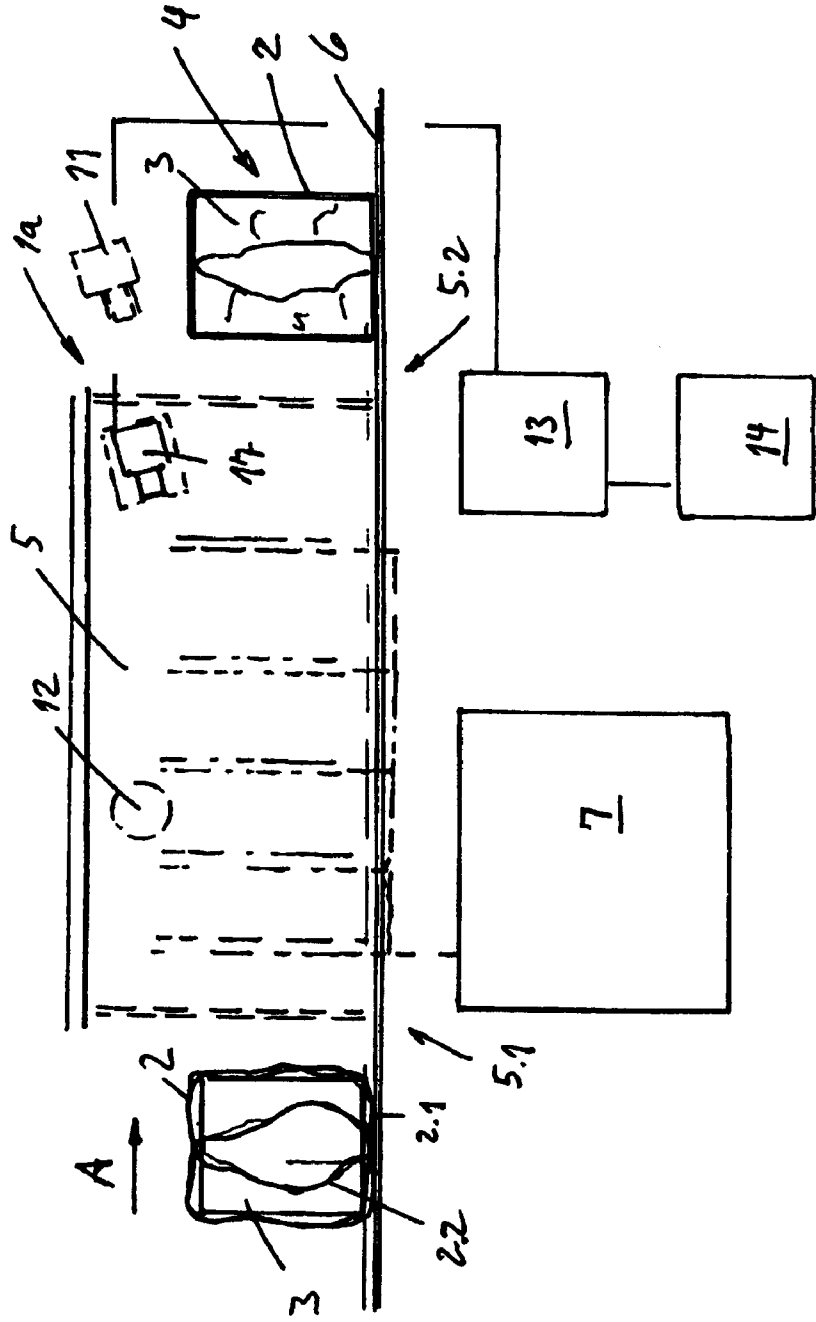


FIG. 2

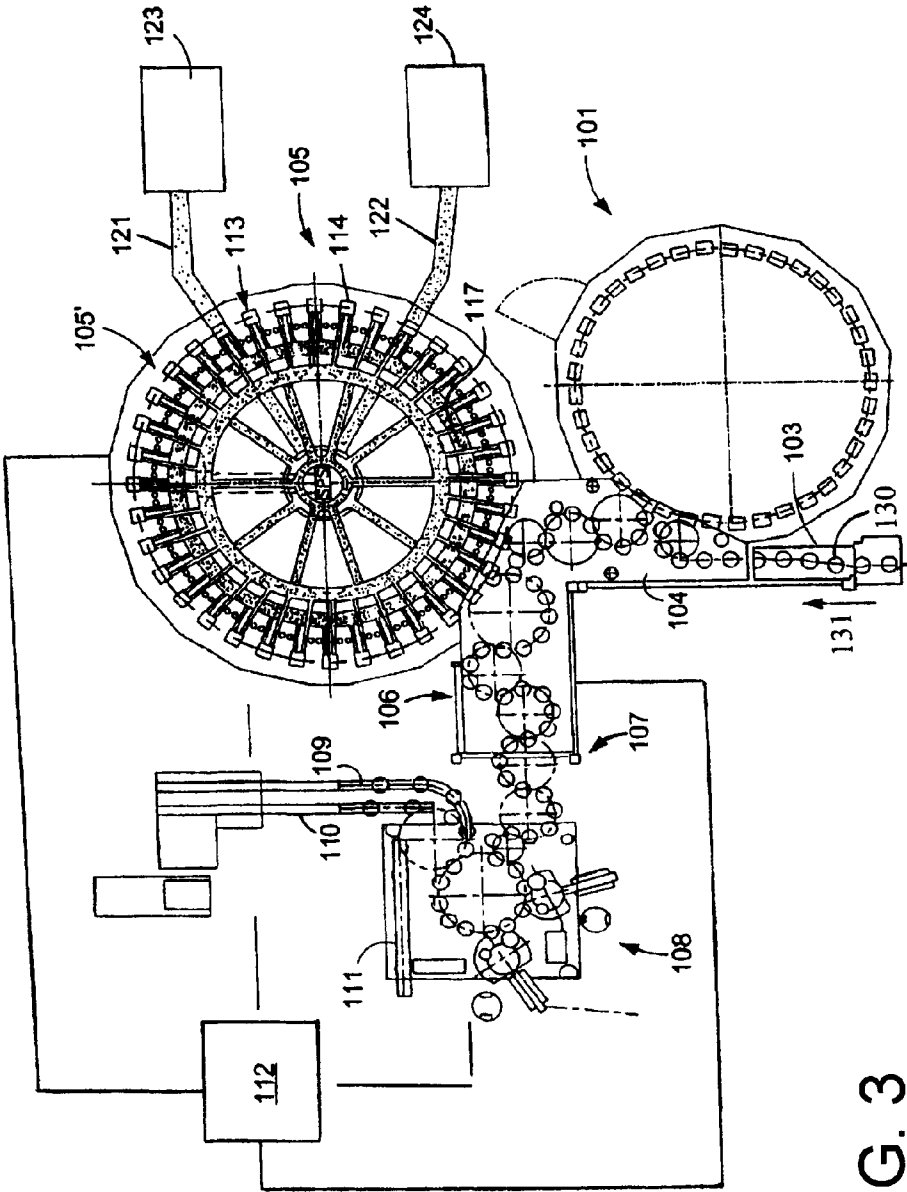
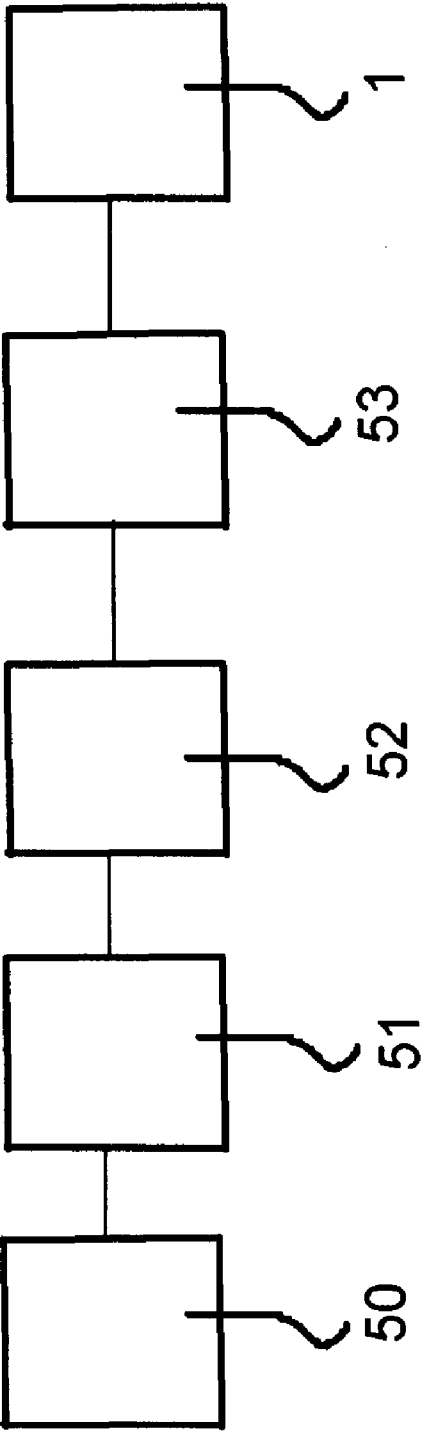


