A system for the folding, aseptic filling, and aseptic sealing of packaging agents including a transporting device including a conveyor belt and cells connected to the conveyor belt for the transportation of the carton sleeves, a device for folding and conveying the carton sleeves to the cells of the transporting device, a device for sterilizing the carton sleeves, a device for folding and sealing bottom surfaces of the carton sleeves, a device for filling the carton sleeves with contents, a device for folding and sealing the gable surfaces of the carton sleeves, and an aseptic chamber. The cells at least in a partial region of the system are arranged within the aseptic chamber, while the conveyor belt is arranged outside the aseptic chamber. A corresponding method is also illustrated and described.
Fig. 4
SYSTEM AND METHOD FOR THE FOLDING, FILLING AND SEALING OF CARTON SLEEVES

[0001] The invention relates to a system for the folding, aseptic filling and aseptic sealing of carton sleeves with a transporting device comprising a conveyor belt and with cells connected to the conveyor belt for transporting the carton sleeves, a device for folding and conveying the carton sleeves to the cells of the transporting device, a device for sterilising the carton sleeves, a device for folding and sealing the bottom surfaces of the carton sleeves, a device for filling the carton sleeves with contents, a device for folding and sealing the gable surfaces of the packing casings, and with an aseptic chamber.

[0002] The invention also relates to a method for the folding, aseptic filling and aseptic sealing of carton sleeves comprising the following steps: a) folding and conveying the carton sleeves to cells fastened to a conveyor belt, b) sterilising the carton sleeves, c) folding and sealing the bottom surfaces of the carton sleeves, d) filling the carton sleeves with contents, and e) folding and sealing the gable surfaces of the carton sleeves.

[0003] In the context of the invention illustrated and described hereinafter the term “aseptic” is understood to mean in conformity with the following publications of the VDMA (Verband Deutscher Maschinen-und Anlagenbau e.V.—German Engineering Federation):

[0004] Aseptische Verpackungsmaschinen für die Nahrungsmittelindustrie: Mindestanforderungen und Rahmenbedingungen für einen bestimmungsgemäßen Betrieb (No. 11/2006; February 2006), and


[0006] According to the aforementioned publications the term “aseptic” presupposes in particular a microorganism reduction rate of the filling and packing plant of at least four powers of 10 (at least four “log steps”; this corresponds to a reduction of at least 99.99%). The microorganism reduction rate is determined on the basis of defined test methods using suitable test microorganisms. Not every plant with aseptic or sterile properties known from the prior art can therefore be regarded as “aseptic” in the meaning of the present invention.

[0007] Packagings can be produced in various ways and from a very wide range of materials. One widely employed method is to produce a blank from the packaging material, from which first of all a carton sleeve is formed by folding and further steps, and finally a finished packaging is formed. This variant has inter alia the advantage that the blanks are very flat and can therefore be stacked in a space-saving manner. In this way the blanks and carton sleeves can be produced at a site other than that in which the folding and filling of the carton sleeves takes place. As material composites are often used, for example a composite consisting of several thin layers of paper, cardboard, plastic or metal. Such packagings are widely used in particular in the foodstuffs industry.

[0008] In the field of packaging technology numerous systems and methods are known, with which carton sleeves collapsed flat are folded, sealed on one side, filled with contents, and can then be completely sealed.

[0009] Conventional non-aseptic systems and methods for the folding, filling and sealing of composite packagings are known for example from EP 0 112 605 A2 or from U.S. Pat. No. 3,060,654. In these systems the carton sleeves are typically transported by conveyor belts or other transporting means from one station to the further stations.

[0010] The systems known from EP 0 112 605 A2 or from U.S. Pat. No. 3,060,654 have the disadvantage however that the carton sleeves are at no point protected against microorganisms. Neither is an active disinfection or sterilisation provided, nor are provisions made for maintaining the state achieved by the sterilisation. With these systems and methods therefore only foodstuffs can be packaged, which in any case have to be consumed within a short period or in which a thorough cooling (“cooling chain”) has to be ensured, for example fruit juices. For the filling and packaging of foodstuffs that have themselves been sterilised in order to increase their longer shelf life, the procedures known from EP 0 112 605 A2 or from U.S. Pat. No. 3,060,654 are therefore not suitable.

