(19) SUOMI - FINLAND
(FI)

PATENTTI- JA REKISTERIHALLITUS
PATENT- OCH REGISTERSTYRELSEN
FINNISH PATENT AND REGISTRATION OFFICE

(10) **FI/EP4100244 T3**

(12) **EUROOPPAPATENTIN KÄÄNNÖS**
ÖVERSÄTTNING AV EUROPEISKT PATENT
TRANSLATION OF EUROPEAN PATENT SPECIFICATION

(45) Käännöksen kuulutuspäivä - Kungörelsedag av översättning - Translation available to the public **17.06.2025**

(97) Eurooppapatentin myöntämispäivä - Meddelandedatum för det europeiska patentet - Date of grant of European patent **02.04.2025**

(51) Kansainvälinen patenttiluokitus - Internationell patentklassificering - International patent classification
B31D 5/00 (2017 . 01)
B31F 1/00 (2006 . 01)
B31F 7/00 (2006 . 01)

(96) Eurooppapatenttihakemus - Europeisk patentansökan - European patent application EP21702992.5

(22) Tekemispäivä - Ingivningsdag - Filing date **01.02.2021**

(97) Patenttihakemuksen julkiseksitulopäivä - Patentansökans publiceringsdag - Patent application available to the public **14.12.2022**

(86) Kansainvälinen hakemus - Internationell ansökan - International application **01.02.2021 PCT/EP2021052272**

(30) Etuoikeus - Prioritet - Priority

04.02.2020 DE DE102020102722

(73) Haltija - Innehavare - Holder
1• Körber Technologies GmbH , Kurt-A.-Körber-Chaussee 8-32 , 21033 Hamburg , (DE)

(72) Keksijä - Uppfinnare - Inventor
1• TOBIAS, Jörg , Weizenhagen 38 , Drage 21423 , (DE)

(74) Asiamies - Ombud - Agent
Berggren Oy , Eteläinen Rautatiekatu 10A , 00100 Helsinki , (FI)

(54) Keksinnön nimitys - Uppfinningens benämning - Title of the invention
Juomapillien valmistaminen
PRODUCTION OF DRINKING STRAWS

Production of drinking straws

Description

The invention relates to a method for producing a drinking straw as well as a drinking straw production apparatus.

To produce drinking straws made of plastic, plastic is extruded via a closed shape. Originally, drinking straws were also produced from small paper tubes, in which paper strips were wound helically over a tube, glued and covered with a layer of paraffin. The first artificially produced straw or, respectively drinking straw was made of paper (see http://www.cusmiq.de/qa/show/851342/wie-werden-trinkhalme-hergestellt/ regarding this). In addition, reference is made to US 3 203 325 A and GB 787 981 A regarding this. The winding manufacture of drinking straws made of paper constitutes a comparatively slow production method.

In cigarette filter production, it is known that hollow tubes are to be produced from at least two-layered paper in a formatting apparatus during the longitudinal axial conveyance of the paper. Reference is made to the applicant's patent applications DE 10 2017 114 910 A1 as well as DE 10 2014 226 019 A1 and DE 10 2016 124 051 A1 regarding this. As a result, hollow tubes made of double-layer material strip sections can be produced very efficiently.

KR 102 054 114 B1 shows an apparatus for continually producing paper straws from a paper roll.

US 2 246 043 A shows a machine for producing hollow tubes made of paper.

A method for processing a wrapping material strip for rod-shaped articles of the tobacco processing industry is shown in EP 2 366 295 A1.

EP 3 357 354 A1 shows a method for producing a strand of the tobacco processing industry as well as a strand forming apparatus.

An apparatus for producing a continual small tube of the tobacco processing industry is shown in DE 36 03 748 A1.

A paper tube production machine, a production method for paper tubes and paper tubes produced by means of the method are shown in EP 2 845 499 B1.

US 2019 / 0 380 520 A1 shows disposable coated straws consisting of paper which is coated with degradable resin.

A drinking straw made of at least one wound paper layer which is formed from a semi-opaque, extremely finely-ground fibrous material, is shown in DE 20 2018 107 331 U1.

It is the object of the present invention to produce drinking straws made of paper efficiently and reliably.