FIG. 3

FIG. 4



METHOD OF WRAPPING BOTTLE PACKAGING UNITS, IN A BEVERAGE BOTTLING PLANT, WITH SHRINKWRAP MATERIAL AND SHRINKING THE SHRINKWRAP MATERIAL AROUND BOTTLE PACKAGING UNITS, METHOD OF WRAPPING PACKAGING UNITS WITH SHRINKWRAP MATERIAL AND SHRINKING SHRINKWRAP MATERIAL AROUND PACKAGING UNITS AND MINIMIZING FAULTY PACKAGING UNITS, AND APPARATUS FOR PERFORMING THE METHOD

CONTINUING APPLICATION DATA

[0001] This application is a Continuation-In-Part application of International Patent Application No. PCT/EP2008/001776, filed on Mar. 6, 2008, which claims priority from Federal Republic of Germany Patent Application No. 10 2007 011 526.3, filed on Mar. 9, 2007. International Patent Application No. PCT/EP2008/001776 was pending as of the filing date of this application. The United States was an elected state in International Patent Application No. PCT/EP2008/001776.

BACKGROUND

[0002] 1. Technical Field

[0003] The present application relates to a shrink tunnel for the shrinking of shrink film over pack formations with a tunnel interior that forms a tunnel entrance and a tunnel exit, through which the pack formations provided with the shrink film can be moved for the shrinking of the shrink film by the effect of heat.

[0004] 2. Background Information

[0005] Background information is for informational purposes only and does not necessarily admit that subsequently mentioned information and publications are prior art.

[0006] Shrink tunnels for the shrinking of a shrink film on pack formations are used for shrink wrap packaging, i.e. for packing operations or in packing plants for the packaging of pack formations with shrink film.

[0007] As used in this application, the term "pack formation" means the broadest possible variety of products to be packaged with shrink film, including but not limited to pack formations comprising a plurality of packaged objects or individual packages, for example those comprising a plurality of containers, bottles, cans or similar individual containers, which are then combined by means of the shrunk shrink film into a single packaging unit or into a trading unit.

Object or Objects

[0008] An object of the present application is to create a shrink tunnel that makes possible a visual monitoring and/or control of the shrinking process.

SUMMARY

[0009] The present application teaches that this object is accomplished with a shrink tunnel for the shrinking of shrink film 2 over pack formations. The shrink tunnel comprises a tunnel interior that forms a tunnel entrance and a tunnel exit, through which the pack formations provided with the shrink film can be moved for the shrinking of the shrink film by the

effect of heat. A camera monitoring system with at least one camera is provided for the monitoring of at least a portion of the tunnel interior.

[0010] The above-discussed embodiments of the present invention will be described further herein below. When the word "invention" or "embodiment of the invention" is used in this specification, the word "invention" or "embodiment of the invention" includes "inventions" or "embodiments of the invention", that is the plural of "invention" or "embodiment of the invention". By stating "invention" or "embodiment of the invention", the Applicant does not in any way admit that the present application does not include more than one patentably and non-obviously distinct invention, and maintains that this application may include more than one patentably and non-obviously distinct invention. The Applicant hereby asserts that the disclosure of this application may include more than one invention, and, in the event that there is more than one invention, that these inventions may be patentable and non-obvious one with respect to the other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Developments of the present application are described according to the present application. The present application is explained in greater detail below with reference to the figures, in which:

[0012] FIG. 1 is a simplified schematic side view of a shrink tunnel of a shrink wrap packaging plant;

[0013] FIG. 1A is a simplified schematic side view of a shrink tunnel of a shrink wrap packaging plant;

[0014] FIG. 2 is a simplified schematic side view of a shrink tunnel of a shrink wrap packaging plant;

[0015] FIG. 2A is a simplified schematic side view of a shrink tunnel of a shrink wrap packaging plant;

[0016] FIG. 3 shows schematically the main components of one possible embodiment example of a system for filling containers, for example a beverage bottling plant for filling bottles with at least one liquid beverage, in accordance with at least one possible embodiment, in which system or plant could possibly be utilized at least one aspect, or several aspects, of the embodiments disclosed herein; and

[0017] FIG. 4 is a block diagram of several components of a container filling plant, one of which components includes the shrink wrapper according to the present application.

DESCRIPTION OF EMBODIMENT OR EMBODIMENTS

[0018] In FIG. 1, the number 1 designates in general the shrink tunnel of a shrink packager, i.e. of a plant for the shrinking of a shrink film 2 over a pack formation 3, and in at least one possible embodiment, for example, for the formation of packaging units or trading units 4 in which the individual packages that form the pack formation 3 can be held together by the shrunk shrink film 2.

[0019] The shrink tunnel 1 forms a tunnel interior 5 which is enclosed from the outside by a tunnel wall. The pack formations 2 which have already been wrapped with the shrink film 2 are moved through the tunnel interior 5 for the shrinking of the shrink film 2 under the action of heat and/or for the formation of the trading unit 4 by means of a conveyor, such as a conveyor belt 6, for example. For this purpose, the tunnel interior 5 is filled with hot air by a heating device 7, so

that the temperature of at least 200 degrees Celsius which is necessary and/or desired for the shrinking of the shrink film can be achieved.

[0020] At the tunnel entrance 5.1, from which the pack formation 3 provided with the shrink film 2 is moved by means of the conveyor 6 into the tunnel interior 5, and at the tunnel exit 5.2, at which the trading units 4 exit the tunnel interior 5, devices 8 and 9 respectively are provided on the upper side of the tunnel entrance and exit, and by means of which, by a vertical or essentially vertical flow of heated air, an air curtain 8.1 or 9.1 respectively is produced, and in at least one possible embodiment to close off or to enclose the tunnel interior 5 at the tunnel entrance 5.1 and tunnel exit 5.2.

[0021] For example, the devices 8 and 9 comprise essentially one or more slotted air discharge openings and corresponding blowers, which can be supplied with hot air from the heater device 7, for example. Outside the tunnel interior, a plurality of cameras 10 and 11 are provided, by means of which the tunnel interior 5 and/or the shrinking process that is taking place there can be monitored through the tunnel entrance 5.1 and the tunnel exit 5.2 respectively, and in one possible embodiment through the respective air curtains 8.1 and 9.1.

[0022] In the embodiment of the present application illustrated in FIG. 1, a video camera 10 is provided at the tunnel entrance 5.1 and at a sufficient distance from said entrance, and an additional video camera 11 is provided at the tunnel exit 5.2 at a sufficient distance from said exit, for example at a distance of one and half meters to two meters. Heat-resistant electric lamps 12 are used to illuminate the tunnel interior 5, although one of these lamps 12 is shown in FIG. 1 to simplify the illustration.

[0023] Through the air curtain 8.1, the video camera 10 monitors or optically records (for display) the first portion of the tunnel interior 5 adjacent to the tunnel entrance 5.1 in the direction of transport A, in which (portion of the tunnel) the decisive steps of the shrinking process take place, namely the sealing of the overlapping segments 2.1 of the shrink film 2 underneath the individual pack formation 3, the inflation of the shrink film over the lateral shrink holes 2.2 that are formed during the wrapping of the individual pack formation 3 and the initiation of the actual shrinking process by heating the individual piece of shrink film, in one possible embodiment on its inner surface that faces the respective pack formation 3. These initial steps of the shrinking process which are monitored or photographed by the video camera 10 already have a decisive effect on the subsequent optical appearance of the trading units 4 and/or the quality of the shrinking process. The step that immediately or substantially immediately follows these first steps of the shrinking process is the final shrinking of the shrink film. The video camera 11, through the air curtain 9.1, photographs the section of the tunnel interior 5 in the direction of transport A preceding the tunnel exit 5.2 and thus also the pack formations 3 or trading units 4 with the shrunk-on shrink film as well as the quality of the individual shrinking process.

