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(54) A DRYING UNIT FOR STERILIZING A WEB OF PACKAGING MATERIAL FOR PACKAGING LIQUID FOOD PRODUCTS

(57) A drying unit for removing a sterilization agent from a web of packaging material comprising a succession of pre-applied opening devices, and the web is adapted to be transformed in to a plurality of sealed packages containing a pourable food product. The drying unit comprises a device for creating a stream of air and a drying member connected to the device for creating a stream of air and for removing the sterilizing agent from the web. The drying member comprises at least two adjacent and angled slits in a length direction of the web and which are extending across at least a width of the web such that the stream of air is directed to the web and onto the longitudinal portion of the web provided with the opening devices and for removing the sterilization agent.

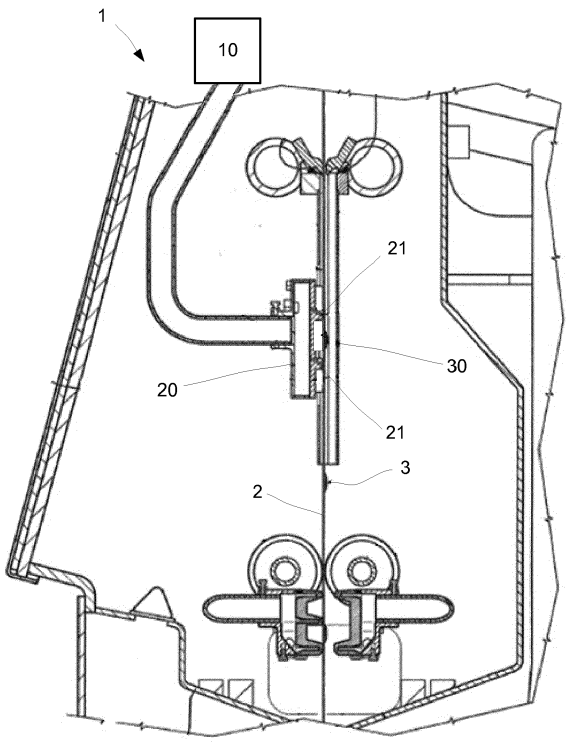

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a drying unit, drying member and method for sterilizing a web of packaging material for packaging pourable food products.

BACKGROUND ART

[0002] As it is known, many food products, such as fruit juice, pasteurized or UHT (ultra-high-temperature treated) milk, wine, tomato sauce, etc., are sold in packages formed from a continuous tube of packaging material made from a longitudinally sealed web.

[0003] The packaging material has a multilayer structure comprising a strong, stiff base layer, which may comprise fibrous material, such as paper, or material such as mineral-filled polypropylene. The base layer is covered on both sides with layers of heat-seal plastic material, such as polyethylene films; in the case of aseptic packages for long-storage products, such as UHT milk, the packaging material also comprises a layer of oxygen-barrier material, such as an aluminium foil or an ethyl vinyl alcohol (EVOH) foil, which is superimposed on a layer of heat-seal plastic material, and is in turn covered with another layer of heat-seal plastic material defining the inner face of the package eventually contacting the food product.

[0004] Packages of this sort are produced on fully automatic packaging machines, on which the web of packaging material is unwound off a reel and fed through a sterilizing unit, in which it is typically sterilized by immersion in a bath of liquid sterilizing agent, such as a concentrated hydrogen peroxide solution or concentrated hydrogen peroxide and water solution.

[0005] More specifically, the sterilizing unit comprises a bath filled, in use, with the sterilizing agent, into which the web is fed continuously. The bath conveniently comprises two parallel vertical branches connected at the bottom to define a U-shaped path long enough to allow sufficient time to treat the packaging material. For effective, relatively fast treatment, thus enabling a reduction in the size of the sterilizing chamber, the sterilizing agent must be maintained at a high temperature, e.g. of around 70°C - 80°C.