This object is achieved by a method for producing a drinking straw in a continuous method, having the following features:

- pulling a paper strip from a paper strip roll, wherein the paper strip has a first edge and a second edge which are arranged parallel to a longitudinal axis of the paper strip,

- feeding the paper strip in a longitudinal axial conveying direction to a formatting apparatus,

- shaping the paper strip to form a hollow tube in the formatting apparatus, wherein the first edge is on the inside and the second edge is on the outside, and a part of the paper strip overlaps the first edge and defines an overlapping region which is or will be configured longitudinally axially on the hollow tube,

- sealing the hollow tube by means of a hot-melt gluing apparatus and

- cutting the hollow tube to length to form drinking straws,

wherein the paper strip has a specific weight of 200 g/m^2 to 480 g/m^2, wherein the diameter of the drinking straw is or will be controlled or regulated via a distance of a sealer section or a seam sealer from a garniture bed of the formatting apparatus.

Here, drinking straws which are of sufficient quality for use can be produced very efficiently and at high speed. Consequently, drinking straws which have a seam overlap are produced. Within the framework of the invention, a single paper strip is in particular shaped to form a hollow tube or, respectively a hollow strand.

A counter-bearing preferably presses against the overlapping region during shaping and/or sealing. For example, a mandrel, via which the paper strip is pulled, can serve as a counter-bearing in order to produce a counterpressure in the hollow tube or, respectively hollow tube strand during closing of the paper strip. A corresponding counter-bearing can preferably also be provided spatially apart following the sealing of the hollow tube. Within the framework of the invention, a hollow tube can also be a hollow tube strand or a hollow strand. A stable paper is used as the paper strip. A stable paper is understood to be a paper which has a specific weight of 200 g/m^2 to 480 g/m^2, in particular preferably 300g/m^2 to 460 g/m^2, in particular preferably 350 g/m^2 to 440 g/m^2.

In this way, drinking straws having a longitudinal seam which is effected by overlapping one part of the paper strip over the other side of the paper strip can be produced particularly efficiently.

The overlapping region is preferably knurled and/or bonded for sealing.

A particularly simple, efficient and safe production results when an adhesive is applied to at least one side of the paper strip in the overlapping region for bonding, prior to the shaping or prior to the sealing.
A particularly firm connection results when adhesive is applied to two sides of the paper strip which are in contact in the closed state, prior to the sealing. The adhesive applied to these two sides of the paper strip can thus already penetrate the paper strip or, respectively the paper material prior to the sealing so that a particularly efficient bonding is possible.

The overlapping region can also be knurled for sealing. To this end, a knurling apparatus can be provided, which acts on the overlapping region and executes a knurling movement against a counter-bearing, so that the two sides of the paper strip which come to rest on one another, and indeed in the overlapping region, are mechanically interlaced or mechanically connected to one another.

A pressure is preferably exerted on at least the outside edge of the paper strip or the overlapping region in order to close the overlapping region or a seam of the hollow tube. To this end, a sealer section of a formatting apparatus is provided, for example, or a seam sealer, which presses from the outside onto the overlapping region, and indeed against a counter-bearing, for example an inside mandrel or a compressed-air jet directed from the inside onto the overlapping region. The sealing of the paper strip to form a hollow tube or, respectively a hollow strand can be such that the paper strip is bent upward. The paper strip can also be bent to one side or downward. In the event that the overlapping region is at the bottom, the seam sealer can be provided at the bottom and, for example, press a garniture bed against the paper strip and the counter-bearing. For logical reasons, the pressing or, respectively exerting of pressure takes place on the overlapping region at the point at which the overlapping region is located.

The paper strip is preferably moistened prior to the shaping in order to reduce any tension existing in the paper so that the produced hollow tube does not open again immediately following the bonding and, consequently, a sufficient drying time is available.

The hollow tube or, respectively the hollow strand is preferably dried following the shaping.
In order to supply the paper strip with a predefinable and desired moisture, it is preferred if the moisture of the paper strip is measured prior to and/or following the moistening. A desired moisture of the paper strip can then be controlled and/or regulated.

The paper strip is preferably printed prior to the shaping. The printing can be conducted on one side of the paper strip which is located on the inside as well as on the outside following the shaping to form the hollow tube.

The outside edge of the hollow tube is preferably embossed, pressed and/or beveled in order to reduce the thickness of the edge.

The paper is preferably roughened in particular in the region in which said paper is provided with adhesive prior to being provided with adhesive.