[0024] The video cameras 10 and 11 are components of a camera or monitoring system which makes possible a variety of applications of the images taken by the cameras 10 and 11, e.g. among other things a display of the images on monitors 14, so that on the basis of these images, among other things, an optimal control of the shrinking process or an optical regulation of the shrink tunnel 1 and/or of the packing line of which this tunnel is a part becomes possible, in one possible

embodiment including in the event of an exchange or replacement of the shrink film and/or a change in format, etc.

[0025] It is also possible to transmit images supplied by the cameras 10 and 11 that comprise information about errors that occur during the shrinkage process via the camera system 13 and a data transmission system, such as an Internet connection, for example, to a service company that is spatially or geographically remote from the process, such as to the service department of the manufacturer of the shrink tunnel 1, for example, to thereby receive a fast and targeted error analysis that makes it possible to resolve the error that has occurred.

[0026] For example, in at least one possible embodiment of the present application, several adjustments may be made to either, or both of, the shrink wrapping machine and the shrink tunnel 1 to alter the wrapped packaging units 4. In one possible embodiment, the speed of the conveyor 6 may be adjusted to a higher speed or a lower speed. This may influence the amount of time the packaging unit 4 spends in the shrink tunnel 1. Also, another adjustment may be made to the temperature of the shrink tunnel 1. The heating device 7 may either increase or decrease its output, and the air curtain-producing devices 8 and 9 may produce air curtains of differing temperatures, depending on the adjustments needed to be

[0027] In at least one possible embodiment of the present application, the images recorded by the camera system during the shrinking process are transmitted directly, i.e. without any delay, to the other location, so that the shrinking process can be modified and monitored directly from this remote location. A technician skilled in the art speaks of a data transmission with no delay as an on-line transmission.

[0028] It is also possible to store the images or image data supplied by the cameras 10 and 11 for documentation purposes, so that these data can be retrieved if necessary and/or desired.

[0029] The above description assumes that two cameras 10 and 11 are provided outside the tunnel interior 5. Of course, there may also be a greater number of cameras and/or it may be sufficient to monitor the first portion of the tunnel interior 5.1 that is downstream of the tunnel entrance 5.1 in the direction of transport A, which is the portion of the tunnel in which the essential steps of the shrinking process occur, with one or with a plurality of cameras.

[0030] FIG. 1A shows a schematic side view of a shrink wrapping tunnel similar to that which is seen in FIG. 1. The embodiment seen in FIG. 1A has the additional components including movers or pivoters 50, which are configured to move or pivot the cameras 10 and 11. Also seen in FIG. 1A is a data transmission system 51, which may be configured to relay information or data from the camera system 13 and/or monitor 14 to a data receiver 53. The data transmission system 51 and the data receiver 53 may be connected through the internet 52, which permits the transmission of information or data from the system 51 to the receiver 53.

[0031] FIG. 2 shows, in an illustration like FIG. 1, a shrink tunnel 1a which differs from the shrink tunnel 1 essentially in that at the tunnel entrance 5.1 and at the tunnel exit 5.2, instead of the devices 8 and 9 for the production of the air curtains 8.1 and 9.1 respectively, there is a net curtain or a curtain 15 (at the tunnel entrance 5.1) or 15 (at the tunnel exit 5.2) respectively, made of a heat-resistant material. The curtains 15 and 16, with which in turn an enclosure of the tunnel interior 5 is achieved both at the tunnel entrance 5.1 and at the tunnel exit 5.2 respectively, can be realized in one piece or in a plurality of pieces, for example, and in one possible embodi-

ment in the latter case, for example, so that a plurality of curtain elements are next to one another vertically with respect to the direction of transport A of the conveyor belt 6 and/or are provided one after another in the direction of transport A.

[0032] For purposes of monitoring, at least one video camera 17 is located in the tunnel interior 5, and in one possible embodiment protected from heat, and can be pivoted or moved so that the details and processes in the tunnel interior 5 can be observed in the greatest possible detail. The camera 17 is in turn a component of the camera system 13, with which the images from the camera 17 are displayed on monitors 14 as described above with reference to the images or image data from the cameras 10 and 11 and/or can be used otherwise. It is therefore also possible to provide additional cameras outside the tunnel interior 5, as illustrated by the broken lines at 11. The video camera 17 is in one possible embodiment provided in a cooler or cooled area of the tunnel interior 5, and in one possible embodiment outside the hot air current that is discharged from nozzles for the shrinking of the shrink film 2.

[0033] The conveyor or the conveyor belt 6 can be realized for a single-lane flow of packages or a multiple-lane flow of packages.

[0034] FIG. 2A shows a schematic side view of a shrink wrapping tunnel similar to that which is seen in FIG. 2. The embodiment seen in FIG. 2A has the additional components including movers or pivoters 50, which are configured to move or pivot the cameras 11 and 17. Also seen in FIG. 2A is a data transmission system 51, which may be configured to relay information or data from the camera system 13 and/or monitor 14 to a data receiver 53. The data transmission system 51 and the data receiver 53 may be connected through the internet 52, which permits the transmission of information or data from the system 51 to the receiver 53.

[0035] FIG. 3 shows schematically the main components of one possible embodiment example of a system for filling containers, specifically, a beverage bottling plant for filling bottles 130 with at least one liquid beverage, in accordance with at least one possible embodiment, in which system or plant could possibly be utilized at least one aspect, or several aspects, of the embodiments disclosed herein.

[0036] FIG. 3 shows a rinsing arrangement or rinsing station 101, to which the containers, namely bottles 130, are fed in the direction of travel as indicated by the arrow 131, by a first conveyer arrangement 103, which can be a linear conveyer or a combination of a linear conveyer and a starwheel. Downstream of the rinsing arrangement or rinsing station 101, in the direction of travel as indicated by the arrow 131, the rinsed bottles 130 are transported to a beverage filling machine 105 by a second conveyer arrangement 104 that is formed, for example, by one or more starwheels that introduce bottles 130 into the beverage filling machine 105.

[0037] The beverage filling machine 105 shown is of a revolving or rotary design, with a rotor 105', which revolves around a central, vertical machine axis. The rotor 105' is designed to receive and hold the bottles 130 for filling at a plurality of filling positions 113 located about the periphery of the rotor 105'. At each of the filling positions 113 is located a filling arrangement 114 having at least one filling device, element, apparatus, or valve. The filling arrangements 114 are designed to introduce a predetermined volume or amount of liquid beverage into the interior of the bottles 130 to a predetermined or desired level.

[0038] The filling arrangements 114 receive the liquid beverage material from a toroidal or annular vessel 117, in which a supply of liquid beverage material is stored under pressure by a gas. The toroidal vessel 117 is a component, for example, of the revolving rotor 105'. The toroidal vessel 117 can be connected by means of a rotary coupling or a coupling that permits rotation. The toroidal vessel 117 is also connected to at least one external reservoir or supply of liquid beverage material by a conduit or supply line. In the embodiment shown in FIG. 3, there are two external supply reservoirs 123 and 124, each of which is configured to store either the same liquid beverage product or different products. These reservoirs 123, 124 are connected to the toroidal or annular vessel 117 by corresponding supply lines, conduits, or arrangements 121 and 122. The external supply reservoirs 123, 124 could be in the form of simple storage tanks, or in the form of liquid beverage product mixers, in at least one possible embodiment.

[0039] As well as the more typical filling machines having one toroidal vessel, it is possible that in at least one possible embodiment there could be a second toroidal or annular vessel which contains a second product. In this case, each filling arrangement 114 could be connected by separate connections to each of the two toroidal vessels and have two individually-controllable fluid or control valves, so that in each bottle 130, the first product or the second product can be filled by means of an appropriate control of the filling product or fluid valves.