[0011] An improvement of the shelf life can be achieved by arrangements in which a sterilisation of the packagings takes place before the filling operation. In addition the state achieved by the sterilisation should be maintained. For this purpose the transporting means with which the packagings are transported—for example conveyor belts or mandrel wheels—are often completely enclosed by a chamber. This has the aim of protecting the packagings from renewed contamination or the sterilisation. Such a system is known for example from U.S. Pat. No. 4,590,754, U.S. Pat. No. 5,534,222 or U.S. Pat. No. 4,375,145. Arranging the transporting means completely within a chamber has the disadvantage however that such chambers must occupy a very large volume that has to be completely sterilised or in any case has to be maintained sterile. A further disadvantage of a complete enclosing of the transporting means by a chamber is the fact that the components disposed within the chamber are very difficult to access for cleaning, maintenance or repair work. In addition it has also proved disadvantageous that the transporting means cannot be lubricated in a conventional manner, since conventional lubricants, e.g. oil or grease, generally do not meet the hygiene requirements that have to be maintained in the chamber.

[0012] The volume to be sterilised can be reduced if the transporting means is not enclosed by a chamber along its whole path. Instead the packagings to be filled can be introduced together with the transporting means into an aseptic chamber and after the filling and possibly further steps can be removed again from this chamber. Such arrangements are therefore an aseptic “tunnel” rather than an aseptic chamber. Airtight locks are provided at the inlet and outlet of the tunnel, which are intended to ensure a sealing of the tunnel—for example by a “curtain” of sterile air. Such systems and methods are known for example from WO 2011/002383 A1. A problem remains however due to the fact that also the transporting means—at least in a partial region of the arrangement—are guided through the aseptic tunnel and in this way contaminants, for example in the form of lubricants or dust, could be introduced into the tunnel.

[0013] Against this background the object of the invention is to elaborate and develop the system mentioned in the introduction and described in more detail hereinafter as well as the method mentioned in the introduction and described in more detail hereinafter in such a way that,
despite the most economical use of sterilising agents, an improved hygiene in the filling of composite packagings is achieved.

[0014] This object is achieved with a system according to the preamble of Claim 1, in that the cells at least in a partial region of the system are arranged within the aseptic chamber, while the conveyor belt is arranged outside the aseptic chamber.

[0015] The invention is based on the idea that only the immediate surroundings of the carton sleeves to be sterilised have to be enclosed by the aseptic chamber. In particular only the cells that carry and guide the carton sleeves should be arranged within the aseptic chamber, while the conveyor belt, to which the cells are connected, is arranged outside the aseptic chamber. Cells are understood to mean any elements that are suitable for carrying carton sleeves, for example clamping elements, frames, containers or the like. A conveyor belt is understood to mean any means that is suitable for moving the cells, for example belts, chains or the like. Although the solution according to the invention is structurally somewhat more complicated, it nevertheless has the considerable advantage that the conveyor belt cannot introduce any contaminants into the aseptic chamber. In addition the volume of the aseptic chamber can be smaller if the conveyor belt runs outside the aseptic chamber. The external arrangement of the conveyor belt and the small chamber volume enable, despite a more sparing use of sterilising agents (e.g. hydrogen peroxide), a very high degree of cleanliness to be achieved within the aseptic chamber. As a result the system is particularly suitable for the filling of very sensitive contents such as foodstuffs. An aseptic chamber is understood to mean a space that is suitable for screening a specific volume, in particular aseptic air, against an external environment, in particular non-aseptic air. Sterile, i.e. largely microorganism-free conditions, can be achieved for example by the system described in WO 2010/142278 A1 and also by the method described therein.

[0016] According to one arrangement of the invention it is envisaged that the aseptic chamber comprises a wall with a slit running in the transportation direction. This arrangement provides a structurally particularly simple possibility of enabling the cells to run within the aseptic chamber even though the conveyor belt runs outside the chamber. In fact, the cells can be guided for example by a thin holding arm that extends outwardly from the conveyor belt through the slit into the interior of the aseptic chamber, where it is then connected to the cells. Preferably the slit is closed tight with a seal.

