(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 862 815 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
22.03.2017 Bulletin 2017/12

(21) Application number: **13188739.0**

(22) Date of filing: **15.10.2013**

(51) Int Cl.:
D21H 17/12 *(2006.01)* ***D21H 21/28*** *(2006.01)*
D21J 7/00 *(2006.01)* ***D21H 11/12*** *(2006.01)*
B65D 85/32 *(2006.01)*

(54) **Method for manufacturing a moulded fibre packaging and moulded fibre food packaging**

Verfahren zur Herstellung eines Verpackungsformteils bestehend aus Fasern und Lebensmittelverpackungsformteil

Procédé de fabrication d'un matériau d'emballage moulé de fibres et matériau d'emballage alimentaires moulé de fibres

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
22.04.2015 Bulletin 2015/17

(73) Proprietor: **Huhtamaki Molded Fiber Technology B.V.**
8801 JB Franeker (NL)

(72) Inventors:
- **Koopmans, Benno Alexander**
  9035 BZ Dronrijp (NL)
- **Schouten, Dirk**
  9079 MA St. Jacobiparochie (NL)
- **Hiemstra, Egbert**
  8802 MA Franeker (NL)

(74) Representative: **Nederlandsch Octrooibureau**
P.O. Box 29720
2502 LS The Hague (NL)

(56) References cited:
EP-A1- 2 135 894
WO-A1-95/15252
WO-A1-2012/023848
DE-A1- 4 406 639
DE-A1- 19 618 554
US-A- 3 320 120

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 862 815 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Background

[0001] The present invention relates to a method for manufacturing a moulded fibre packaging in particular a food package , more particular an egg package.

[0002] Such a method is known, e.g. from DE-A-19618554.

[0003] In many modem food retailing operations, e. g. supermarkets and hardware stores, various products like fruit, meat, eggs and the like, are presented and displayed to the retail customer in trays of many types and sizes, said trays being manufactured from paper pulp. Often the colour or appearance of such trays, for example egg trays, is e. g. greyish and therefore not attractive or aesthetically appealing to the retail customer.

[0004] In addition, usually, fibre packaging materials such as egg boxes and fibre trays are uniform in colour. However, such fibre packaging materials are less appealing to the customer. Although the package as a whole could be provided with different colours by employing labelling and/or printing techniques, such techniques are generally much too expensive. Consequently, there is a need within the art for a cheap and uncomplicated process for the manufacture of more appealing fibre packaging materials.

[0005] Also packaging materials for e. g. electronic equipment comprise less attractive materials such as white coloured expanded polystyrene and similar synthetic materials that can be recycled only with difficulty and which are detrimental to the environment. At present there exists a long felt need to provide coloured or appealing packaging materials based on paper pulp, in particular for food products such as fruit, that are more appealing to the retail customer. However, such coloured packaging materials based on paper pulp have to comply with rather severe food regulations, i. e. that the colouring agent used does not leach into and contaminate the food product.

[0006] Articles based on paper pulp are manufactured in a pulp moulding process wherein pulp moulding machines are employed. The basic principles of manufacture are to provide recovered paper (including newspaper, magazines) or paper furnish that is re-pulped. Relevant regulation for recovered paper in this connection is for example EN 643. Subsequently, various chemicals may be added to the pulp. For example, chemicals are added to give finished products water resistance, wet strength and/or colour. The pulp is cleaned of contaminants such as staples, sand and plastic particles, and transferred to the moulding machine. The moulding dies of the machine are dipped into the pulp and a vacuum is applied to the die and in that way a product is created. The wet product is placed on a conveyor belt and sent through a drying tunnel. Finally, the dried products may be pressed, counted, bundled, printed, labelled, palletised and despatched to the end user. Reference is for example made to US 3.320. 120 and US 3.654.076.

Summary of the invention

[0007] The invention aims to provide a method for manufacturing a moulded fibre food packaging in particular an egg package, which method enables to obtain a package in a more environmental friendly way. It will be clear that the invention is also beneficial for fruit and vegetable packages, cup carriers and industrial buffering means.

[0008] Yet another object of the invention is to provide a food package which appearance is more appealing to the customer during display and/or use.

[0009] According to the invention this is realized with a method for manufacturing a moulded fibre packaging, in particular a food package , more particular an egg package, comprising,

- providing a fibre pulp for a moulding process, the fibre pulp being contained in a pulp container, the method comprises,
- adding lignocellulosic biomass not originating from wood to the pulp container to obtain a pulp mix comprising between 5-80 % lignocellulosic biomass, preferably between 5-60% lignocellulosic biomass, wherein the lignocellulosic biomass contains between 0 to 2% protein in dry weight.