[0040] Downstream of the beverage filling machine 105, in the direction of travel of the bottles 130, there can be a beverage bottle closing arrangement or closing station 106 which closes or caps the bottles 130. The beverage bottle closing arrangement or closing station 106 can be connected by a third conveyer arrangement 107 to a beverage bottle labeling arrangement or labeling station 108. The third conveyer arrangement may be formed, for example, by a plurality of starwheels, or may also include a linear conveyer device.

[0041] In the illustrated embodiment, the beverage bottle labeling arrangement or labeling station 108 has at least one labeling unit, device, or module, for applying labels to bottles 130. In the embodiment shown, the labeling arrangement 108 is connected by a starwheel conveyer structure to three output conveyer arrangements: a first output conveyer arrangement 109, a second output conveyer arrangement 110, and a third output conveyer arrangement 111, all of which convey filled, closed, and labeled bottles 130 to different locations.

[0042] The first output conveyer arrangement 109, in the embodiment shown, is designed to convey bottles 130 that are filled with a first type of liquid beverage supplied by, for example, the supply reservoir 123. The second output conveyer arrangement 110, in the embodiment shown, is designed to convey bottles 130 that are filled with a second type of liquid beverage supplied by, for example, the supply reservoir 124. The third output conveyer arrangement 111, in the embodiment shown, is designed to convey incorrectly labeled bottles 130. To further explain, the labeling arrangement 108 can comprise at least one beverage bottle inspection or monitoring device that inspects or monitors the location of labels on the bottles 130 to determine if the labels have been correctly placed or aligned on the bottles 130. The third output conveyer arrangement 111 removes any bottles 130 which have been incorrectly labeled as determined by the inspecting device.

[0043] The beverage bottling plant can be controlled by a central control arrangement 112, which could be, for example, computerized control system that monitors and controls the operation of the various stations and mechanisms of the beverage bottling plant.

[0044] FIG. 4 shows a block diagram of several components of a container filling and packaging plant according to the present application. Filled containers may be closed and/or sealed and/or capped at a closing station 50. The closed, filled containers may then be transported to a labeling station 51. The closed, filled containers may then be labeled at the labeling station 51. The labeled, closed, filled containers may then be transferred from the labeling station 51 to a separator or compactor 52. The separator or compactor 52 is configured to separate groups of containers into packs and/or compact the groups of containers into tight groups ready to be wrapped and packaged. The groups of containers may then be transferred to a wrapping machine 53. The wrapping machine 53 is configured to wrap shrink wrap or shrink film around the bundles or groups of containers. The wrapped bundles of containers may then be transferred from the wrapping machine 53 to the shrinking machine or shrink wrapper 1, which is configured to apply heat to the shrink film or shrink wrap and shrink the film that is wrapped around the bundles or groups of containers.

[0045] The present application relates to a shrinking tunnel for heat-shrinking film 2 onto package formations 3, having a tunnel interior 5 forming a tunnel entrance 5.1 and a tunnel exit 5.2, wherein the package formations 3 to be provided with heat-shrinking film 2 may be moved through said interior for the purpose of shrinking the heat-shrinking film by the application of heat.

[0046] One feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in a shrink tunnel for the shrinking of shrink film 2 over pack formations 3 with a tunnel interior 5 that forms a tunnel entrance 5.1 and a tunnel exit 5.2, through which the pack formations 3 provided with the shrink film 2 can be moved for the shrinking of the shrink film 2 by the effect of heat, comprising a camera monitoring system 13 with at least one camera 10, 11, 17 for the monitoring of at least a portion of the tunnel interior 5.

[0047] Another feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in the shrink tunnel, wherein at least one camera 10, 11 of the camera monitoring system 13 is located outside the tunnel interior 5.

[0048] Yet another feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in the shrink tunnel, wherein at the tunnel entrance 5.1 and/or at the tunnel exit 5.2, means 8, 9 are provided for the production of at least one air curtain 8.1, 9.1 that closes the tunnel interior 5 off from the outside, and that the at least one camera 10 located outside the tunnel interior 5 photographs the tunnel interior 5 or the portion of the tunnel interior through the at least one air curtain 8.1, 9.1.

[0049] Still another feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in the shrink tunnel, wherein at least one camera 17 is located in the tunnel interior 5.

[0050] A further feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in the shrink tunnel, wherein the at least one camera 10, 11, 17 can be moved and/or pivoted.

[0051] Another feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in the shrink tunnel, wherein the images that are supplied by the at least one camera 10, 11, 17 can be transmitted via the camera system 13 and a data transmission system to a spatially or geographically remote location.

[0052] Yet another feature or aspect of an embodiment is believed at the time of the filing of this patent application to possibly reside broadly in the shrink tunnel, wherein the transmission takes place online.

[0053] The components disclosed in the various publications, disclosed or incorporated by reference herein, may possibly be used in possible embodiments of the present invention, as well as equivalents thereof.

[0054] The purpose of the statements about the technical field is generally to enable the Patent and Trademark Office and the public to determine quickly, from a cursory inspection, the nature of this patent application. The description of the technical field is believed, at the time of the filing of this patent application, to adequately describe the technical field of this patent application. However, the description of the technical field may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the technical field are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0055] The appended drawings in their entirety, including all dimensions, proportions and/or shapes in at least one embodiment of the invention, are accurate and are hereby included by reference into this specification.

[0056] The background information is believed, at the time of the filing of this patent application, to adequately provide background information for this patent application. However, the background information may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the background information are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0057] All, or substantially all, of the components and methods of the various embodiments may be used with at least one embodiment or all of the embodiments, if more than one embodiment is described herein.

[0058] The purpose of the statements about the object or objects is generally to enable the Patent and Trademark Office and the public to determine quickly, from a cursory inspection, the nature of this patent application. The description of the object or objects is believed, at the time of the filing of this patent application, to adequately describe the object or objects of this patent application. However, the description of the object or objects may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the object or objects are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0059] All of the patents, patent applications and publications recited herein, and in the Declaration attached hereto, are hereby incorporated by reference as if set forth in their entirety herein.

[0060] The summary is believed, at the time of the filing of this patent application, to adequately summarize this patent application. However, portions or all of the information contained in the summary may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the summary are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0061] It will be understood that the examples of patents, published patent applications, and other documents which are included in this application and which are referred to in paragraphs which state "Some examples of . . . which may possibly be used in at least one possible embodiment of the present application . . ." may possibly not be used or useable in any one or more embodiments of the application.

[0062] The sentence immediately above relates to patents, published patent applications and other documents either incorporated by reference or not incorporated by reference.

[0063] All of the patents, patent applications or patent publications, which were cited in the International Search Report dated Jun. 23, 2008, and/or cited elsewhere are hereby incorporated by reference as if set forth in their entirety herein as follows: EP 0 512 244, having the following English translation of the German title, "Apparatus for sterilising packaging containers, subjected to high temperatures," published on Nov. 11, 1992; U.S. Pat. No. 3,744,146, having the title "SHRINK TUNNEL," published on Jul. 10, 1973; JP 2005 050109, having the following English translation of the Japanese title, "TUNNEL MONITORING DEVICE," published on Feb. 24, 2005; U.S. Pat. No. 6,259,474, having the title "METHOD FOR RECORDING/REPRODUCTION BY RECORDING/REPRODUCING SYSTEM FOR VISUAL INSPECTION DEVICE," published on Jul. 10, 2001; JP 06 042300, having the following English translation of the Japanese title "TUNNEL INSPECTION DEVICE," published on Feb. 15, 1964; JP 2006 143231, having the following English translation of the Japanese title "SHRINK FILM AND ARTICLE, PROCESSING APPARATUS, INSPECTION METHOD AND MANUFACTURING METHOD RELATED TO THEM," published on Jun. 8, 2006; DE 25 20 428, having the German title "ALS ENDLOS-KETTEN-STABBAND AUSGEBILDETE VORSCHUBEINRICHTUNG FUER VERPACKUNGSGUETER," published on Nov. 25, 1976; and DE 33 26 444, having the following English translation of the German title "Device for detecting the position of mobile machine units on coke oven batteries," published on Jan. 31, 1985.