[0017] In a further development of the invention it is envisaged that the cells, at least in the region of the device for sterilising the carton sleeves, the device for folding and sealing the bottom surfaces of the carton sleeves, the device for filling the carton sleeves with contents and the device for folding and sealing the gable surfaces of the carton sleeves, are arranged within the aseptic chamber. Preferably the cells during the aforementioned steps and between the aforementioned steps are arranged the whole time within the same aseptic chamber. Since the cells are arranged within the aseptic chamber only in the hygienically particularly critical steps of sterilisation, bottom folding/sealing, filling and gable folding/sealing, the volume to be maintained sterile can be further reduced. The cells are thus introduced before or during the sterilisation into the aseptic chamber, and during or after the gable folding/sealing are withdrawn again from the aseptic chamber. This arrangement can also be described as an aseptic “tunnel”. The conveyor belt runs all the time outside the aseptic chamber. Preferably the inlet and outlet of the aseptic chamber are sealed. This can be achieved for example by a “curtain” of sterile air.

[0018] A further arrangement of the invention envisages that the system comprises a device for removing the filled and sealed carton sleeves from the cells of the transporting device. The filled and sealed carton sleeves have to be removed from the cells of the transporting device so that the cells can receive new carton sleeves that have not yet been filled. This can be effected for example by gripping arms that grasp the carton sleeves at the seams that are formed during the sealing of the gable surfaces and bottom surfaces (“fin seams”). To this end the gripping arms preferably follow for a short time the direction and speed of the conveyor belt.

[0019] According to a further development of the invention it is envisaged that the conveyor belt and the cells are arranged in a horizontal plane. By means of this development it is ensured that the carton sleeves are guided in a horizontal plane. This has the advantage that the carton sleeves and where appropriate their contents are not subjected to vertical accelerations. In addition the arrangement in a horizontal plane has the advantage that all regions of the unit are equally easily accessible in order to carry out for example cleaning, maintenance or repair work.

[0020] In a further arrangement of the invention it is envisaged that the system comprises devices for the pre-folding of the bottom surfaces and gable surfaces of the carton sleeves. In this connection those fold lines are formed that are located between adjacent bottom surfaces and adjacent gable surfaces, between bottom surfaces and adjacent side surfaces, and between gable surfaces and adjacent side surfaces. This procedure has the advantage of making the fold lines more flexible, so that the subsequent folding can take place more quickly, more simply and more precisely.

[0021] The reliability of the arrangement can be increased if, according to a further development of the invention, it is envisaged that the system comprises at least one device for ejecting defective carton sleeves from the cells and—in so far as the device is arranged in the region of the aseptic chamber—from the aseptic chamber itself. Defective carton sleeves can cause the system to stop. For example, a carton sleeve that is not folded properly could fall out of the cells. In addition an unsatisfactory folding could result in an insufficiently tight sealing of the bottom or gable. A carton sleeve that has fallen out of the cell as well as a non-airtight packaging sealing could mean that the contents do not remain in the carton sleeve during the filling, but contaminate the system, necessitating a cleaning and disinfection of the system that often takes several hours. This can be avoided by devices by which defective carton sleeves are sorted out and ejected. To this end sensors, in particular optical sensors, are preferably provided that determine the state of the carton sleeves. Since it would be a complicated and expensive procedure to replace the defective carton sleeves by non-defective carton sleeves, it is instead proposed to suspend or at any rate temporarily stop the filling and the further processing steps in the region of that cell that contains the defective carton sleeve or no carton sleeve at all.

[0022] According to a further arrangement of the invention it is proposed that the system comprises a device for the
final fabrication of the carton sleeves, in particular for attaching the flaps or tabs of the carton sleeves. The final fabrication brings the already filled and closed carton sleeves into their ready-for-sale shape. In particular the projecting regions of packaging material ("flaps") are attached during the final fabrication. A fastening of the flaps can take place for example by treatment with hot air or adhesive. Preferably the carton sleeves in the region of the final fabrication have already been removed from the cells.