[0006] The sterilizing unit also defines an aseptic environment connected to the outlet of the bath, and in which the web of packaging material is dried and subsequently folded and sealed longitudinally to form a vertical tube, which is then filled continuously with the food product for packaging.

[0007] More specifically, in the aseptic environment, the web is treated to eliminate any residual sterilizing agent, the amount of which permitted in the packaged food product is governed by regulations decided by various local food authorities.

[0008] The above treatment normally comprises a preliminary operation, whereby the drops on the packaging material are removed mechanically, and air drying.

[0009] Preliminary removal of the drops may be performed, for example, by means of a pair of squeeze rollers conveniently located close to the inlet of the aseptic environment; the packaging material is fed between the rollers and comes out still covered with a film of sterilizing agent, but with no macroscopic drops.

[0010] Drying may be performed using air knives directed onto the opposite faces of the web of packaging material, supplied with sterile air, and for evaporating any leftover traces of sterilizing agent.

[0011] Before leaving the aseptic environment, the web is folded into a cylinder and sealed longitudinally to form a continuous vertical tube in known manner. The tube of packaging material, in effect, forms an extension of the aseptic environment, and is filled continuously with the pourable food product, and then fed to a (transverse) form-and-seal unit for forming the individual packages.

[0012] In some known solutions, the packages coming out of the form-and-seal unit are already provided with reclosable opening devices. In these cases, the opening devices are pre-applied, e.g. injection molded directly, to the web of packaging material before the latter is supplied to the sterilizing unit.

[0013] Packaging machines of the type described above are used widely and satisfactorily in a wide range of food industries to produce sealed packages from a web of packaging material, such as e.g. WO2013045192. Performance of the sterilizing units of such machines, in particular, ensures ample compliance with regulations governing sterility of the packages and the amount of residual sterilizing agent in the finished packages.

[0014] Within the industry, however, a demand for further improvements is felt, particularly in view of the continual increase in the output rate of the packaging machines and the desire to have an improved treatment with the sterilizing agent.

[0015] As a matter of fact, continually increasing the output rate obviously reduces the time available to remove all the residual sterilizing agent from each portion of the web of packaging material travelling through the aseptic environment, and especially on the pre-applied opening devices, which, having a more complex geometry than the web, and which could then form some sorts of pockets for the residual sterilizing agent to stay in.

SUMMARY OF THE INVENTION

[0016] It is an object of the present inventive concept to mitigate, alleviate, or eliminate one or more of the above-identified deficiencies in the art and disadvantages singly or in combination.

[0017] According to a first aspect of the inventive concept, a drying unit for removing a sterilization agent from a web of packaging material comprising a succession of pre-applied opening devices, and the web is adapted to be transformed in to a plurality of sealed packages con-

taining a pourable food product is disclosed. The drying unit comprises a device for creating a stream of air and a drying member connected to the device for creating a stream of air and for removing the sterilizing agent from the web. Wherein the drying member comprises at least two adjacent and angled slits in a length direction of the web and which are extending across at least a width of the web such that the stream of air is directed to the web and onto the longitudinal portion of the web provided with the opening devices and for removing the sterilization agent.

[0018] According to a second aspect of the inventive concept, a drying member connectable to a device for creating a stream of air, and for removing a sterilizing agent from a web of packaging material having opening devices is disclosed. The drying member comprises at least two adjacent and angled slits in a length direction of the web, and the slits are extending across at least a width of the web such that the stream of air is directed to the web and onto a longitudinal portion of the web provided with the opening devices and for removing the sterilization agent.

[0019] According to a third aspect of the inventive concept, a method of drying a web of packaging material having opening devices is disclosed. The method comprises providing a drying member and drying the web of packaging material.

[0020] Further examples of the disclosure are defined in the dependent claims, wherein features for the fourth and subsequent aspects of the disclosure are as for the first to third aspects mutatis mutandis.

[0021] Some examples of the disclosure provide for a drying unit that will blow away any sterilization agent from a web and around attached opening devices.