[0064] All of the patents, patent applications or patent publications, which were cited in the German Office Action dated Jul. 13, 2007, and/or cited elsewhere are hereby incorporated by reference as if set forth in their entirety herein as follows: DE 24 40 517, having the following English translation of the German title "APPARATUS AND METHOD FOR COVERING A LOAD ON A PALLET," published on Aug. 5, 1975; DE 10 2005 038 718, having the following English translation of the German title "Packaging machine for packing of e.g. tablets, comprises housing with a set of windows having glass

plates, where flat displays are arrangement as display units and a control unit is connected with the flat displays over data link," published on Aug. 31, 2006; DE 100 64 217, having the following English translation of the German title "Products packing machine for filling cartons on moving track has several multi-axis mobile robots with interchangeable heads along track," published on Jul. 4, 2002; DE 297 05 781, having the German title "Vorrichtung zur Erkennung falsch orientierter und/oder von einem vorgegebenen Muster abweichender Teile," published on May 15, 1997; DE 198 39 852, having the German title "Verfahren and Vorrichtung zum Prüfen von (Zigaretten-)Packungen," published on Sep. 9, 1999; DE 43 38 190, having the following English translation of the German title "Volumetric drinks bottle filling device," published on Jun. 1, 1995; DE 196 48 447, having the following English translation of the German title "Appliance for handling blister strips," published on May 28, 1998; and DE 197 53 704, having the German title "Maschine, insbesondere Verpackungsmaschine," published on Jun. 10, 1999.

[0065] Some examples of shrink wrapping machines or machines for wrapping items in plastic film which may possibly be utilized or adapted for use in at least one possible embodiment may possibly be found in the following U.S. Patents: U.S. Pat. No. 6,826,893, entitled "Apparatus for wrapping products with plastic film;" U.S. Pat. No. 6,739,115, entitled "Equipment for wrapping groups of products in plastic film;" U.S. Pat. No. 5,878,555, entitled "Apparatus for wrapping articles in plastic film;" U.S. Pat. No. 5,787,691, entitled "Apparatus for wrapping articles in plastic film;" U.S. Pat. No. 5,519,983, entitled "Shrink wrap packaging system with an ultrasonic side sealer;" U.S. Pat. No. 4,956,963, entitled "Method of sealing a shrink wrap package;" U.S. Pat. No. 4,873,814, entitled "Method of making a shrink wrap package;" U.S. Pat. No. 4,214,419, entitled "Collating and shrink wrap packaging apparatus;" U.S. Pat. No. 6,484,475, entitled "Modular packaging machine;" U.S. Pat. No. 4,694,633, entitled "Film wrapping machine;" U.S. Pat. No. 4,118,916, entitled "Thermoplastic wrapping machine;" U.S. Pat. No. 4,118,916, entitled "Thermoplastic wrapping machine;" U.S. Pat. No. 5,371,999, entitled "Shrink film wrapping machine;" U.S. Pat. No. 4,748,795, entitled "Film wrapping machine;" U.S. Pat. No. 5,115,620, entitled "Wrapping machine;" U.S. Pat. No. 7,363,728, having the title "Shrink wrap tunnel with variable set points," published on Apr. 29, 2008; and U.S. Pat. No. 7,263,812, having the title "Beverage bottling plant for filling bottles with a liquid beverage material having a machine and method for wrapping filled bottles," published on Sep. 4, 2007.

[0066] One example of pattern recognition software, which may possibly be utilized or adapted for use in at least one possible embodiment of the present application may possibly be found in U.S. Pat. No. 6,527,181, having the title "Device and method for characterizing and identifying an object," published on Mar. 4, 2003.

[0067] One example of a heat-resistant lamp, which may possibly be utilized or adapted for use in at least one possible embodiment of the present application, may possibly be found in U.S. Pat. No. 7,252,402, having the title "Lighting device for baking oven," published on Aug. 7, 2007.

[0068] Some examples of heat tunnels that may possibly be utilized or adapted for use in at least one possible embodiment are as follows: Weldotron Model 1611 and Weldotron 7141,

available through or manufactured by Weldotron 2000, Inc., located at 8211 Manchester Pike, Murfreesboro, Tenn., 37127, U.S.A.

[0069] Some examples of shrink wrappers or shrink packers, which may possibly make adjustments for change-overs in package size and/or film material, manufactured by KHS AG include the following: the Innopack WSP, the Innopack Kisters ST 700 and 1000 series, the Innopack PSP, and the Innopack WP. Another example of a shrink packer which may possibly be utilized or adapted for use with the present application includes the Variopac Pro, manufactured by Kronos AG, headquartered at Böhmerwaldstraße 5, 93073 Neu- traubling, Germany.

[0070] Some examples of devices for producing air curtains, which may possibly be utilized or adapted for use with the present application, may possibly be found in the following: U.S. Pat. No. 7,464,521, having the title “Vacuum packaging machine for product packages with multiple products,” published on Dec. 16, 2008; and U.S. Patent Application No. 2009/0199844, having the title “EXHAUST HOOD WITH AIR CURTAIN,” published on Aug. 13, 2009.

[0071] Operating and instruction manuals of wrapping machines and shrinking machines may be available through the manufacturers and are incorporated by reference as if presented in their entirety herein.

[0072] Some examples of labeling machines which may possibly be utilized in at least one possible embodiment may possibly be found in the following U.S. patents: U.S. Pat. No. 6,634,400, entitled “Labeling machine;” U.S. Pat. No. 6,561,246, entitled “Labeling machine capable of precise attachment of a label to different sizes of containers;” U.S. Pat. No. 6,550,512, entitled “Labeling machine capable of preventing erroneous attachment of labels on containers;” U.S. Pat. No. 6,543,514, entitled “In-line continuous feed sleeve labeling machine and method;” U.S. Pat. No. 6,378,587, entitled “Cylindrical container labeling machine;” U.S. Pat. No. 6,328,086, entitled “Labeling machine;” U.S. Pat. No. 6,315,021, entitled “Labeling machine;” U.S. Pat. No. 6,263,940, entitled “In-line continuous feed sleeve labeling machine and method;” U.S. Pat. No. 6,199,614, entitled “High speed labeling machine having a constant tension driving system;” U.S. Pat. No. 6,167,935, entitled “Labeling machine;” U.S. Pat. No. 6,066,223, entitled “Labeling machine and method;” U.S. Pat. No. 6,050,319, entitled “Non-round container labeling machine and method;” and U.S. Pat. No. 6,045,616, entitled “Adhesive station and labeling machine.”

[0073] Some examples of methods and apparatuses for closing bottles and containers and their components that may possibly be utilized or possibly adapted for use in at least one possible embodiment of the present application may possibly be found in the following U.S. patents: U.S. Pat. No. 5,398,485 issued to Osifchin on Mar. 21, 1995; U.S. Pat. No. 5,402,623 issued to Ahlers on Apr. 4, 1995; U.S. Pat. No. 5,419,094 issued to Vander Bush, Jr. et al. on May 30, 1995; U.S. Pat. No. 5,425,402 issued to Pringle on Jun. 20, 1995; U.S. Pat. No. 5,447,246 issued to Finke on Sep. 5, 1995; and U.S. Pat. No. 5,449,080 issued to Finke on Sep. 12, 1995.

[0074] Some examples of separating and/or compacting arrangements, which may possible be utilized or adapted for use in at least one possible embodiment of the present application, may possibly be found in the following: U.S. patent application Ser. No. 12/035,688, having the title “METHOD FOR THE MANUFACTURE OF MIXED PACKAGES AND DEVICE FOR CARRYING OUT THE METHOD,”

filed on Feb. 2, 2008; U.S. patent application Ser. No. 12/410,999, having the title “METHOD AND APPARATUS FOR TRANSPORTING GROUPS OF FILLED BEVERAGE BOTTLES TO A BEVERAGE BOTTLE PACKAGING MACHINE IN A BEVERAGE BOTTLING PLANT, AND A METHOD AND APPARATUS FOR TRANSPORTING GROUPS OF CONTAINERS TO A CONTAINER HANDLING MACHINE IN A CONTAINER PROCESSING PLANT;” filed on Mar. 25, 2009; U.S. Pat. No. 7,543,424, having the title “Beverage bottling plant for filling and closing beverage bottles with a packaging device for packaging beverage bottles,” published Jun. 9, 2009; and U.S. Pat. No. 7,481,309, having the title “Method of separating, synchronizing and compacting packed groups of articles;” published on Jan. 27, 2009.