The diameter of the drinking straw is or will be controlled or regulated, preferably adjusted via a distance of a sealer section or a seam sealer from a garniture bed of the formatting apparatus or via a diameter of the formatting apparatus.

The cutting-to-length apparatus is preferably a cutting apparatus which preferably comprises at least one knife. The cutting apparatus or, respectively the knife is preferably wetted with an oil and/or has a Teflon coating.

The paper strip is preferably arranged so that the wire side of the paper strip is on the outside in the cavity and the felt side is on the inside.

Furthermore, two hollow tubes or, respectively hollow strands are preferably produced at the same time, wherein the two hollow tubes or, respectively hollow strands are conveyed in parallel at least in sections. In order to provide only one cutting apparatus for two hollow tubes or, respectively hollow strands, in order to cut drinking straws to length or, respectively cut off drinking straws herefrom, the distance of the hollow tubes or, respectively hollow strands is minimized, for example, in a range of 5 cm to 15 cm. The distance of the two hollow tubes or, respectively hollow strands is preferably 5 cm to 10 cm.

The produced drinking straws can have a diameter of 3 mm to 20 mm. A diameter is preferably between 4 mm and 15 mm, in particular preferably between 6 mm and 10 mm.

A paper strip roll changing apparatus is preferably provided, which ensures that the one end of a paper strip roll is connected to the start of a second paper strip roll, so that virtually infinitely long paper strips can be made available.

The adhesive can be applied to the paper strips via adhesive nozzles or glue nozzles with or without contact with the paper, but can also be applied via disk gluing. As a result, one or more traces of glue or, respectively traces of adhesive are applied to the paper strips. When using multiple traces of glue or, respectively traces of adhesive, these can be applied so that they are at least partially directly in contact when the paper strips are later bonded. The advantage is that if adhesive is applied to both sides of the paper of the paper

strip prior to the bonding, said adhesive has more time to connect to the paper prior to strand formation, paper tube formation or hollow tube formation. This can be advantageous, for example, when the paper strip which is to later be used as a drinking straw absorbs less liquid than conventional paper material and thus the drinking straw later remains stable for a longer period of time when it comes into contact with liquid.

Following the application, the adhesive can preferably also be thermally treated, for example with infrared heating or contact heating, in order to improve the adhesive properties or to promote a faster bonding or setting. The adhesive can be applied prior to the bending of the paper strip to form a hollow tube or, respectively to form a hollow strand or shortly prior to the sealing of the hollow tube.

Following the application of the adhesive, the paper strip or paper strips is/are bent via external guides so that the sides of the paper strip are bent upward or downward and finally laid on top of one another to form a round strand or, respectively a hollow tube. The bending can also be done laterally. The two sides of the paper strip overlap when they are laid on top of one another. To transport the paper strip during the shaping, the paper strip is placed on a textile tape, for example a garniture tape, which is, for example, a closed endless tape which is driven via rollers and is flexible to the extent that it guarantees reshaping from a flat to a round shape and transfers the shape to the paper strip placed thereon.

In order to make it possible to apply an adhesive shortly prior to the sealing of the hollow tube or, respectively of the hollow strand, one side of the paper strip is left protruding, wherein an adhesive is then applied to the side facing the other side of the paper. Both sides are subsequently pressed onto one another, so that an overlapping region is produced, in which bonding takes place. At this point as well, an adhesive can be applied to both sides of the paper, so that two adhesive sides are brought together.

Hot glues can be considered as adhesives. To close the seam or, respectively the overlapping region, a seam sealer is preferably pressed onto the paper from above. The seam sealer can be heated or cooled in order to accelerate the setting of the adhesive depending on which adhesive has been selected. To

produce a counterpressure when the seam is closed, the paper can be pulled around a mandrel which projects from the front into the paper strand or the hollow tube. The mandrel can also be heated or cooled so that the hollow strand or the hollow tube is optimally bonded. The diameter can preferably be adjusted or automatically regulated by a variable seam sealer. The hollow strand thus sealed or, respectively the hollow tube thus sealed is preferably cut to a desired length by means of a rotating knife.