[0022] Some examples of the disclosure provide for a drying unit that will blow away any sterilizing agent and out over an edge of a web.

[0023] Some examples of the disclosure provide for all or almost all of a sterilization agent being removed and/or evenly distributed on a web.

[0024] Some examples of the disclosure provide for rollers that are used to keep a web stretched and/or to aid in distribution of a sterilizing agent on the web.

[0025] Some examples of the disclosure provide for an air flow which is more uniform and distributes a sterilizing agent evenly along a web.

[0026] Some examples of the disclosure provide for an air flow which is more uniform and removes any excess of a sterilizing agent by pushing it over a edge of a web.

[0027] Some examples of the disclosure provide for blowing a sterilizing agent downward and slightly outward toward an edge of a web.

[0028] Some examples of the disclosure provide for blowing a sterilizing agent in a more outward direction toward an edge of a web.

[0029] Some examples of the disclosure provide for an air flow to be greater in a same direction.

[0030] Some examples of the disclosure provide for air flows to cooperate with each other from the different slits.

[0031] Some examples of the disclosure provide for an effective air stream for pushing a sterilizing agent of a web, being created.

[0032] Some examples of the disclosure provide for a customized air stream.

[0033] Some examples of the disclosure provide for a customized air stream for a specific desired air flow at a web.

[0034] Some examples of the disclosure provide for a specific distance between a web and a drying member.

[0035] Some examples of the disclosure provide for an air stream covering a desired area of a web.

[0036] It should be emphasized that the term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] Embodiments of the invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Figure 1 illustrates a cross sectional view of a drying unit.

Figure 2 illustrates a side view of a drying member.

Figures 3a-d illustrates different types of drying members.

Figure 4 illustrate a flow chart of a method for drying a web of packaging material.

DETAILED DESCRIPTION

[0038] Figure 1 illustrates a drying unit 1 for removing a sterilization agent from a web of packaging material 2 comprising a succession of pre-applied opening devices 3, and the web 2 is adapted to be transformed in to a plurality of sealed packages containing a pourable food product. The drying unit 1 comprises a device for creating a stream of air 10 and a drying member 20 connected to the device for creating a stream of air 10 and for removing the sterilizing agent from the web 2. The drying member 20 comprises at least two adjacent and angled slits 21 in a length direction of the web 2 and which are extending across at least a width of the web 2 such that the stream of air is directed to the web 2 and onto the longitudinal portion of the web 2 provided with the opening devices 3 and for removing the sterilization agent. By having two adjacent and angled slits 21 that extend over the width over the web 2 the drying member 20 will blow any sterilization agent from the web 2 and around the opening device, out over the edge of the web 2 and of the web 2 such that all or almost all of the sterilization agent is removed and/or evenly distributed. In the example illustrated in figure 1 the device for creating the stream of air 10

is closely connected to the drying member 20, but the skilled person would easily appreciate that the device 10 can be placed almost anywhere close to or remote to the drying member 20. Figure 1 also illustrates rollers above and below the drying member 20 that are used to keep the web stretched and/or to aid in the distribution of the sterilizing agent on the web 2.

[0039] In an example the drying member 20 comprises at least three angled slits 21, illustrated in e.g. figure 2. By having at least three angled slits 21 the air flow will be more uniform and distribute the sterilizing agent evenly along the web 2 and remove any excess of it by pushing it over the edge of the web 2.

[0040] In an example, illustrated in e.g. figs.3a-d, the slits 21 are angled between 10-80 degrees, more preferably between 25-65 degrees, in a direction perpendicular to the longitudinal direction of the web 2. By having the slits 21 angled between 10-80 degrees the air stream will hit the web 2 at an angle that either has a greater downward direction, blowing the sterilizing agent downward and slightly outward toward the edge of the web 2. Or, the angle will be such that it will blow the sterilizing agent in a more outward direction toward the edge of the web 2. Either way, the effect of the blowing will be that the sterilizing agent will be removed from and/or more evenly distributed on the web 2.