[0075] The patents, patent applications, and patent publication listed above in the preceding twelve paragraphs are herein incorporated by reference as if set forth in their entirety. The purpose of incorporating U.S. patents, Foreign patents, publications, etc. is solely to provide additional information relating to technical features of one or more embodiments, which information may not be completely disclosed in the wording in the pages of this application. Words relating to the opinions and judgments of the author and not directly relating to the technical details of the description of the embodiments therein are not incorporated by reference. The words all, always, absolutely, consistently, preferably, guarantee, particularly, constantly, ensure, necessarily, immediately, endlessly, avoid, exactly, continually, expediently, ideal, need, must, only, perpetual, precise, perfect, require, requisite, simultaneous, total, unavoidable, and unnecessary, or words substantially equivalent to the above-mentioned words in this sentence, when not used to describe technical features of one or more embodiments, are not considered to be incorporated by reference herein.

[0076] The corresponding foreign and international patent publication applications, namely, Federal Republic of Germany Patent Application No. 10 2007 011 526.3, filed on Mar. 9, 2007, having inventors Christian SCHILLING and Herbert BRAAM, and DE-OS 10 2007 011 526.3 and DE-PS 10 2007 011 526.3, and International Application No. PCT/EP2008/001776, filed on Mar. 6, 2008, having WIPO Publication No. WO 2008/110293 and inventors Christian SCHILLING and Herbert BRAAM, are hereby incorporated by reference as if set forth in their entirety herein for the purpose of correcting and explaining any possible misinterpretations of the English translation thereof. In addition, the published equivalents of the above corresponding foreign and international patent publication applications, and other equivalents or corresponding applications, if any, in corresponding cases in the Federal Republic of Germany and elsewhere, and the references and documents cited in any of the documents cited herein, such as the patents, patent applications and publications, are hereby incorporated by reference as if set forth in their entirety herein.

[0077] The purpose of incorporating the corresponding foreign equivalent patent application(s), that is, PCT/EP2008/001776 and German Patent Application 10 2007 011 526.3, is solely for the purpose of providing a basis of correction of any wording in the pages of the present application, which may have been mistranslated or misinterpreted by the translator. Words relating to opinions and judgments of the author and not directly relating to the technical details of the description of the embodiments therein are not to be incorporated by

reference. The words all, always, absolutely, consistently, preferably, guarantee, particularly, constantly, ensure, necessarily, immediately, endlessly, avoid, exactly, continually, expediently, ideal, need, must, only, perpetual, precise, perfect, require, requisite, simultaneous, total, unavoidable, and unnecessary, or words substantially equivalent to the above-mentioned word in this sentence, when not used to describe technical features of one or more embodiments, are not generally considered to be incorporated by reference herein.

[0078] Statements made in the original foreign patent applications PCT/EP2008/001776 and DE 10 2007 011 526.3 from which this patent application claims priority which do not have to do with the correction of the translation in this patent application are not to be included in this patent application in the incorporation by reference.

[0079] Any statements about admissions of prior art in the original foreign patent applications PCT/EP2008/001776 and DE 10 2007 011 526.3 are not to be included in this patent application in the incorporation by reference, since the laws relating to prior art in non-U.S. Patent Offices and courts may be substantially different from the Patent Laws of the United States.

[0080] All of the references and documents, cited in any of the documents cited herein, are hereby incorporated by reference as if set forth in their entirety herein. All of the documents cited herein, referred to in the immediately preceding sentence, include all of the patents, patent applications and publications cited anywhere in the present application.

[0081] The description of the embodiment or embodiments is believed, at the time of the filing of this patent application, to adequately describe the embodiment or embodiments of this patent application. However, portions of the description of the embodiment or embodiments may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the embodiment or embodiments are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0082] The details in the patents, patent applications and publications may be considered to be incorporable, at applicant's option, into the claims during prosecution as further limitations in the claims to patentably distinguish any amended claims from any applied prior art.

[0083] The purpose of the title of this patent application is generally to enable the Patent and Trademark Office and the public to determine quickly, from a cursory inspection, the nature of this patent application. The title is believed, at the time of the filing of this patent application, to adequately reflect the general nature of this patent application. However, the title may not be completely applicable to the technical field, the object or objects, the summary, the description of the embodiment or embodiments, and the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, the title is not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0084] The abstract of the disclosure is submitted herewith as required by 37 C.F.R. §1.72(b). As stated in 37 C.F.R. §1.72(b):

[0085] A brief abstract of the technical disclosure in the specification must commence on a separate sheet, pref-

erably following the claims, under the heading "Abstract of the Disclosure." The purpose of the abstract is to enable the Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure. The abstract shall not be used for interpreting the scope of the claims.

Therefore, any statements made relating to the abstract are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0086] The embodiments of the invention described herein above in the context of the preferred embodiments are not to be taken as limiting the embodiments of the invention to all of the provided details thereof, since modifications and variations thereof may be made without departing from the spirit and scope of the embodiments of the invention.

At Least Partial Nomenclature

- [0087]** 1, 1a Shrink tunnel
- [0088]** 2 Shrink film
- [0089]** 3 Pack formation
- [0090]** 4 Trading unit
- [0091]** 5 Tunnel interior
- [0092]** 5.1 Tunnel entrance
- [0093]** 5.2 Tunnel exit
- [0094]** 6 Conveyor belt
- [0095]** 7 Heating device
- [0096]** 8, 9 Device for the production of an air curtain
- [0097]** 8.1, 9.1 Air curtain
- [0098]** 10, 11 Video camera
- [0099]** 12 Lamp
- [0100]** 13 Camera or monitoring system
- [0101]** 14 Monitor
- [0102]** 15, 16 Curtain
- [0103]** 17 Camera
- [0104]** A Direction of transport

What is claimed is:

1. A method of wrapping bottle packaging units, in a beverage bottling plant, with shrinkwrap material and shrinking the shrinkwrap material around the bottle packaging units, which bottle packaging unit comprise a plurality of beverage bottles, and minimizing faulty bottle packaging units minimizing wastage of shrinkwrap material and minimizing rewrapping of faulty bottle packaging units and minimizing the time between when a shrinkwrapping fault is discovered and when an adjustment is made to fix the shrinkwrapping fault and fixing the shrinkwrapping fault, said method comprising the steps of:

- wrapping a first bottle packaging unit of a first size with shrinkwrap material in a shrink wrapping machine;
- transporting said wrapped first bottle packaging unit to a shrink tunnel and applying heat to the shrinkwrap material while moving said wrapped first bottle packaging unit through said shrink tunnel;
- shrinking the shrinkwrap material wrapped around said first bottle packaging unit;
- changing at least one of: the size of said bottle packaging unit, the format of said bottle packaging unit, a supply of said shrinkwrap material, and a type of shrinkwrap material;
- wrapping, with shrinkwrap material, a second bottle packaging unit in said shrink wrapping machine after changing at least one of: the size of said bottle packaging unit,

the format of said bottle packaging unit, a supply of said first shrinkwrap material, and a type of shrinkwrap material;

transporting said wrapped second bottle packaging unit to said shrink tunnel and applying heat to the shrinkwrap material while moving said wrapped second bottle packaging unit through said shrink tunnel;

shrinking the shrinkwrap material wrapped around said second bottle packaging unit;

observing, with at least two cameras, which at least two cameras comprise:

- a first camera being disposed at the entrance of said shrink tunnel and being configured and disposed to observe the wrapping on said bottle packaging units coming from said shrink wrapping machine before entering said shrink tunnel before and during the entrance of said bottle packaging units into said shrink tunnel;
- a second camera being disposed at the exit of said shrink tunnel and being configured and disposed to observe the result of said shrinking of the shrinkwrap material wrapped around said second bottle packaging unit exiting said shrink tunnel during the exit of said bottle packaging units from said shrink tunnel; and
- a third camera being disposed in said shrink tunnel and being configured and disposed to observe the shrinking of said wrapping on said bottle packaging units within said shrink tunnel during the transit of said bottle packaging units through said shrink tunnel; and

determining, from said observing, any shrinkwrapping resultant faults including at least one of:

- improper wrapping of said bottle packaging unit by said shrink wrapping machine;
- the sealing of overlapping segments of said shrinkwrap material;
- the inflation of said shrinkwrap material over formed lateral shrink holes; and
- the initiation of the shrinking process;

upon determining a shrinkwrapping fault, adjusting at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and correcting of said shrinkwrapping fault and to minimize wastage of shrinkwrap material and to minimize rewrapping bottle packaging units and to minimize the time between when a shrinkwrapping fault is discovered and when an adjustment is made to fix the shrinkwrapping fault and when the shrinkwrapping fault is fixed;

wrapping a third bottle packaging unit, substantially immediately subsequent to said adjusting, of at least one of said shrink wrapping machine and said shrink tunnel, relating to said second bottle packaging unit, in said shrink wrapping machine after changing at least one of: the size of said bottle packaging unit, the format of said bottle packaging unit, a supply of said shrinkwrap material, and a type of shrinkwrap material prior to said second bottle packaging unit being wrapped and shrunk;

transporting said wrapped third bottle packaging unit to said shrink tunnel and applying heat to the shrinkwrap material while moving said wrapped third bottle packaging unit through said shrink tunnel;

shrinking the shrinkwrap material wrapped around said third bottle packaging unit;

observing, with said at least two cameras, the wrapping, the shrinking, and result of said shrinking of the shrinkwrap

material wrapped around said third bottle packaging unit during at least one of: entrance into said shrink tunnel, transit through said shrink tunnel, and exit from said shrink tunnel;

determining, from said observing, any shrinkwrapping resultant faults including at least one of:

- improper wrapping of said bottle packaging unit by said shrink wrapping machine;
- the sealing of overlapping segments of said shrinkwrap material;
- the inflation of said shrinkwrap material over formed lateral shrink holes; and
- the initiation of the shrinking process;

upon determining a shrinkwrapping fault, readjusting at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and correcting said shrinkwrapping fault and to minimize wastage of shrinkwrap material and to minimize rewrapping bottle packaging units and to minimize the time between when a shrinkwrapping fault is discovered and when an adjustment is made to fix the shrinkwrapping fault and when the shrinkwrapping fault is fixed; and

continuing said steps of observing and adjusting subsequent bottle packaging units until said bottle packaging units are substantially free of shrinkwrapping faults such that wastage of shrinkwrap material, rewrapping of bottle packaging units, and the time between when a shrinkwrapping fault is discovered and when an adjustment is made to fix the shrinkwrapping fault and fixing the shrinkwrapping fault is minimized.

2. The method of wrapping bottle packaging units, in a beverage bottling plant, with shrinkwrap material and shrinking the shrinkwrap material around the bottle packaging units according to claim 1, wherein at the tunnel entrance (5.1) and/or at the tunnel exit (5.2), means (8, 9) are provided for the production of at least one air curtain (8.1, 9.1) that closes the tunnel interior (5) off from the outside, and that the at least one camera (10) located outside the tunnel interior (5) photographs the tunnel interior (5) or the portion of the tunnel interior through the at least one air curtain (8.1, 9.1).

3. The method of wrapping bottle packaging units, in a beverage bottling plant, with shrinkwrap material and shrinking the shrinkwrap material around the bottle packaging units according to claim 2, wherein at least one camera (17) is located in the tunnel interior (5).

4. The method of wrapping bottle packaging units, in a beverage bottling plant, with shrinkwrap material and shrinking the shrinkwrap material around the bottle packaging units according to claim 3, wherein the at least one camera (10, 11, 17) can be moved and/or pivoted.

5. The method of wrapping bottle packaging units, in a beverage bottling plant, with shrinkwrap material and shrinking the shrinkwrap material around the bottle packaging units according to claim 4, wherein:

- the images that are supplied by the at least one camera (10, 11, 17) can be transmitted via the camera system 13 and a data transmission system to a spatially or geographically remote location; and
- the transmission takes place online.

6. A method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty packaging units, said method comprising the steps of:

wrapping a first packaging unit of a first size with a first shrinkwrap material in a shrink wrapping machine;

transporting said wrapped first packaging unit to a shrink tunnel and applying heat to the first shrinkwrap material while moving said wrapped first packaging unit through said shrink tunnel;

shrinking the first shrinkwrap material wrapped around said first packaging unit;

changing at least one parameter of said method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units;

wrapping, with a second shrinkwrap material, a second packaging unit in said shrink wrapping machine after changing at least one parameter;

transporting said wrapped second packaging unit to said shrink tunnel and applying heat to the second shrinkwrap material while moving said wrapped second packaging unit through said shrink tunnel;

shrinking the second shrinkwrap material wrapped around said second packaging unit;

detecting, with at least two sensing devices, which at least two sensing devices comprise:

(A) a first sensing device being disposed at the entrance of said shrink tunnel and being configured and disposed to detect the wrapping on said packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of said packaging units into said shrink tunnel;

(B) a second sensing device being disposed at the exit of said shrink tunnel and being configured and disposed to detect the result of said shrinking of the shrinkwrap material wrapped around said packaging units exiting said shrink tunnel during or subsequent to the exit of said packaging units from said shrink tunnel; and

(C) a third sensing device being disposed in said shrink tunnel and being configured and disposed to detect the shrinking of said wrapping on said packaging units within said shrink tunnel during the transit of said packaging units through said shrink tunnel;

determining, from said detecting, any shrinkwrapping resultant faults;

upon determining a shrinkwrapping fault, adjusting at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of said shrinkwrapping fault;

wrapping a third packaging unit, substantially immediately subsequent to said adjusting relating to said second packaging unit of at least one of said shrink wrapping machine and said shrink tunnel;

transporting said wrapped third packaging unit to said shrink tunnel and applying heat to the second shrinkwrap material while moving said wrapped third packaging unit through said shrink tunnel;

shrinking the second shrinkwrap material wrapped around said third packaging unit;

detecting, with said at least two sensing devices:

the wrapping on said packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of said packaging units into said shrink tunnel;

the result of said shrinking of the shrinkwrap material wrapped around said packaging units exiting said

shrink tunnel during or subsequent to the exit of said packaging units from said shrink tunnel; and

the shrinking of said wrapping on said packaging units within said shrink tunnel during the transit of said packaging units through said shrink tunnel;

determining, from said detecting, any shrinkwrapping resultant faults;

upon determining a shrinkwrapping fault, readjusting at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of said shrinkwrapping fault and to minimize faulty packaging units; and

continuing said steps of detecting and adjusting of subsequent packaging units until said packaging units are substantially free of shrinkwrapping faults.

7. Means for performing the method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty packaging units according to claim 6, said means comprising:

means for wrapping a first packaging unit of a first size with a first shrinkwrap material in a shrink wrapping machine;

means for transporting a wrapped first packaging unit to a shrink tunnel and applying heat to the first shrinkwrap material while moving the wrapped first packaging unit through said shrink tunnel;

means for shrinking the first shrinkwrap material wrapped around a first packaging unit;

means for changing at least one parameter of the method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units;

means for wrapping, with a second shrinkwrap material, a second packaging unit in said shrink wrapping machine after changing at least one parameter;

means for transporting a wrapped second packaging unit to said shrink tunnel and applying heat to the second shrinkwrap material while moving the wrapped second packaging unit through said shrink tunnel;

means for shrinking the second shrinkwrap material wrapped around a second packaging unit;

means for detecting, with at least two sensing devices, which at least two sensing devices comprise:

(A) a first sensing device being disposed at the entrance of said shrink tunnel and being configured and disposed to detect the wrapping on packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of packaging units into said shrink tunnel;

(B) a second sensing device being disposed at the exit of said shrink tunnel and being configured and disposed to detect the result of said shrinking of the shrinkwrap material wrapped around packaging units exiting said shrink tunnel during or subsequent to the exit of packaging units from said shrink tunnel; and

(C) a third sensing device being disposed in said shrink tunnel and being configured and disposed to detect the shrinking of said wrapping on packaging units within said shrink tunnel during the transit of packaging units through said shrink tunnel;

means for determining, from detecting, any shrinkwrapping resultant faults;