[0023] A further improvement in hygiene can be achieved according to a further development of the invention if the system comprises a device for the conditioning of the cells, in particular for cleaning, disinfecting and/or drying the cells. Preferably the conditioning device is arranged between the device for removing the carton sleeves and the device for feeding the carton sleeves. This has the advantage that the cells in this region do not carry any carton sleeves, so that the cleaning, disinfection and drying of the cells can be carried out particularly thoroughly.

[0024] According to a further arrangement of the invention it is envisaged that the device for filling the carton sleeves with contents is a carousel-type device. The advantage of a carousel for the filling is above all a more compact design and construction of the system, since also the region in which the conveyor belt reverses direction is utilised for filling the carton sleeves. Preferably the carousel has co-rotating filling outlets.

[0025] In a method according to the preamble of Claim 11 the afore-described object is achieved in that the cells at least in a partial region of the method are guided through an aseptic chamber, while the conveyor belt is guided outside the aseptic chamber.

[0026] As was already explained for the system, an advantage of having the conveyor belt outside the aseptic chamber is a more compact shape of the aseptic chamber and also an improved hygiene.

[0027] In a further modification of the method it is proposed that the cells are guided at least during the steps b), c), d) and e) through the aseptic chamber. A restriction of the guidance of the cells in the aseptic chamber to the hygienically particularly critical steps of sterilisation, bottom folding/sealing, filling and gable folding/sealing means that the volume to be maintained sterile can be reduced. The cells are for this purpose introduced before or during the sterilisation into the aseptic chamber and are removed again from the aseptic chamber during or after the gable folding/sealing.

[0028] A further teaching of the invention envisages that after step a) and before step b) the following step is carried out: a) pre-folding of the bottom surfaces and/or of the gable surfaces of the carton sleeves. In this connection those fold lines are formed that are located respectively between adjacent bottom surfaces and adjacent gable surfaces, between bottom surfaces and adjacent side surfaces, and between gable surfaces and adjacent side surfaces. The purpose of this procedure is to make the fold lines more flexible, so that the subsequent folding can be carried out more quickly, more simply and more precisely. It may be envisaged that the bottom surfaces as well as the gable surfaces are pre-folded before step b) (sterilisation). This has the advantage that dust produced in the pre-folding does not endanger the result of the sterilisation. It is also sufficient however if the bottom surfaces are pre-folded before step c) and if the gable surfaces are pre-folded before step e).

[0029] According to a further modification of the invention it is envisaged that after step a), in particular after step aa) and before step b), the following step is carried out: ab) ejection of defective carton sleeves from the cells of the transportation device. Alternatively or in addition it is envisaged that after step c) and before step d) the following step is carried out: ca) ejection of defective carton sleeves from the cells of the transportation device and from the aseptic chamber. An ejection of defective carton sleeves has in particular the already described advantage that the system operates more reliably and as far as possible without interruptions.

[0030] According to a further modification of the invention it is envisaged that the carton sleeves are guided during step d) along a circular path. The guide of the carton sleeves along the circular path has the advantage of a more compact design and construction of the system. In order to compensate the centrifugal forces produced by the rotation of the filling device, it may be envisaged that the carton sleeves are guided in an inclined manner in the region of the filling device.

[0031] A further modification of the invention envisages that after step e) the following step is carried out: f) removal of the filled and sealed carton sleeves from the cells of the transportation device. The removal of the carton sleeves in a system with a continuously circulating conveyor belt is necessary in order to be able to reload the cells with carton sleeves.

[0032] According to a further arrangement of the invention it is proposed that after step f) the following step is carried out: g) final fabrication of the carton sleeves, in particular attachment of the flaps of the carton sleeves. By means of the final fabrication the carton sleeves are brought into a ready-for-sale state.

[0033] According to a further modification of the invention it is envisaged that after step f) the following step is carried: h) conditioning of the cells of the transporting device, in particular a fluctuation about a mean value, may be envisaged. The conveyor belt should thus at no time be stopped, as would be the case in an intermittent operation. A cyclical variation of the speed of the conveyor belt permits an optimisation of specific process steps, for example the introduction of the carton sleeves into the cells.