[0010] The lignocellulosic biomass containing between 0 to 2% protein in dry weight enables to perform the method in an economical that is to obtain packages therewith that can compete in the market. In contract with the current invention; when used in a moulded fibre process, ordinary grass, containing much more protein, does suffer from bad drainage, long drying times and/or high energy consumption which lead to slow production and/or high production cost. The high content of lignocellulosic biomass not originating from wood wherein the lignocellulosic biomass contains between 0 to 2% protein in dry weight enables to optimize operations in that a choice can be made between raw material flow being ordinary pulp originating from paper thus wood and the lignocellulosic biomass not originating from wood. Also the production process is much more efficient. In addition, the high content lignocellulosic biomass not originating from wood enables to provide a package a "green" appearance. Moreover, packages obtained by the method according to the invention perform surprisingly well in known compression tests for egg packages. This was not expected because lignocellulosic biomass not originating from wood is much weaker than wood based fibres. It is found that about 50% lignocellulosic biomass not originating from wood still provides the effect of the invention without compromising too much on strength of the package. Thus, the lignocellulosic biomass not originating from wood being added to the wood based fibre pulp at a rate of 5-80 % lignocellulosic biomass, preferably between 5-60% lignocellulosic biomass on dry fibre

weight enables to manufacturing a moulded fibre food packaging in a an environmental friendly way without compromising too much on strength of the package. In addition, using lignocellulosic biomass not originating from wood as raw material for the fibre pulp mix aims at becoming less independent of wood fibres. This is necessary when paper as journals will become less available what will lead to higher prices of paper in the future.

[0011] The lignocellulosic biomass originates from grass, leaves of tomato plants, stems of tomato plants, and/or rapeseed straw. The grass originates preferably from controlled cultivation such that regulation in connection with food contact may be respected with more ease. More preferably this controlled cultivation does not involve fertilizing. It is conceivable to use other grass as well like roadside grass for non food packages. It will be understood that the invention is not limited to grass fibres including other gramineous plants. It is conceivable that other natural fibres, other than wood, like straw fibres, sugar beet residue, are used in the invention.

[0012] The method comprises, before adding the lignocellulosic biomass to the pulp container, processing the lignocellulosic biomass for removing protein from the lignocellulosic biomass such that the lignocellulosic biomass contains between 0 to 2% protein in dry weight. Such a process for removing protein from lignocellulosic biomass is known per se, like from the patent publication WO 2012/023848 A1 to Danvos B.V. This removing of protein even more enables to optimize operations in that a choice can be made between raw material flows. In the technical field of moulded fibre packaging the pulp container is also referred to with "thin stock tank".

[0013] In an embodiment, the method comprises pre-processing of the lignocellulosic biomass, the pre-processing comprising soaking the lignocellulosic biomass in water for a soaking period of at least 1 day preferably at least 2 days. Pre-processing here means processing the lignocellulosic biomass before adding the lignocellulosic biomass to the pulp container.

[0014] In an embodiment of the method, the pre-processing comprises cutting the lignocellulosic biomass, preferably before the soaking, for obtaining visible lignocellulosic biomass fibres having a length such that the visible lignocellulosic biomass fibres may surface on the fibre pulp mix, the visible lignocellulosic biomass fibres preferably having an average length smaller than 5 cm, preferably smaller than 2 cm, more preferably between 1,5 and 2 cm.

[0015] The visible lignocellulosic biomass fibres having a length such that the fibres may surface on the fibre pulp mix ensure that during moulding these relatively long fibres are positioned at a package surface. These long fibres are then visible on a package and can be distinguished by touch. This provides an improved appearance to the food package. In this connection, visible has its ordinary meaning that the fibre can be seen with the naked eye without any aid. It will therefore be understood that fibre does not refer to fibres on cellulose level. Instead a fibre here is on biomass level and may have a width typical between 0.1 mm to 2 mm.

[0016] In an embodiment of the method, the pre-processing comprises refining the visible lignocellulosic biomass fibres for facilitating interaction between the fibre pulp and the visible lignocellulosic biomass fibres in the pulp mix. Refining is a process which is known per se in the paper and paper pulp processing industry. The interaction has both a mechanical and chemical component, a mechanical component in that binding surface between fibres is increased, and a chemical component in that e.g. forming of hydrogen bridges is promoted. This refining seems important in connection with strength of the thus manufactured package.

[0017] In an embodiment of the method, the pre-processing comprises adjusting the degree of refining the visible lignocellulosic biomass fibres for facilitating firstly interaction between the fibre pulp and the visible lignocellulosic biomass fibre in the pulp mix, and secondly allowing a portion of the visible lignocellulosic biomass fibres to surface on the pulp mix. Because of the adjusting, an optimum can be chosen for both the strength of the package and the so called "green" appearance.

[0018] In an embodiment of the method, the pre-processing comprises providing a refining device comprising a number of refiner discs arranged at a mutual disc distance wherein adjusting the degree of refining the visible lignocellulosic biomass fibres comprises adjusting the disc distance less than 1,5 mm, preferably between 0,5 and 1,5 mm, and wherein the refining comprises refining the visible lignocellulosic biomass fibres at a concentration of between 10 kg to 75 kg, preferably about 25 kg visible lignocellulosic biomass fibres in dry weight, per 1000 litre of water. An example of such a refiner is a Sprout Waldron disc refiner.