- means for, upon determining a shrinkwrapping fault, adjusting at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of the shrinkwrapping fault;
- means for wrapping a third packaging unit, substantially immediately subsequent to adjusting relating to a second packaging unit of at least one of said shrink wrapping machine and said shrink tunnel;
- means for transporting a wrapped third packaging unit to said shrink tunnel and applying heat to the second shrinkwrap material while moving the wrapped third packaging unit through said shrink tunnel;
- means for shrinking the second shrinkwrap material wrapped around a third packaging unit;
- means for detecting, with said at least two sensing devices: the wrapping on packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of packaging units into said shrink tunnel;
- the result of the shrinking of the shrinkwrap material wrapped around packaging units exiting said shrink tunnel during or subsequent to the exit of packaging units from said shrink tunnel; and
- the shrinking of the wrapping on packaging units within said shrink tunnel during the transit of packaging units through said shrink tunnel;
- means for determining, from the detecting, any shrinkwrapping resultant faults;
- means for, upon determining a shrinkwrapping fault, readjusting at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of the shrinkwrapping fault and to minimize faulty packaging units; and
- means for continuing the steps of detecting and adjusting of subsequent packaging units until the packaging units are substantially free of shrinkwrapping faults.
- 8.** A shrinkwrapping arrangement for performing the method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty packaging units according to claim 7, said shrinkwrapping arrangement comprising:
- a wrapping arrangement being configured to wrap a first packaging unit of a first size with a first shrinkwrap material in a shrink wrapping machine;
 - a transporting arrangement being configured to transport a wrapped first packaging unit to a shrink tunnel and apply heat to the first shrinkwrap material while moving the wrapped first packaging unit through said shrink tunnel;
 - a shrinking arrangement being configured to shrink the first shrinkwrap material wrapped around a first packaging unit;
 - a changing arrangement being configured to change at least one parameter of the method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units;
 - said wrapping arrangement being configured to wrap, with a second shrinkwrap material, a second packaging unit in said shrink wrapping machine after changing at least one parameter;
 - said transporting arrangement being configured to transport a wrapped second packaging unit to said shrink tunnel and applying heat to the second shrinkwrap material while moving the wrapped second packaging unit through said shrink tunnel;
 - said shrinking arrangement being configured to shrink the second shrinkwrap material wrapped around a second packaging unit;
 - a detecting arrangement being configured to detect, with at least two sensing devices, which at least two sensing devices comprise:
 - (A) a first sensing device being disposed at the entrance of said shrink tunnel and being configured and disposed to detect the wrapping on packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of packaging units into said shrink tunnel;
 - (B) a second sensing device being disposed at the exit of said shrink tunnel and being configured and disposed to detect the result of said shrinking of the shrinkwrap material wrapped around packaging units exiting said shrink tunnel during or subsequent to the exit of packaging units from said shrink tunnel; and
 - (C) a third sensing device being disposed in said shrink tunnel and being configured and disposed to detect the shrinking of said wrapping on packaging units within said shrink tunnel during the transit of packaging units through said shrink tunnel;
 - a determining arrangement being configured to determine, from detecting, any shrinkwrapping resultant faults;
 - an adjusting arrangement being configured to adjust, upon determining a shrinkwrapping fault, at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of the shrinkwrapping fault;
 - said wrapping arrangement being configured to wrap a third packaging unit, substantially immediately subsequent to adjusting relating to a second packaging unit of at least one of said shrink wrapping machine and said shrink tunnel;
 - said transporting arrangement being configured to transport a wrapped third packaging unit to said shrink tunnel and applying heat to the second shrinkwrap material while moving the wrapped third packaging unit through said shrink tunnel;
 - said shrinking arrangement being configured to shrink the second shrinkwrap material wrapped around a third packaging unit;
 - said detecting arrangement being configured to detect, with said at least two sensing devices:
 - the wrapping on packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of packaging units into said shrink tunnel;
 - the result of the shrinking of the shrinkwrap material wrapped around packaging units exiting said shrink tunnel during or subsequent to the exit of packaging units from said shrink tunnel; and
 - the shrinking of the wrapping on packaging units within said shrink tunnel during the transit of packaging units through said shrink tunnel;
 - said determining arrangement being configured to determine, from the detecting, any shrinkwrapping resultant faults;
 - a readjusting arrangement being configured to readjust, upon determining a shrinkwrapping fault, at least one of said shrink wrapping machine and said shrink tunnel to

initiate adjusting and attempting correction of the shrinkwrapping fault and to minimize faulty packaging units; and

a continuing arrangement being configured to permit the continuation of the steps of detecting and adjusting of subsequent packaging units until the packaging units are substantially free of shrinkwrapping faults.

9. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 6, wherein said at least two sensing devices comprise one of:

- (A) and (B); and
- (B) and (C).

10. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 9, wherein said at least two sensing devices comprise at least two cameras.

11. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 10, wherein at the tunnel entrance (5.1) and/or at the tunnel exit (5.2), means (8, 9) are provided for the production of at least one air curtain (8.1, 9.1) that closes the tunnel interior (5) off from the outside, and that the at least one camera (10) located outside the tunnel interior (5) photographs the tunnel interior (5) or the portion of the tunnel interior through the at least one air curtain (8.1, 9.1).

12. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 11, wherein at least one camera (17) is located in the tunnel interior (5).

13. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 12, wherein the at least one camera (10, 11, 17) can be moved and/or pivoted.

14. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 13, wherein the images that are supplied by the at least one camera (10, 11, 17) can be transmitted via the camera system 13 and a data transmission system to a spatially or geographically remote location.

15. The method of wrapping packaging units with shrink-wrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty wrapped packaging units according to claim 14, wherein the transmission takes place online.

16. A shrinkwrapping arrangement for performing the method of wrapping packaging units with shrinkwrap material and shrinking the shrinkwrap material around the packaging units, and minimizing faulty packaging units, said shrinkwrapping arrangement comprising:

- a transporting arrangement being configured to transport a wrapped packaging unit to a shrink tunnel and apply heat to the shrinkwrap material while moving the wrapped packaging unit through said shrink tunnel;
- a shrinking arrangement being configured to shrink the shrinkwrap material wrapped around a packaging unit;

a changing arrangement being configured to change at least one parameter of the method of wrapping packaging units with shrinkwrap material and shrinking the shrink-wrap material around the packaging units;

a detecting arrangement being configured to detect, with at least two sensing devices, which at least two sensing devices comprise:

- (A) a first sensing device being disposed at the entrance of said shrink tunnel and being configured and disposed to detect the wrapping on packaging units coming from said shrink wrapping machine before entering said shrink tunnel before or during the entrance of packaging units into said shrink tunnel;
- (B) a second sensing device being disposed at the exit of said shrink tunnel and being configured and disposed to detect the result of shrinking of the shrinkwrap material wrapped around packaging units exiting said shrink tunnel during or subsequent to the exit of packaging units from said shrink tunnel; and
- (C) a third sensing device being disposed in said shrink tunnel and being configured and disposed to detect the shrinking of wrapping on packaging units within said shrink tunnel during the transit of packaging units through said shrink tunnel;

a determining arrangement being configured to determine, from detecting, any shrinkwrapping resultant faults;

an adjusting arrangement being configured to adjust, upon determining a shrinkwrapping fault, at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of a shrinkwrapping fault;

a readjusting arrangement being configured to readjust, upon determining a shrinkwrapping fault, at least one of said shrink wrapping machine and said shrink tunnel to initiate adjusting and attempting correction of a shrinkwrapping fault and to minimize faulty packaging units; and

a continuing arrangement being configured to permit continuation of the steps of detecting and adjusting of subsequent packaging units until packaging units are substantially free of shrinkwrapping faults.

17. The shrinkwrapping arrangement as recited in claim 16, wherein at the tunnel entrance (5.1) and/or at the tunnel exit (5.2), means (8, 9) are provided for the production of at least one air curtain (8.1, 9.1) that closes the tunnel interior (5) off from the outside, and that the at least one camera (10) located outside the tunnel interior (5) photographs the tunnel interior (5) or the portion of the tunnel interior through the at least one air curtain (8.1, 9.1).

18. The shrinkwrapping arrangement as recited in claim 17, wherein at least one camera (17) is located in the tunnel interior (5).

19. The shrinkwrapping arrangement as recited in claim 18, wherein the at least one camera (10, 11, 17) can be moved and/or pivoted.

20. The shrinkwrapping arrangement as recited in claim 19, wherein:

- the images that are supplied by the at least one camera (10, 11, 17) can be transmitted via the camera system 13 and a data transmission system to a spatially or geographically remote location; and
- the transmission takes place online.