[0034] A particularly more uniform and thus less wear-affected operation can be achieved if, according to a further modification of the method, the conveyor belt and the cells have a constant speed. Alternatively it may be envisaged that the speed of the conveyor belt is changed, the speed always being greater than zero. For example, a cyclical variation of the speed, in particular a fluctuation about a mean value, may be envisaged. The conveyor belt should thus at no time be stopped, as would be the case in an intermittent operation. A cyclical variation of the speed of the conveyor belt permits an optimisation of specific process steps, for example the introduction of the carton sleeves into the cells.

[0035] According to a further modification of the method it is envisaged that the conveyor belt and the cells are guided in a horizontal plane. As has already been described here-inbefore in connection with the system, an advantage of the arrangement in a horizontal plane is the avoidance of vertical accelerations as well as a good accessibility to the carton sleeves and in addition a simpler construction of the system.
Finally, according to a further arrangement of the method it is proposed that a continuous inflow of sterile air takes place within the aseptic chamber. The aseptic chamber cannot be closed in an absolutely airtight manner during operation, despite seals and airlocks. In order to avoid non-sterile air from the surroundings penetrating the aseptic chamber, a continuous feed of sterile air into the aseptic chamber is provided. As the result sterile air escapes in small amounts from the not completely airtight aseptic chamber. In this way the inflow of non-sterile air into the aseptic chamber is prevented.

The invention is described in more detail hereinafter with the aid of a drawing simply illustrating a preferred exemplary embodiment. In the drawings:

Fig. 1A shows a blank known from the prior art for folding a carton sleeve,

Fig. 1B shows a carton sleeve known from the prior art, formed from the blank illustrated in Fig. 1A, in the flat folded state,

Fig. 1C shows the carton sleeve of Fig. 1B in the folded state,

Fig. 1D shows the carton sleeve of Fig. 1C in the filled and sealed state,

Fig. 1E shows the carton sleeve of Fig. 1C in the filled, sealed and ready-for-sale state,

Fig. 2 shows a system according to the invention for the folding, filling and sealing of carton sleeves, in a plan view,

Fig. 3 shows part of the system illustrated in Fig. 2 in cross-section along the cutting plane III-III identified in Fig. 2, and

Fig. 4 shows the course of a method according to the invention for the folding, filling and sealing of carton sleeves, in a schematic view.

Fig. 1A shows a blank known from the prior art, from which a carton sleeve can be formed. The blank 1 can comprise a plurality of plies or layers of different materials, for example paper, cardboard, plastic or metal, in particular aluminium. The blank 1 has a plurality of fold lines 2, which are intended to facilitate the folding of the blank 1 and subdivide the blank 1 into several surfaces. The blank 1 can be subdivided into a first side surface 3, a second side surface 4, a front surface 5, a rear surface 6, a sealing surface 7, bottom surfaces 8 and gable surfaces 9. A carton sleeve can be formed from the blank 1 by folding the blank 1 in such a way that the sealing surface 7 can be joined, in particular welded, to the front surface 5.

Fig. 1B shows a carton sleeve 10 known from the prior art in the flat folded state. The regions of the carton sleeve already described in connection with Fig. 1A are provided with corresponding reference numerals in Fig. 1B.

The carton sleeve 10 is formed from the blank 1 illustrated in Fig. 1A. For this purpose the blank 1 was folded in such a way that the sealing surface 7 and the front surface 5 are arranged overlapping, so that the two surfaces can be welded to one another over their whole area. A longitudinal seam 11 is thereby formed. In Fig. 1B the carton sleeve 10 is illustrated in a flat folded up state. In this state a side surface 4 (covered in Fig. 1B) lies underneath the front surface 5, while the other side surface 3 lies on the rear surface 6 (covered in Fig. 1B). In the flat folded up state a plurality of packing casings 10 can be stacked in a particularly space-saving manner. The carton sleeves 10 are therefore often stacked at the site of production and transported stacked to the filling site. Only there are the carton sleeves unstacked and folded, so that they can be filled with contents, for example with foodstuffs.