[0041] In an example the slits 21 are angled parallel and adjacent to each other, such that they blow any sterilizing agent of the web 2 in a same direction, illustrated in e.g. figures 3a-d. by having the slits parallel and arranged adjacent to each other the air flow will be greater in a same direction and cooperate with each other from the different slits 21.

[0042] In an example, the height of the opening of the slits 21 is between 0.25-2mm. By having the height of the opening of the slits 21 being in the range of 0.25-2mm an effective air stream for pushing the sterilizing agent of the web 2 is created. In an example, the size of the opening of the slits 21 are decided based on the effect of the air stream from the device 10 and the desired blowing effect on the web 2. Another parameter that could be used is how much effect is needed to remove the sterilizing agent in relation to the speed of the web 2.

[0043] In an example, the opening of the slits 21 are different from slit 21 to slit 21, as illustrated in e.g. fig. 3c. By having the slits 21 having different sizes of the openings the effect of the air stream is different and can be customized to a specific desired air flow at the web 2 for removing the sterilizing agent.

[0044] In an example, the drying unit 1 comprises at least two drying members 20. In an example, illustrated in e.g. fig. 2, the at least two drying members 20 are arranged on opposite sides of the web 2 for drying both sides of the web 2.

[0045] In an example, illustrated in e.g. fig. 1, the drying unit 1 further comprises a back plate 30. By having the back plate 30 a specific distance between the web 2 and the drying member 20 is set. In an example, the back plate is arranged at a distance between 2-6mm from the slits 21, and more preferably 4mm. By having the back plate arranged at a distance between 2-6mm from the slits 21 the air stream will be covering a desired area of the web 2, have a chosen blowing effect but at the same time the web 2 will not move to far away from the slits 21 such that the blowing effect will be too low to move the sterilizing agent. The skilled person will appreciate that other distances are also possible and this will then be based on factors such as the effect of the air stream from the device 10, the size of the opening of the slits 20 and so on.

[0046] In an example, the drying member 20 is connectable to the device for creating the stream of air. In an example the drying member 20 is a replacement part.

[0047] In an example, a method 100 of drying a web 2 of packaging material having opening devices 3, comprises providing 110 the drying member 20. The method also comprises drying 120 the web 2 of packaging material.

[0048] In an example, the method further comprises providing the device for creating a stream of air 10.

[0049] In an example, the method further comprises providing the back plate 30 for restricting any movement of the web 2.

[0050] From the description above it follows that, although various examples of the invention have been described and illustrated, the invention is not restricted thereto, but may also be embodied in other ways within the scope of the subject-matter defined in the appended claims.

Claims

1. A drying unit for removing a sterilization agent from a web of packaging material comprising a succession of pre-applied opening devices, and the web is adapted to be transformed in to a plurality of sealed packages containing a pourable food product, the drying unit comprises,

    - a device for creating a stream of air,
    - a drying member connected to the device for creating a stream of air and for removing the sterilizing agent from the web, and

    wherein the drying member comprises at least two adjacent and angled slits in a length direction of the web and which are extending across at least a width of the web such that the stream of air is directed to the web and onto the longitudinal portion of the web provided with the opening devices and for removing the sterilization agent.

2. A drying unit according to claim 1, wherein the drying member comprises at least three angled slits.

3. A drying unit according to claims 1 or 2, wherein the slits are angled between 10-80 degrees, more preferably between 25-65 degrees in a direction perpendicular to the longitudinal direction of the web.

4. A drying unit according to any one of the preceding claims, wherein the height of the opening of the slits are between 0.25-2mm.