[0019] In an embodiment of the method, the refining comprising fibrillating the visible lignocellulosic biomass fibres for increasing binding surface of the visible lignocellulosic biomass fibres. This even more for facilitates interaction between the fibre pulp and the visible lignocellulosic biomass fibres in the pulp mix. In this connection, fibrillate means the partly splitting of a fibre into fibrils.

[0020] In an embodiment, the method comprises providing a vacuum mould which has a mesh work for sucking up said fibre pulp mix and forming the packaging, wherein the mesh work has mesh openings having a mesh size and the visible lignocellulosic biomass fibres have a length between 50 to 150 times the mesh size, preferably about 100 times the mesh size. This ensures that the visible lignocellulosic biomass fibres extend lengthwise along the mould such that the fibre is visible at a surface of the manufactured package. A typical mesh size for moulding packages is 60 Tyler Mesh which corresponds with a mesh size of 0.251 mm.

[0021] In an embodiment, the method comprises the step of adding an aromatic substance to the fibre pulp mix for providing a grass smell to the moulded fibre food

packaging. The possibly grassy smell can be strengthened or covered as desired by the addition of the aromatic substance.

[0022] In an embodiment, the pulp mix is coloured by adding a colour agency, preferably a green colour agency comprising chlorophyll, to the fibre pulp mix. It is conceivable that the visible lignocellulosic biomass fibres are coloured before adding the visible lignocellulosic biomass fibres to the fibre pulp mix to provide an increased contrast between the grass fibre and the moulded fibre package. This even more improves the appealing effect of the package. In connection with colouring fibres before adding these to the pulp, specific reference is made to WO/2006/091102 of HUHTAMAKI MOLDED FIBER TECHNOLOGY B.V. titled "PROCESS FOR THE MANUFACTURE OF A MOTTLED FIBRE PACKAGING".

[0023] The invention further provides a moulded fibre packaging in particular a food package , more particular an egg package obtained by the method according to the invention, the packaging comprising between 10 to 60 wt. % lignocellulosic biomass not originating from wood.

[0024] In an embodiment of the moulded fibre package, visible lignocellulosic biomass fibres protrude from a package surface to such an extent that separate visible lignocellulosic biomass fibres can be distinguished by sight and/or touch. This even more improves the appealing effect of the package.

[0025] The various aspects discussed in this patent can be combined in order to provide additional advantages.

Description of the drawings

[0026] The invention will be further elucidated referring to a preferred embodiment shown in the drawing wherein shown in:

Fig. 1 in perspective view a package obtained by the method according to the invention;
fig. 2 a cross sectional side view of the package of fig. 1;
fig. 3 a detail of an outer surface of the package of fig. 1; and
fig. 4 a simplified process scheme of an embodiment of the method according to the invention.

Detailed description of embodiments

[0027] In the figure 1 and 2 a moulded fibre egg package 1 is shown. The package 1 is made from moulded fibre containing about 50 % grass fibres. Grass fibres 12 protrude from a package outside surface 2 to such an extent that separate grass fibres can be distinguished by sight and/or touch. These longer grass fibres 12 have a length of about 25 mm. The longer grass fibres 12 have a length such that the fibres are able to float on a fibre pulp which enables that during moulding these long fibres are positioned at the package surface. These protruding fibres 12 even more improve the appealing effect of the package 1. Grass fibres 12 protrude even more from a package inside surface 3, 4 also because that inside surface is determined by the suction side of a mould. This suction side of a mould is a well known concept in manufacturing a moulded fibre food packaging.

[0028] Fig. 3 shows a detail of an outer surface 2 of the package 1.

[0029] Fig. 4 shows a process scheme of an embodiment of the method according to the invention.

[0030] A fibre pulp, for a moulding process, is contained in a pulp container 9 also referred to as storage tank and also known as thick stock tank. The process of moulding a moulded fibre package is indicate with reference number 11 and is not described here since this is known per se. Such a process of moulding a moulded fibre package is fed with the fibre pulp mix from the pulp container 9.

[0031] According to the invention, lignocellulosic biomass not originating from wood 5 is added to the pulp container 9 to obtain a pulp mix comprising between 5-60% lignocellulosic biomass, wherein the lignocellulosic biomass contains between 0 to 2% protein in dry weight.

[0032] The method comprises pre-processing of the lignocellulosic biomass 5. This pre-processing may be done on site or (partly) elsewhere. When the lignocellulosic biomass is pre-processed elsewhere, the lignocellulosic biomass fibres may be added directly to the pulp container 9 which added lignocellulosic biomass fibres are indicated with reference number 10. Here, the pre-processing comprises soaking 6 the lignocellulosic biomass 5 in water for a soaking period of at least 1 day preferably at least 2 days.