Fig. 1C shows the carton sleeve 10 of Fig. 1B in the folded state. Here too the regions of the carton sleeve already described in connection with Fig. 1A or Fig. 1B are provided with corresponding reference numerals. A folded state is understood to be a configuration in which an angle of about 90° is formed between the two respectively adjacent surfaces 3, 4, 5, 6, so that the carton sleeve 10 has, depending on the shape of these surfaces, a square or rectangular cross-section. Corresponding to this the opposite side surfaces 3, 4 are arranged parallel to one another. The same also applies to the front surface 5 and the rear surface 6.

Fig. 1D shows the carton sleeve 10 of Fig. 1C in the filled and sealed state. In the region of the bottom surfaces 8 and in the region of the gable surfaces 9 a fin seam 12 is formed after the sealing operation. In addition, in the edge regions of the bottom surfaces 8 and of the gable surfaces 9 projecting regions of excess material are formed, which are also termed “flaps” 13. In Fig. 1D the fin seams 12 and the flaps 13 project upwards and outwards respectively. In Fig. 1E the fin seams 12 and also the flaps 13 have been attached, for example by bonding. The flaps 13 formed by the gable surfaces 9, i.e. the upper flaps, are attached to the side surfaces 3, 4, while the flaps 13 formed by the bottom surfaces, i.e. the lower flaps, are attached to the lower side of the carton sleeve 10. (Note: Fig. 1E is also appropriately adapted). In Fig. 1E the carton sleeve 10 is therefore shown in a ready-for-sale state.

Fig. 2 shows a system 14 according to the invention for the folding, filling and sealing of carton sleeves 10 in a plan view. The system 14 includes first of all a transporting device, which in the preferred exemplary embodiment illustrated in Fig. 2 is a circulating, endless conveyor belt 15 with cells 16 fastened thereto for accommodating and transporting the carton sleeves 10. The conveyor belt 15 and the cells 16 are preferably arranged in a horizontal plane. The system 14 also includes a device 17 for folding and conveying the carton sleeves 10 to the transporting device. This device 17 includes a separating device 18 for individually separating and preparing the flat carton sleeves 10 and a transfer unit 19. The separating device 18 can for example be a magazine, from which the flat carton sleeves 10 are expelled individually. The transfer unit 19 can for example be designed as a rotating drum with suction elements for suctioning the carton sleeves 10. The device 17 is also termed an "infeed" device.

After the pre-folding (not illustrated in Fig. 2) a first device 20 is provided for ejecting defective carton sleeves 10 from the cells 16 of the transporting device. In order to detect damaged carton sleeves 10 the device 20 can comprise a sensor. In addition the system 14 can comprise a device 21 for sterilising the carton sleeves 10. In this connection this may be a device known from WO 2010/142278 A1. Following this a device 22 for folding and sealing the bottom surfaces 8 of the carton sleeves 10 is provided as part of the system 14, which in turn is followed by a second device 24 for ejecting defective carton sleeves 10. The sealing of the bottom surfaces 8 can take place by activating the packaging material with hot air or by suitable welding or bonding methods. The devices 20, 21, 22 are
arranged in a region in which the cells 16 of the transporting device are guided along a straight line.

[0052] In addition the system 14 illustrated in FIG. 2 comprises a device 23 for filling and sealing the carton sleeves 10 with contents. This device 23 is designed as a carousel, so that the carton sleeves 10 are also guided in the region of this device 23 along a circular path. After the filling operation the carton sleeves 10 are conveyed to a device 24 for folding and sealing the gable surfaces 9 of the carton sleeves 10. The sealing of the gable surfaces 9 can also take place by an activation of the packaging material with hot air or by suitable welding or bonding methods. The system 14 includes in addition a device 25 for removing the now filled and sealed carton sleeves 10 from the cells 16 of the transporting device. This device 25 can for example include gripping arms and a conveyor belt, so as to move the carton sleeves 10 removed from the transporting device away from the system 14. The device 25 is also termed an “outfeed” device. Furthermore a device 26 is provided for the final fabrication of the carton sleeves 10, by which is understood for example the attachment and bonding of the projecting “flaps” 13 of the carton sleeves 10. Finally a device 27 is provided for conditioning the cells 16. This device 27 is arranged between the “outfeed” 25 and the “infed” 17 and is therefore disposed in a region in which the cells 16 do not carry any carton sleeves 10. In this way the cells 16 can be conditioned particularly well by the device 27, by which is understood for example a cleaning, disinfection or drying of the cells 16.