The object is further achieved by a drinking straw production apparatus, comprising

- a paper strip roll holder and a paper strip pulling apparatus, which is configured to pull a paper strip from a paper strip roll arranged on the paper strip roll holder, wherein the paper strip has a specific weight of 200 g/m^2 to 480 g/m^2,

- a formatting apparatus which is configured to bend a paper strip guided in a direction parallel to the longitudinal axis of the paper strip through the formatting apparatus to form a hollow tube, wherein a part of the paper strip overlaps a first edge of the paper strip, so that an overlapping region is produced, which is configured longitudinally axially on the hollow tube, and

- a cutting-to-length apparatus which is configured to cut drinking straws from the longitudinally axially conveyed hollow tube to length,

wherein the formatting apparatus has a sealer section and/or a seam sealer, wherein the sealer section or the seam sealer can be adjusted at a distance from a garniture bed, wherein a hot-melt gluing apparatus is provided for sealing the hollow tube.

A mandrel is preferably provided in the formatting apparatus, which is provided as a counter-bearing for the overlapping region from the inside. The mandrel can be heated or cooled in order to accelerate, for example, the setting of an adhesive which has been applied for bonding the paper strip in the overlapping region.

A compressed-air nozzle is preferably provided in the formatting apparatus, which is configured to direct compressed air from internally onto the overlapping region. In this respect, the compressed air can also be provided as a counter-bearing for the overlapping region, so that pressure can be exerted onto the overlapping region accordingly from the outside. The compressed air can be heating air or cooling air, for example, in order to allow any adhesive to set more quickly. Heating air can also be used, for example, in order to already surface dry or, respectively pre-dry a previously moistened paper at this point.

The formatting apparatus has a sealer section and/or a seam sealer which can be adjusted at a distance from a garniture bed. The formatting apparatus preferably has an adjustable diameter.

A gluing apparatus is provided for sealing the hollow tube. A knurling apparatus is preferably provided for sealing the hollow tube. The gluing apparatus can be arranged in the conveying direction of the paper strip upstream of the formatting apparatus. A further or a sole gluing apparatus can also be provided in the region of the formatting apparatus in such a way that the paper strip is provided with adhesive prior to being completely sealed.

A moistening apparatus is preferably provided, which is configured to moisten the paper strip prior to the shaping.

Furthermore, a measuring apparatus is preferably provided, which measures the moisture of the paper strip prior to the moistening and/or following the moistening and thus makes it possible to regulate or control the moistening apparatus.

Furthermore, a roughening apparatus is preferably provided, which is configured to roughen at least one side of the paper strip in the overlapping region. This serves to allow an adhesive to be applied in the overlapping region to better penetrate the material of the paper strip. The roughening apparatus can also roughen the paper strip from two sides in order to prepare, for example, the two sides of the paper strip for being provided with adhesive.

A pressing apparatus and/or a tapering apparatus is/are preferably provided, which serve(s) to reduce the thickness of an outside edge of the hollow tube. Here, the outside edge of the hollow tube can be thinned out, for example in a pressing process, for example by a pressing roller, or abrasively, in order to no longer perceive an edge which may be present when using the drinking straw as a nuisance.

The drinking straw production apparatus is preferably configured so that at least two hollow tubes can be produced at the same time.

The drinking straw production apparatus is preferably used for producing drinking straws.
In its simplest form, the drinking straw production apparatus can be configured without a weight measurement of the produced drinking straw, without a diameter measurement, without a transverse discharge of the produced drinking straws and/or without a regulation, that is to say, it can be produced very simply and cost-effectively.

The produced drinking straws are preferably introduced into collecting containers in a longitudinal axial conveying direction.

Further features of the invention will become obvious from the description of embodiments according to the invention, together with the claims and the appended drawings. Embodiments according to the invention can fulfil individual features or a combination of multiple features.

The invention is described below without limiting the general inventive idea on the basis of exemplary embodiments with reference to the drawings, wherein reference is expressly made to the drawings regarding all of the details according to the invention, which are not explained in more detail in the text, wherein:

Fig. 1 shows a schematic view of a drinking straw production apparatus according to the invention,

Fig. 2 shows a schematic view of a paper strip,

Fig. 3 shows a schematic cross-sectional view through a hollow tube,

Fig. 4 shows a schematic representation of a drinking straw according to the invention, and

Fig. 5 shows a schematic cross-sectional view through a formatting apparatus.

Within the framework of the invention, features which are identified by “in particular” or “preferably” are to be understood to be optional features.