[0033] Here, the pre-processing comprises cutting 7 the lignocellulosic biomass 5, preferably before the soaking 6, for obtaining visible lignocellulosic biomass fibres having a length such that the visible lignocellulosic biomass fibres may surface on the fibre pulp mix in the storage tank 9.

[0034] The pre-processing comprises refining 8 the visible lignocellulosic biomass fibres for facilitating interaction between the fibre pulp and the visible lignocellulosic biomass fibres in the pulp mix.

[0035] The refining is performed in a refining device (not shown) comprising a number of refiner discs arranged at a mutual disc distance. The degree of refining the visible lignocellulosic biomass fibres is set by adjusting the disc distance between 0,5 and 1,5 mm. The refining of the visible lignocellulosic biomass fibres is done at a concentration of between 10 kg to 75 kg, preferably about 25 kg visible lignocellulosic biomass fibres in dry weight, per 1000 litre of water. An example of such a refiner is a Sprout Waldron disc refiner.

[0036] Before adding the lignocellulosic biomass 5 to the pulp container 9, the lignocellulosic biomass may be processed for removing protein from the lignocellulosic biomass such that the lignocellulosic biomass contains

between 0 to 2% protein in dry weight. This process is not shown here.

[0037] It will also be obvious after the above description and drawings are included to illustrate some embodiments of the invention, and not to limit the scope of protection. Starting from this disclosure, many more embodiments will be evident to a skilled person which are within the scope of protection.

Claims

1. Method for manufacturing a moulded fibre packaging (1), in particular a food package, more particular an egg package, comprising,

   - providing a fibre pulp for a moulding process, the fibre pulp being contained in a pulp container (9), wherein the method comprises,
   - adding lignocellulosic biomass (5) originating from grass, leaves of tomato plants, stems of tomato plants, and/or rapeseed straw to the pulp container to obtain a pulp mix comprising between 5-80 % lignocellulosic biomass, preferably between 5-60% lignocellulosic biomass, wherein the lignocellulosic biomass contains between 0 to 2% protein in dry weight, and
   - before adding the lignocellulosic biomass to the pulp container, processing the lignocellulosic biomass for removing protein from the lignocellulosic biomass such that the lignocellulosic biomass contains between 0 to 2% protein in dry weight.

2. Method according to claim 1, the method comprising pre-processing of the lignocellulosic biomass, the pre-processing comprising soaking, (6) the lignocellulosic biomass (5) in water for a soaking period of at least 1 day preferably at least 2 days.

3. Method according to claim 2, the pre-processing comprising cutting (7) the lignocellulosic biomass, preferably before the soaking, for obtaining visible lignocellulosic biomass fibres having a length such that the visible lignocellulosic biomass fibres may surface on the fibre pulp mix, the visible lignocellulosic biomass fibres preferably having an average length smaller than 5 cm, preferably smaller than 2 cm, more preferably between 1,5 and 2 cm.

4. Method according to claim 2 or 3, the pre-processing comprising refining (8) the visible lignocellulosic biomass fibres for facilitating interaction between the fibre pulp and the visible lignocellulosic biomass fibres in the pulp mix.

5. Method according to claim 4, comprising adjusting the degree of refining the visible lignocellulosic biomass fibres for facilitating firstly interaction between the fibre pulp and the visible lignocellulosic biomass fibre in the pulp mix, and secondly allowing a portion of the visible lignocellulosic biomass fibres to surface on the pulp mix.

6. Method according to claim 5, comprising providing a refining device comprising a number of refiner discs arranged at a mutual disc distance wherein adjusting the degree of refining the visible lignocellulosic biomass fibres comprises adjusting the disc distance less than 1,5 mm, preferably between 0,5 and 1,5 mm, and wherein the refining (8) comprises refining the visible lignocellulosic biomass fibres at a concentration of between 10 kg to 75 kg, preferably about 25 kg visible lignocellulosic biomass fibres in dry weight, per 1000 litre of water.

7. Method according to claim 4, 5, or 6, the refining (8) comprising fibrillating the visible lignocellulosic biomass fibres for increasing binding surface of the visible lignocellulosic biomass fibres.

8. Method according to a preceding claim, comprising providing a vacuum mould which has a mesh work for sucking up said fibre pulp mix and forming the packaging, wherein the mesh work has mesh openings having a mesh size and the visible lignocellulosic biomass fibres have a length between 50 to 150 times the mesh size, preferably about 100 times the mesh size.

9. Method according to a preceding claim, wherein the method comprises the step of adding an aromatic substance to the fibre pulp mix for providing a grass smell to the moulded fibre food packaging.

10. Method according to a preceding claim, wherein the pulp mix is coloured by adding a colour agency, preferably a green colour agency comprising chlorophyll, to the fibre pulp mix.