[0053] The system 14 illustrated in FIG. 2 is characterised by a specially designed aseptic chamber 28. The cells 16 of the transporting device are at least in the region of the devices 21, 22, 23 and 24 arranged within the aseptic chamber 28. In this way the level of asepsis achieved in the device 21 by the sterilisation can be largely maintained in the following devices 22, 23 and 24. The conveyor belt 15 on the other hand always runs outside the aseptic chamber 28.

[0054] FIG. 3 shows part of the system 14 illustrated in FIG. 2 in cross-section along the sectional plane identified in FIG. 2. In the selected view this is a cross-section through the aseptic chamber 28. The aseptic chamber 28 has a wall 29, which encloses the cells 16 of the transporting device. The cells 16 comprise a rear wall 30, side walls 31 and—not shown in FIG. 3—spring elements. The spring elements are produced from an elastic material, for example spring steel or a flexible plastic, and serve to tightly hold or clamp the carton sleeves 10 in the cells 16. The size of the cell 16 is adapted to the size of the carton sleeve 10 in such a way that the bottom surfaces 8 as well as the gable surfaces 9 of the carton sleeves 10 project respectively downwardly and upwardly from the cell 16. This facilitates access to the bottom and gable surfaces 8, 9, so that these can easily be folded and sealed while they are held by the cells 16.

[0055] The rear wall 30 of the cell 16 illustrated in FIG. 2 is connected via a holding arm 32 and a fastening plate 33 to the conveying belt 15. The holding arm 32 projects from the aseptic chamber 28 through a slit 34, this slit 34 being tightly sealed by a seal 35. In other words, the cell 16 is therefore arranged within the aseptic chamber 28 and enclosed by the wall 29, while the conveying belt 15 is arranged outside the aseptic chamber 28.

[0056] Finally, the course of a method according to the invention for the folding, filling and sealing of carton sleeves 10 is shown in a schematic representation in FIG. 4. The stations of the system 14 already described in connection with FIG. 2 are provided with corresponding reference numerals in FIG. 4.

[0057] First of all an inward transfer of the carton sleeves 10 into the cells 16 of the transporting device takes place. This is carried out by the device 17. In the device 20 the defective carton sleeves 10 are then ejected from the transporting device while the regular and undamaged carton sleeves 10 enter the sterilisation device 21 and also the aseptic chamber 28. Following the sterilisation the folding and sealing of the bottom surfaces 8 takes place in the device 22. This is then followed by a renewed ejection of the defective carton sleeves 10, wherein this time the carton sleeves not only have to be ejected from the transporting device but also from the aseptic chamber 28. In the device 23 the carton sleeves 10 are then filled with contents, before the gable surfaces 9 are folded together and sealed in the device 24. Following this the filled and sealed carton sleeves 10 are ejected by the device 25 from the transporting device as well as from the aseptic chamber 28. A final fabrication of the carton sleeves 10 takes place in the device 26. Before the cells 16 receive the next carton sleeve 10 a conditioning is carried out, thus for example a cleaning of the cells 16 in the device 27. The final fabrication of the carton sleeves 10 in the device 26 and the conditioning of the cells 16 in the device 27 can take place simultaneously.