In the drawings, the same or similar elements and/or parts are, in each case, provided with the same reference numerals so that they are not introduced again in each case.

Fig. 1 shows a schematic view of a drinking straw production apparatus 5 according to the invention.

A paper strip 12 is pulled from a paper strip roll 13, preferably by a motor, by means of a paper strip pulling apparatus. The paper strip roll 13, which can also be referred to as a bobbin, is arranged on a paper strip roll holder 30. In addition, a further, still full paper strip roll 13’ is provided on the paper strip roll holder 30, the start of which still full paper strip roll can be connected to the end of the paper strip roll 13 in order to then be able to pull the paper strip from this roll when the paper strip roll 13 is coming to an end. The paper strip roll holder 30 can then be rotated by 180° and the empty paper strip roll 13 can be removed in order to apply a new paper strip roll 13 to the paper strip roll holder 30. As a result, it is possible to attain uninterrupted operation of the drinking straw production apparatus 5.

After being pulled from the paper strip roll 13, the paper strip 12 first passes through a moistening apparatus 35 which can have, for example, a water mist having an adjustable mist density or, respectively moisture. The paper strip 12 is conveyed in the conveying direction, and indeed past an optional roughening apparatus 36. This is followed in the conveying direction 15 by a gluing apparatus 34 which applies adhesive to the one side, in this case the inside of the paper strip 12. Alternatively, the outside of the paper strip 12 can be

provided with a trace of adhesive or several traces of adhesive via a gluing apparatus 34' which is depicted schematically in Fig. 1.

The paper strip 12 is then deflected around a roller 26 and guided in the direction of a formatting apparatus 16. The formatting apparatus 16 is only depicted schematically in Fig. 1. The sealer section 17 is depicted. The garniture bed is not depicted. Admittedly, a garniture tape 20 which is directed via rollers 26 and is virtually designed as an endless tape, is actually depicted in Fig. 1, which is guided in the garniture bed which is not depicted.
A hollow tube 11 or, respectively a hollow strand is formed from the paper strip 12 in the formatting apparatus 16. In this case, the sealer section 17 presses on the overlapping region 23 so that, if an adhesive has been used, the paper strip 12 is pre-fixed or, respectively closed to form a hollow tube 11 in the formatting apparatus 16. Subsequently, a pressing apparatus 37 can also be provided, which ensures that the overlapping region 23 remains closed until the adhesive has set sufficiently. The pressing apparatus 37 can be provided over the entire route up to the end of the course of the garniture tape 20 in the longitudinal axial conveying direction 15. In addition, the pressing apparatus 37 can be or comprise a heating apparatus or a cooling apparatus 39 which supports the setting of the adhesive, depending on the type of the adhesive.

In addition, a drying apparatus can be provided at this point, which is not depicted in Fig. 1 or, respectively which can also be part of the pressing apparatus 37 or of the heating or cooling apparatus 39. In addition, the pressing apparatus 37 can be followed by a tapering apparatus 38 in order to taper the edge of the outer paper layer. Instead of providing adhesive on the paper strip 12 or, in addition to this, a knurling apparatus 33 can be provided, which follows the formatting apparatus 16, for example.

Following production of the hollow tube 11, said hollow tube is cut to length to form drinking straws 10 with a cutting-to-length apparatus 32, for example a rotating knife apparatus.

Fig. 2 schematically shows a top view of a paper strip 12 conveyed in the conveying direction 15. The paper strip 12 has a longitudinal axis 14 so that the conveying direction 15 is in the longitudinal axis 14. The paper strip 12 has a first edge 21 and a second edge 22. In the exemplary embodiments presented

here, the first edge 21 is arranged on the inside and the second edge 22 is arranged on the outside in the hollow tube 11 or, respectively the drinking straw 10. In addition, an adhesive 25 is applied in an overlapping region 23, schematically depicted in Fig. 2. The paper strip 12 is bent upward in Fig. 2 and reshaped to form a tube so that the first edge 21 is on the inside and the second edge 22 is on the outside, so that the overlapping region 23 is bonded on the side which is depicted as concealed in Fig. 2.

Fig. 3 schematically shows a section through a produced hollow tube 11 in the region of the formatting apparatus 16 at the point at which the hollow tube 11 is already closed. At this point, a mandrel is provided as a counter-bearing 24 in order to provide a pressure from outside on the overlapping region 23 of the paper strip 12 in the overlapping region 23, so that a counterpressure can be produced by the mandrel or, respectively the counter-bearing 24 until the adhesive has at least partially set.