11. Moulded fibre food packaging obtained by the method according to a preceding claim, the packaging comprising between 10 to 60 wt. % lignocellulosic biomass originating from grass, leaves of tomato plants, stems of tomato plants, and/or rapeseed straw, wherein the lignocellulosic biomass contains between 0 to 2% protein in dry weight.

12. Moulded fibre food package according to claim 11, wherein visible lignocellulosic biomass fibres protrude from a package surface to such an extent that separate visible lignocellulosic biomass fibres can be distinguished by sight and/or touch.

Patentansprüche

1. Verfahren zur Herstellung einer geformten Faserverpackung (1), insbesondere einer Lebensmittelverpackung, weiter insbesondere einer Eierverpackung, umfassend,

   - Bereitstellung einer Faserpulpe für ein Formverfahren, wobei die Faserpulpe in einem Pulpenbehälter (9) enthalten ist, wobei das Verfahren Folgendes umfasst:

     - Hinzufügen einer lignocellulosehaltigen Biomasse (5), die ihren Ursprung in Gras, Blättern von Tomatenpflanzen, Stängeln von Tomatenpflanzen, und/oder Rapshalmen hat, in den Pulpenbehälter, um eine Pulpenmischung zu erhalten, die zwischen 5-80% lignocellulosehaltige Biomasse umfasst, bevorzugt zwischen 5-60% lignocellulosehaltige Biomasse, wobei die lignocellulosehaltige Biomasse zwischen 0 bis 2% Protein im Trockengewicht enthält, und
     - vor dem Hinzufügen der lignocellulosehaltigen Biomasse in den Pulpenbehälter, das Verarbeiten der lignocellulosehaltigen Biomasse zum Entfernen von Protein von der lignocellulosehaltigen Biomasse, derart, dass die lignocellulosehaltige Biomasse zwischen 0 bis 2 % Protein im Trockengewicht enthält.

2. Verfahren nach Anspruch 1, wobei das Verfahren das Vorverarbeiten der lignocellulosehaltigen Biomasse umfasst, wobei das Vorverarbeiten das Einweichen (6) der lignocellulosehaltigen Biomasse (5) in Wasser für eine Einweichungszeit von wenigstens 1 Tag, bevorzugt wenigstens 2 Tagen, umfasst.

3. Verfahren nach Anspruch 2, wobei das Vorverarbeiten das Schneiden (7) der lignocellulosehaltigen Biomasse, bevorzugt vor dem Einweichen, umfasst, zum Erhalt von sichtbaren lignocellulosehaltigen Biomassefasern mit einer Länge derart, dass die sichtbaren lignocellulosehaltigen Biomassefasern auf der Faserpulpenmischung auftauchen können, wobei die sichtbaren lignocellulosehaltigen Biomassefasern bevorzugt eine durchschnittliche Länge aufweisen, die kleiner als 5 cm ist, bevorzugt kleiner als 2 cm, besonders bevorzugt zwischen 1,5 und 2 cm.

4. Verfahren nach Anspruch 2 oder 3, wobei das Vorverarbeiten das Raffinieren (8) der sichtbaren lignocellulosehaltigen Biomassefasern zur Vereinfachung der Interaktionen zwischen der Faserpulpe und den sichtbaren lignocellulosehaltigen Biomassefasern in der Pulpenmischung umfasst.

5. Verfahren nach Anspruch 4, umfassend das Anpassen des Grades der Raffinierung der sichtbaren lignocellulosehaltigen Biomassefasern zum Vereinfachen erstens der Interaktion zwischen der Faserpulpe und den sichtbaren lignocellulosehaltigen Biomassefasern in der Pulpenmischung, und zweitens des Erlaubens, dass ein Teil der sichtbaren lignocellulosehaltigen Biomassefasern auf der Pulpenmischung auftaucht.

6. Verfahren nach Anspruch 5, umfassend das Bereitstellen einer Raffinierungsvorrichtung umfassend mehrere Raffinierungsscheiben, die in einem gegenseitigen Scheibenabstand angeordnet sind, wobei die Anpassung des Raffinierungsgrades der sichtbaren lignocellulosehaltigen Biomassefasern das Anpassen des Scheibenabstandes auf weniger als 1,5 mm, bevorzugt zwischen 0,5 und 1,5 mm, umfasst, und wobei das Raffinerien (8) das Raffinieren der sichtbaren lignocellulosehaltigen Biomassefasern bei einer Konzentration von zwischen 10 kg bis 75 kg, bevorzugt etwa 25 kg, sichtbaren lignocellulosehaltige Biomassefasern im Trockengewicht, pro 1000 Liter Wasser, umfasst.

7. Verfahren nach Anspruch 4, 5 oder 6, wobei das Raffinieren (8) das Fibrillieren der sichtbaren lignocellulosehaltigen Biomassefasern zur Erhöhung der Bindungsoberfläche der sichtbaren lignocellulosehaltigen Biomassefasern umfasst.