5. A drying unit according to any one of the preceding claims, further comprising a back plate.

6. A drying unit according to claim 5, wherein the back plate is arranged at a distance between 2-6mm from the slits.

7. A drying member connectable to a device for creating a stream of air, and for removing a sterilizing agent from a web of packaging material having opening devices, comprising,

- at least two adjacent and angled slits in a length direction of the web, and
- the slits are extending across at least a width of the web such that the stream of air is directed to the web and onto a longitudinal portion of the web provided with the opening devices and for removing the sterilization agent.

8. A drying member according to claim 7, wherein the drying member comprises at least three angled slits.

9. A drying member according to claims 7 or 8, wherein the slits are angled between 10-80 degrees, more preferably between 25-65 degrees in a direction perpendicular to the longitudinal direction of the web.

10. A drying member according to any one of claims 7-9, wherein the height of the opening of the slits is between 0.25-2mm.

11. A method of drying a web of packaging material having opening devices, comprising,

- providing a drying member according to any one of claims 7-10, and
- drying the web of packaging material.

12. A method of drying a web of packaging material according to claim 11, further comprising,

- providing a device for creating a stream of air.

13. A method of drying a web of packaging material according to any one of claims 11 or 12, further comprising,

- providing a back plate for restricting movement of the web.

14. A method of drying a web of packaging material according to claim 13, wherein the back plate is arranged 2-6 mm from the slits of the drying member.