Fig. 4 schematically shows a three-dimensional representation of a produced drinking straw 10 which has a longitudinal seam in the form of the second edge 22.

Fig. 5 shows a schematic representation of a section through a formatting apparatus 16, in which instead of the mandrel or additionally to the mandrel, a compressed-air nozzle 27 is shown, which blows compressed air 28 onto the transition area from the inside in order to thus produce a counter-bearing through compressed air 28 to the sealer section 17. Here, the formatting apparatus 16 has a garniture bed 18, in which both a garniture tape 20 as well as two side cheeks 19 and the sealer section 17 are mounted. The sealer section 17 can be adjusted in terms of height or distance, as shown by the double arrow, relative to the garniture bed 18, in order to adjust the cross-section of the produced hollow tube 11. For better clarity, the hollow tube 11 in Fig. 5 is depicted with a smaller diameter than it would actually be in the formatting apparatus 16. In actual fact, the hollow tube 11 would lie against the inner walls of the side cheeks 19 of the sealer section 17 and the inside of the garniture tape 20. In this exemplary embodiment, the garniture tape 20 has a width which is adapted to the contour of the garniture bed 18. An embodiment can also be provided, in which the garniture tape 20 can fill, for example, three-

quarters of the circumference of the inner surface of the formatting apparatus 16 or 80% hereof.

Thanks to the invention, it is possible to produce drinking straws made of paper in a very simple, efficient and cost-effective manner.

All of the indicated features, including those which are to be inferred from the drawings alone, and individual features which are disclosed in combination with other features, are deemed to be essential to the invention both alone and in combination. Embodiments according to the invention can be performed by individual features or a combination of multiple features.

List of reference numerals

5	Drinking straw production apparatus
10	Drinking straw
11	Hollow tube
12	Paper strip
13, 13'	Paper strip roll
14	Longitudinal axis
15	Conveying direction
16	Formatting apparatus
17	Sealer section
18	Garniture bed
19	Side cheek
20	Garniture tape
21	First edge
22	Second edge
23	Overlapping region
24	Counter-bearing
25	Adhesive
26	Guide roller
27	Compressed-air nozzle
28	Compressed air
30	Paper strip roll holder
31	Paper strip pulling apparatus
32	Cutting-to-length apparatus
33	Knurling apparatus
34, 34'	Gluing apparatus
35	Moistening apparatus
36	Roughening apparatus
37	Pressing apparatus
38	Tapering apparatus
39	Heating or cooling apparatus

Patenttivaatimukset:

1. Menetelmä juomapillin (10) valmistamiseksi jatkuvalla menetelmällä, jossa on seuraavat tunnusmerkit:
   - paperiliuskan (12) vetäminen paperiliuskarullasta (13, 13') siten, että paperiliuskassa (12) on ensimmäinen reuna (21) ja toinen reuna (22), jotka on järjestetty rinnakkaisesti paperiliuskan (12) pituusakseliin (14) nähden,
   - paperiliuskan (12) syöttäminen pituusakselin suuntaisessa kuljetussuunnassa (15) muotoilulaitteeseen (16),
   - paperiliuskan (12) muotoileminen ontoksi putkeksi (11) muotoilulaitteessa (16) siten, että ensimmäinen reuna (21) on sisäpuolella ja toinen reuna (22) on ulkopuolella ja paperiliuskan (12) osa menee päällekkäin ensimmäisen reunan (21) kanssa ja määrittää päällekkäisalueen (23), joka on muodostettu tai muodostetaan onttoon putkeen (11) pituusakselin suuntaisesti,
   - onton putken (11) sulkeminen kuumasulateliimauslaitteen (34, 34') avulla ja
   - onton putken (11) leikkaaminen juomapilleiksi (10),

   siten että paperiliuskalla (12) on ominaispaino 200 g/m^2 – 480 g/m^2, siten että juomapillin halkaisijaa on ohjattu ja säädelty tai sitä ohjataan ja säädellään muotoilulaitteen (16) ylemmän muotoiluosan (17) tai saumansulkijan etäisyydellä alemmasta muotoiluosasta (18).