8. Verfahren nach einem vorhergehenden Anspruch, umfassend das zur Verfügung stellen einer Vakuumform, die ein Maschengeflecht zum Aufsaugen der Faserpulpenmischung und Formen der Verpackung aufweist, wobei das Maschengeflecht Maschenöffnungen mit einer Maschengröße aufweist und wobei die sichtbaren lignocellulosehaltigen Biomassefasern eine Länge aufweisen, die 50 bis 150 Mal die Maschengröße aufweist, bevorzugt etwa 100 Mal die Maschengröße.

9. Verfahren nach einem vorangehenden Anspruch, wobei das Verfahren den Schritt des Hinzufügens einer aromatischen Substanz zur Faserpulpenmischung umfasst, zur Bereitstellung eines Grasgeruchs zur geformten Lebensmittelfaserverpackung.

10. Verfahren nach einem vorangehenden Anspruch, wobei die Pulpenmischung durch das Hinzufügen eines Färbemittels, bevorzugt eines grünen Färbemittels, das Chlorophyll umfasst, zur Faserpulpenmischung, gefärbt wird.

11. Geformte Faser-Lebensmittelverpackung, erhalten durch das Verfahren gemäß einem vorangehenden Anspruch, wobei die Verpackung zwischen 10 bis 60 Gew.-% lignocellulosehaltige Biomasse, die ihren

Ursprung in Gras, Blättern von Tomatenpflanzen, Stängeln von Tomatenpflanzen und/oder Rapshalmen hat, wobei die lignocellulosehaltige Biomasse zwischen 0 bis 2 % Protein im Trockengewicht enthält.

12. Geformte Faser-Lebensmittelverpackung nach Anspruch 11, wobei sichtbare lignocellulosehaltige Biomassefasern aus einer Verpackungsoberfläche in einem solchen Ausmaß herausstehen, dass separat sichtbare lignocellulosehaltige Biomassefasern durch Sehen und/oder Tasten unterschieden werden können.

Revendications

1. Procédé de fabrication d'un emballage en fibre moulée (1), en particulier d'un emballage alimentaire, plus particulièrement d'un emballage pour oeufs, comprenant:

- la fourniture d'une pâte de fibre destinée à être moulée, la pâte de fibre étant contenue dans un réservoir de pâte (9), dans lequel

le procédé comprend

- l'ajout de biomasse lignocellulosique (5) à base d'herbe, de feuilles de plants de tomate, de tiges de plants de tomate, et/ou de paille de colza au réservoir de pâte (9) pour obtenir un mélange de pâte comprenant de 5 à 80 % de biomasse lignocellulosique, de préférence de 5 à 60 % de biomasse lignocellulosique, dans lequel la biomasse lignocellulosique contient de 0 à 2 % de protéines en poids sec, et
- avant l'ajout de la biomasse lignocellulosique (5) au réservoir de pâte (9), le traitement de la biomasse lignocellulosique pour éliminer des protéines de la biomasse lignocellulosique de sorte que la biomasse lignocellulosique contienne de 0 à 2 % de protéines en poids sec.

2. Procédé selon la revendication 1, ce procédé comprenant le prétraitement de la biomasse lignocellulosique, le prétraitement comprenant le trempage (6) de la biomasse lignocellulosique (5) dans de l'eau pendant une période de trempage d'au moins 1 jour, de préférence au moins 2 jours.

3. Procédé selon la revendication 2, le prétraitement comprenant le découpage (7) de la biomasse lignocellulosique, de préférence avant le trempage (6), pour obtenir des fibres apparentes de biomasse lignocellulosique ayant une longueur telle que les fibres apparentes de biomasse lignocellulosique peuvent émerger à la surface du mélange de pâte de fibre, les fibres apparentes de biomasse lignocellulosique présentant de préférence une longueur inférieure à 5 cm, de préférence inférieure à 2 cm, et plus préférablement entre 1,5 et 2 cm.

4. Procédé selon la revendication 2 ou 3, le prétraitement comprenant le raffinage (8) des fibres apparentes de biomasse lignocellulosique pour faciliter l'interaction entre la pâte de fibre et les fibres apparentes de biomasse lignocellulosique dans le mélange de pâte.

5. Procédé selon la revendication 4, comprenant le réglage du degré de raffinage des fibres apparentes de biomasse lignocellulosique pour faciliter, tout d'abord, l'interaction entre la pâte de fibre et les fibres apparentes de biomasse lignocellulosique dans le mélange de pâte et, en second lieu, pour permettre l'émergence d'une partie des fibres apparentes de biomasse lignocellulosique à la surface du mélange de pâte.