LIST OF REFERENCE NUMERALS

[0058] 1: Blank
[0059] 2: Fold line
[0060] 3: 4: Side surfaces
[0061] 5: Front surface
[0062] 6: Rear surface
[0063] 7: Sealing surface
[0064] 8: 9: Gable surface
[0065] 9: 10: Carton sleeve
[0066] 11: Longitudinal seam
[0067] 12: Fin seam
[0069] 13: Flaps
[0070] 14: System for the folding, filling and sealing of carton sleeves
[0071] 15: Conveyor belt
[0072] 16: Cells
[0073] 17: Device for the folding and conveying of carton sleeves
[0074] 18: Separating device
[0075] 19: Transfer unit
[0076] 20: Device for ejecting defective carton sleeves
[0077] 21: Device for filling and sealing carton sleeves
[0078] 22: Device for folding and sealing the bottom surfaces of the carton sleeves
[0079] 23: Device for filling carton sleeves
[0080] 24: Device for folding and sealing the gable surfaces of the carton sleeves
[0081] 25: Device for removing carton sleeves from the transporting device
[0082] 26: Device for the final fabrication of carton sleeves
[0083] 27: Device for conditioning the cells of the transporting device
[0084] 28: Aseptic chamber
[0085] 29: Wall of the aseptic chamber
[0086] 30: Rear wall of the cell
1. A system for folding, aseptic filling, and aseptic sealing of carton sleeves comprising:
a conveying device comprising a conveyor belt and cells connected to the conveyor belt for transporting the
carton sleeves,
a device for folding and conveying the carton sleeves to the cells of the transporting device,
a device for sterilising the carton sleeves,
a device for folding and sealing the bottom surfaces of the carton sleeves,
a device for filling the carton sleeves with contents,
a device for folding and sealing gable surfaces of the carton sleeves, and
an aseptic chamber,
wherein
the cells at least in a partial region of the system are arranged within the aseptic chamber, while the conveyor belt is arranged outside the aseptic chamber.
2. The system according to claim 1, wherein the aseptic chamber has a wall with a slit running in a transporting direction.
3. The system according to claim 1, wherein the cells at least in a region of the device for sterilising the carton sleeves,
device for folding and sealing the bottom surfaces of the carton sleeves,
device for filling the carton sleeves with contents, and the device for folding and sealing the gable surfaces of the carton sleeves,
are arranged within the aseptic chamber.
4. The system according to claim 1, wherein the system further comprises a device for removing filled and sealed carton sleeves from the cells of the transporting device.
5. The system according to claim 1, wherein the conveyor belt and the cells are arranged in a horizontal plane.
6. The system according to claim 1, wherein the system comprises devices for pre-folding the bottom surfaces and the gable surfaces of the carton sleeves.
7. The system according to claim 1, wherein the system further comprises at least one device for ejecting defective carton sleeves from the aseptic chamber.
8. The system according to claim 1, wherein the system further comprises a device for the final fabrication of the carton sleeves, for attaching flaps of the carton sleeves.
9. The system according to claim 1, wherein the system further comprises a device for cleaning, disinfecting and/or drying the cells.
10. The system according to claim 1, wherein the device for filling the carton sleeves with contents is a carousel.
11. A method for the folding, aseptic filling, and aseptic sealing of carton sleeves, comprising the following steps:
a) folding and conveying the carton sleeves to cells fastened to a conveyor belt,
b) sterilising the carton sleeves,
c) folding and sealing the bottom surfaces of the carton sleeves,
d) filling the carton sleeves with contents, and
e) folding and sealing gable surfaces of the carton sleeve, wherein the cells at least in a partial region of the method are guided through an aseptic chamber, while the conveyor belt is guided outside the aseptic chamber.
12. The method according to claim 11, wherein the cells are guided through the aseptic chamber at least during the steps b), c), d) and e).
13. The method according to claim 11, wherein step a) pre-folding of the bottom surfaces and/or gable surfaces of the carton sleeves is carried out after step a) and before step b).
14. The method according to claim 13, wherein step b) ejection of defective carton sleeves from the cells of the transporting device is carried out after step a) and before step b).
15. The method according to claim 11, wherein step c) ejection of defective carton sleeves from the cells of the transporting device and from the aseptic chamber is carried out after step c) and before step d).
16. The method according to claim 11, wherein the carton sleeves are guided during step d) along a circular path.
17. The method according to claim 11, wherein step f) removal of the filled and sealed carton sleeves from the cells of the transporting device is carried out after step e).
18. The method according to claim 17, wherein step g) final fabrication of the carton sleeves and attachment of the flaps of the carton sleeves is carried out after step f).
19. The method according to claim 17, wherein step h) conditioning of the cells of the transporting device and cleaning, disinfecting and/or drying of the cells of the transporting device is carried out after step f).
20. The method according to claim 11, wherein the conveyor belt and the cells have a constant speed.
21. The method according to claim 11, wherein the conveyor belt and the cells are guided in a horizontal plane.
22. The method according to claim 11, wherein a continuous inflow of sterile air takes place within the aseptic chamber.

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