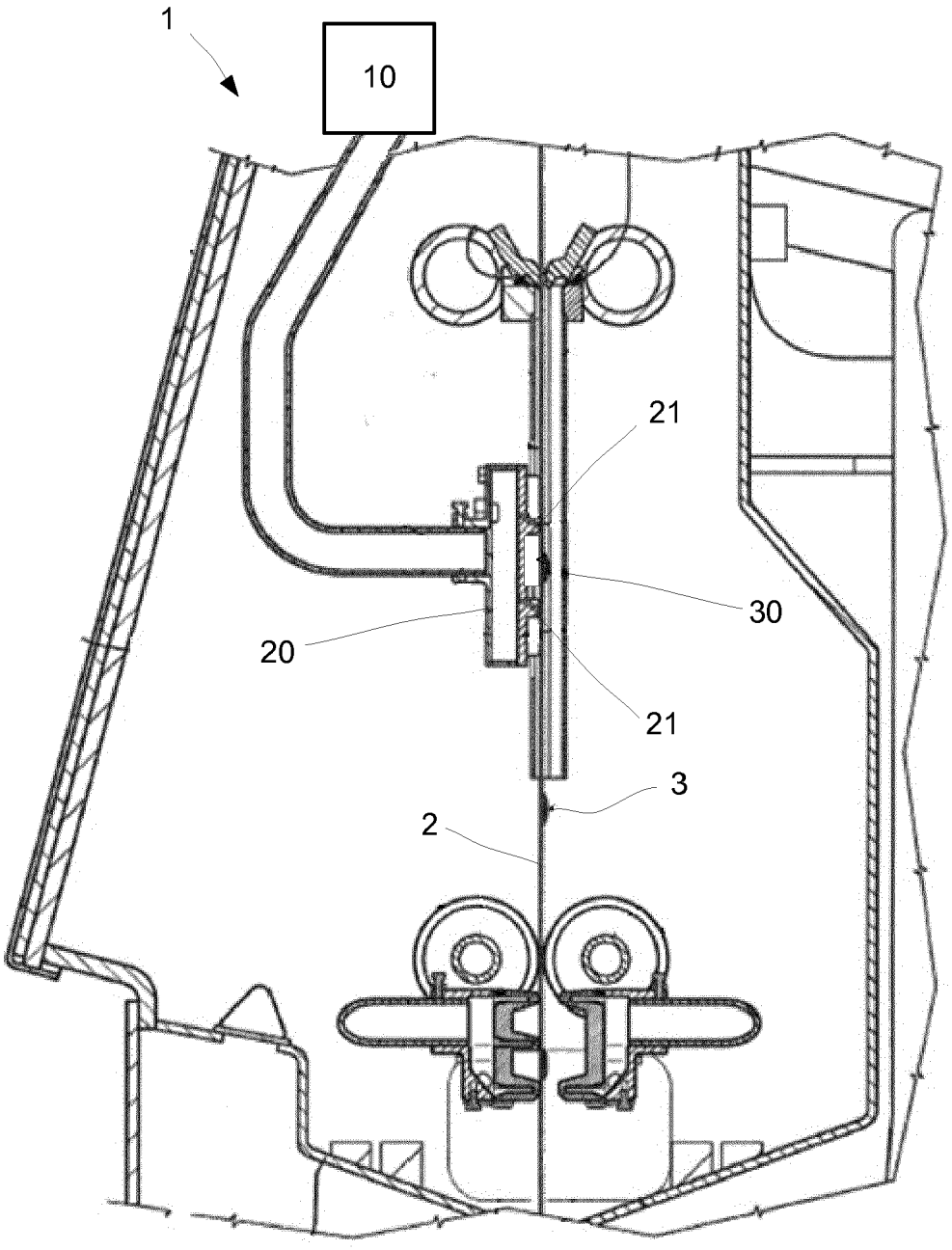

Fig. 1

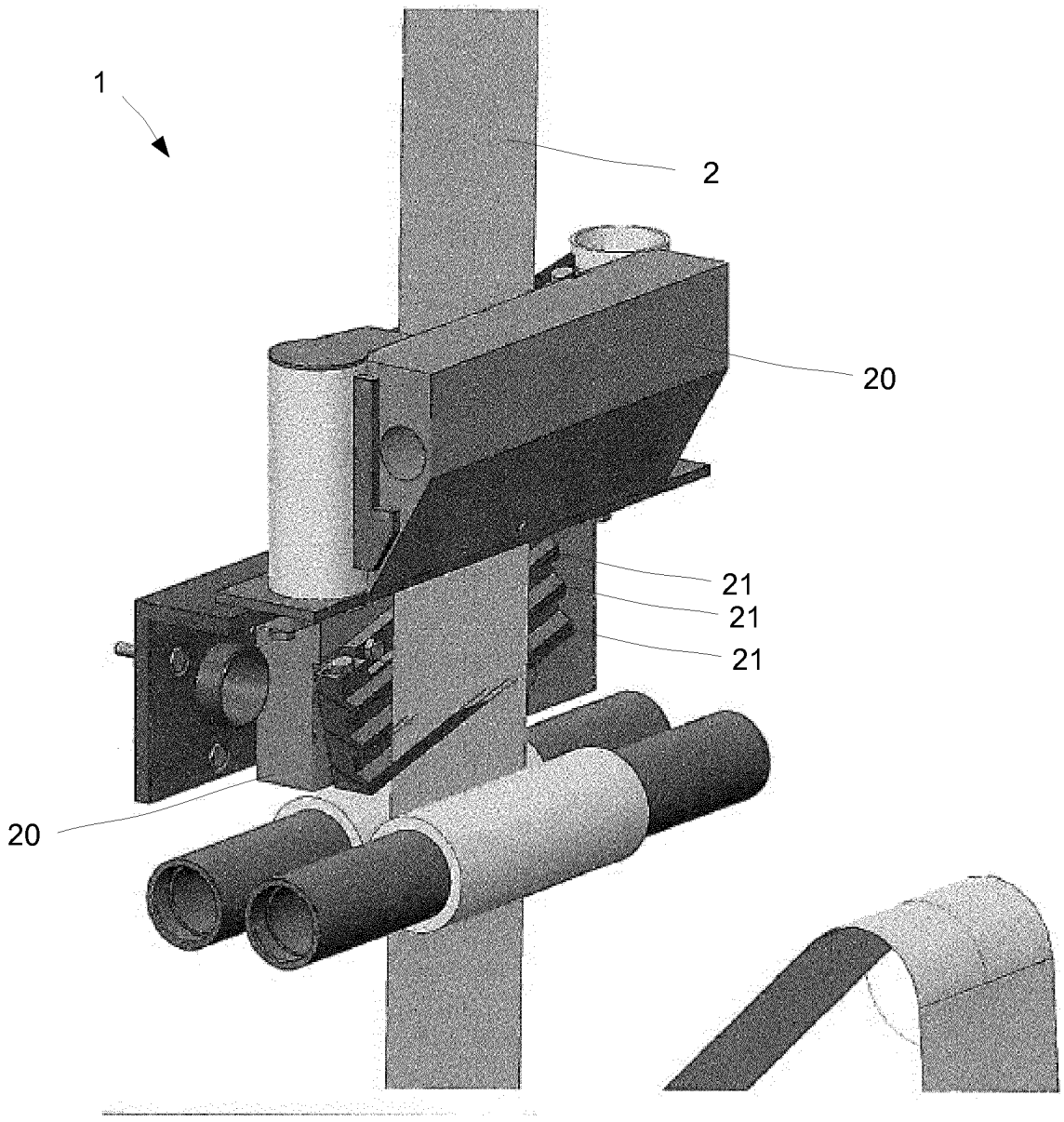

Fig. 2

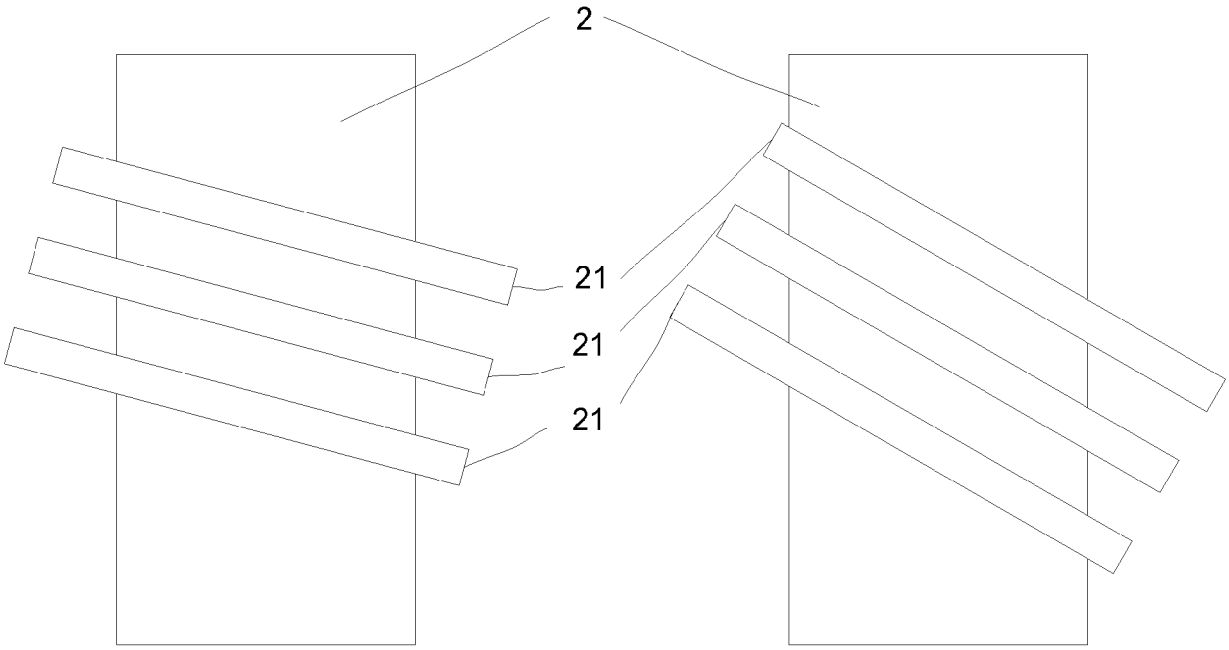

Fig. 3a

Fig. 3b

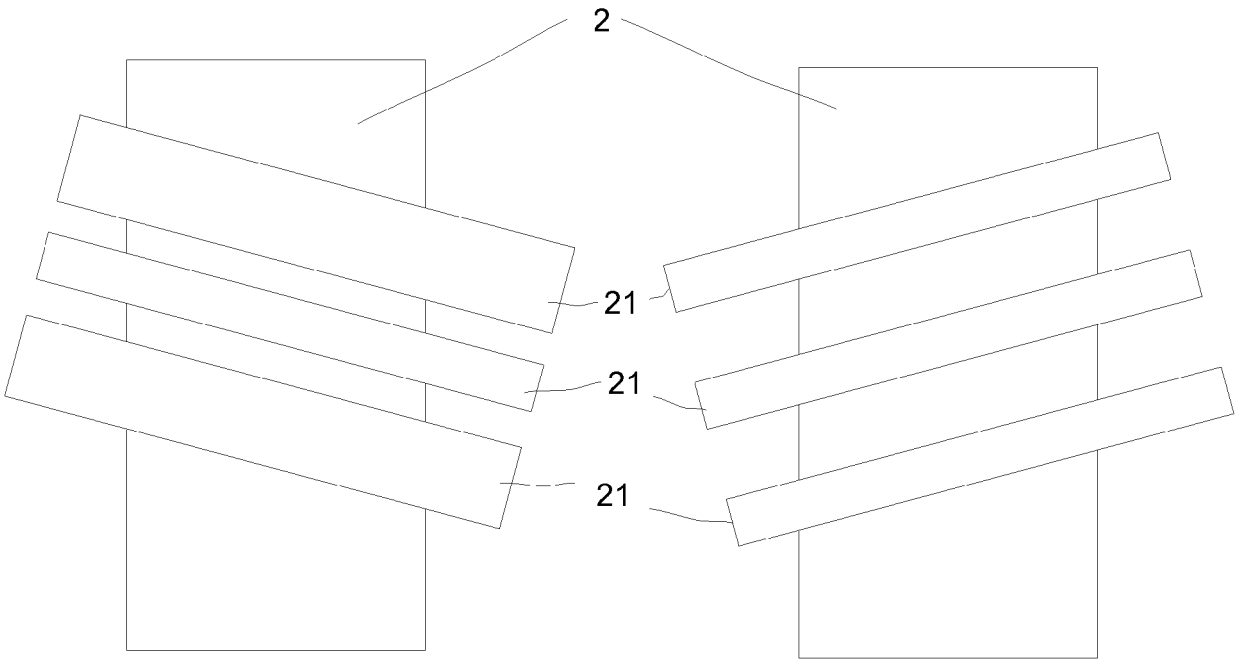

Fig. 3c

Fig. 3d

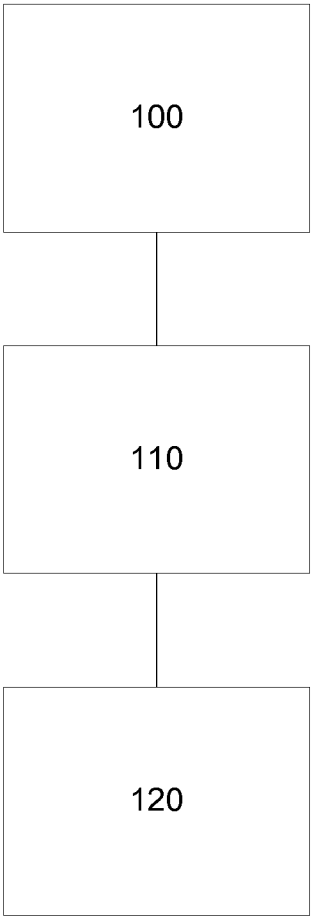

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 7445

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

F26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 July 2018	De Meester, Reni

CATEGORY OF CITED DOCUMENTS

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REFERENCES CITED IN THE DESCRIPTION

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