6. Procédé selon la revendication 5, comprenant la fourniture d'un dispositif de raffinage comprenant plusieurs disques de raffinage disposés à une distance mutuelle les uns des autres, dans lequel le réglage du degré de raffinage des fibres apparentes de biomasse lignocellulosique comprend le réglage de la distance interdisques à moins de 1,5 mm, de préférence entre 0,5 et 1,5 mm, et dans lequel le raffinage (8) comprend le raffinage des fibres apparentes de biomasse lignocellulosique à une concentration entre 10 kg et 75 kg, de préférence environ 25 kg de fibres apparentes de biomasse lignocellulosique en poids sec, pour 1000 litres d'eau.

7. Procédé selon la revendication 4, 5 ou 6, le raffinage (8) comprenant la fibrillation des fibres apparentes de biomasse lignocellulosique pour augmenter la surface de liaison des fibres apparentes de biomasse lignocellulosique.

8. Procédé selon l'une des revendications précédentes, comprenant la fourniture d'un moule sous vide pourvu d'un treillis pour aspirer ledit mélange de pâte de fibre et former l'emballage, dans lequel le treillis présente des ouvertures de maille ayant une taille de maille et les fibres apparentes de biomasse lignocellulosique ont une longueur environ de 50 à 150 fois la taille de maille, de préférence environ 100 fois la taille de maille.

9. Procédé selon l'une des revendications précédentes, dans lequel le procédé comprend l'étape consistant à ajouter une substance aromatique au mélange de pâte de fibre pour donner un parfum d'herbe à l'emballage alimentaire en fibre moulée.

10. Procédé selon l'une des revendications précédentes, dans lequel le mélange de pâte est coloré par l'ajout d'un colorant, de préférence un colorant vert comprenant de la chlorophylle, au mélange de pâte de fibre.

11. Emballage alimentaire en fibre moulée obtenu par un procédé selon l'une des revendications précédentes, l'emballage comprenant de 10 à 60% en poids de biomasse lignocellulosique en provenance d'herbe, de feuilles de plants de tomate, de tiges de plants de tomate et/ou de paille de colza, dans lequel la biomasse lignocellulosique contient de 0 à 2% de protéines en poids sec.

12. Emballage alimentaire en fibre moulée selon la revendication 11, dans lequel des fibres visibles de biomasse lignocellulosique se présentent suffisamment en relief sur une surface de l'emballage pour que l'on puisse distinguer à la vue et/ou au toucher des fibres visibles séparées de biomasse lignocellulosique.

Fig. 1

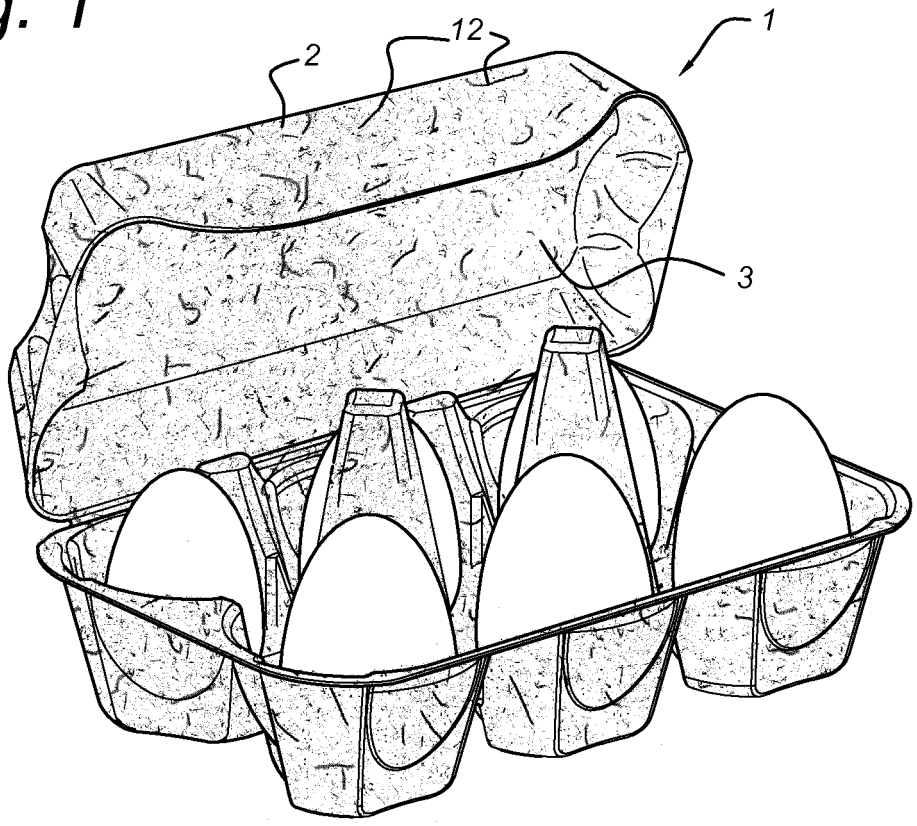


Fig. 2

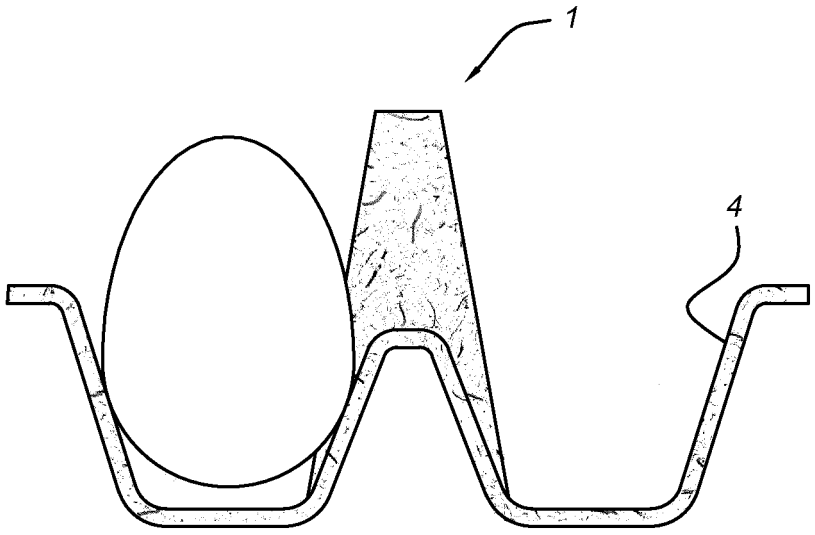


Fig. 3

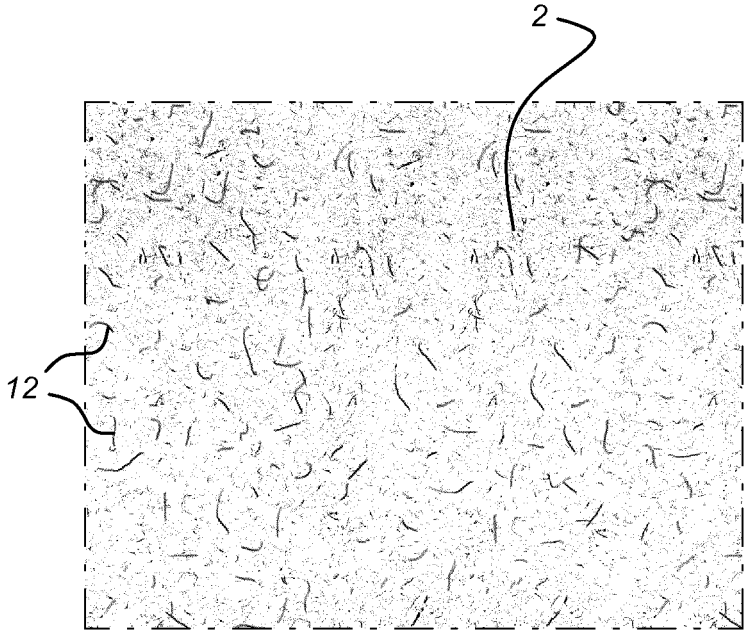
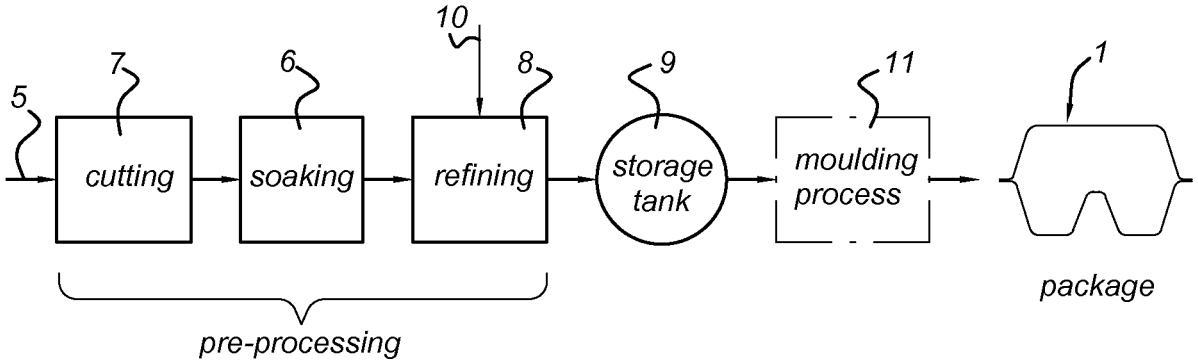

2
12

Fig. 4


5
7
cutting
6
soaking
10
8
refining
9
storage tank
11
moulding process
1
package
pre-processing

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 19618554 A **[0002]**
- US 3320120 A **[0006]**
- US 3654076 A **[0006]**
- WO 2012023848 A1, Danvos B.V **[0012]**
- WO 2006091102 A **[0022]**