2. Patenttivaatimuksen 1 mukainen menetelmä, **tunnettu** siitä, että muotoilun ja/tai sulkemisen yhteydessä painetaan vastalaakeri (24) päällekkäisaluetta (23) vasten.

3. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, **tunnettu** siitä, että sulkemista varten päällekkäisalue (23) pyälletään ja/tai liimataan.

4. Patenttivaatimuksen 3 mukainen menetelmä, **tunnettu** siitä, että liimausta varten järjestetään liima-ainetta (25) päällekkäisalueella (23) ainakin paperiliuskan (12) yhdelle sivulle ennen muotoilemista tai ennen sulkemista.

5. Patenttivaatimuksen 4 mukainen menetelmä, **tunnettu** siitä, että liimaainetta (25) järjestetään paperiliuskan (12) kahdelle suljetussa tilassa toisiinsa kosketuksissa olevalle sivulle ennen sulkemista.

6. Jonkin patenttivaatimuksista 1-5 mukainen menetelmä, **tunnettu** siitä, että päällekkäisalueen (23) sulkemiseksi käytetään painetta ainakin paperiliuskan (12) ulkopuoliseen reunaan (22).

7. Jonkin patenttivaatimuksista 1-6 mukainen menetelmä, **tunnettu** siitä, että paperiliuska (12) kostutetaan ennen sen muotoilemista.

8. Jonkin patenttivaatimuksista 1-7 mukainen menetelmä, **tunnettu** siitä, että paperiliuska (12) painetaan ennen sen muotoilemista.

9. Jonkin patenttivaatimuksista 1-8 mukainen menetelmä, **tunnettu** siitä, että onton putken (11) ulkoreuna (22) kohokuvioidaan, puristetaan ja/tai viistetään.

10. Juomapillien valmistuslaite (5), joka käsittää
- paperiliuskarullatelineen (30) ja paperiliuskojen vetolaitteen (31), joka on järjestetty vetämään paperiliuska (12) yhdestä paperiliuskarullatelineeseen (30) järjestetystä paperiliuskarullasta (13), siten että paperiliuskalla (12) on ominaispaino 200 g/m^2 – 480 g/m^2.
- muotoilulaitteen (16), joka on järjestetty taivuttamaan paperiliuskan (12) pituusakseliin (14) nähden rinnakkaisessa suunnassa muotoilulaitteen (16) läpi johdettu paperiliuska (12) ontoksi putkeksi (11) siten, että paperiliuskan (12) osa menee päällekkäin paperiliuskan (12) ensimmäisen reunan (21) kanssa niin, että syntyy päällekkäisalue (23), joka on muodostettu onttoon putkeen (11) pituusakselin suunnassa, ja
- katkaisulaite (32), joka on järjestetty leikkaamaan juomapillejä (10) pituusakselin suunnassa kuljetetusta ontosta putkesta (11),

siten että muotoilulaitteessa (16) on ylempi muotoiluosa (17) ja/tai saumansulkija, siten että ylemmän muotoiluosan (17) tai saumansulkijan voi säätää etäisyyden päähän alemmasta muotoiluosasta (18), siten että onton putken (11) sulkemiseksi on järjestetty kuumasulateliimauslaite (34, 34').

11. Patenttivaatimuksen 10 mukainen juomapillien valmistuslaite (5), **tunnettu** siitä, että muotoilulaitteeseen (16) on järjestetty paineilmasuutin (27), joka on järjestetty suuntaamaan paineilmaa (28) sisältä käsin päällekkäisalueelle (23).

12. Patenttivaatimuksen 10 tai 11 mukainen juomapillien valmistuslaite (5), **tunnettu** siitä, että siinä on pyällyslaite (33) onton putken (11) sulkemiseksi.

13. Jonkin patenttivaatimuksista 10-12 mukainen juomapillien valmistuslaite (5), **tunnettu** siitä, että siinä on kostutuslaite (35), joka on järjestetty kostuttamaan paperiliuska (12) ennen sen muotoilemista.

14. Jonkin patenttivaatimuksista 10-13 mukainen juomapillien valmistuslaite (5), **tunnettu** siitä, että siinä on karhennuslaite (36), joka on järjestetty karhentamaan paperiliuskan (12) ainakin toinen sivu päällekkäisalueella (23).

15. Jonkin patenttivaatimuksista 10-14 mukainen juomapillien valmistuslaite (5), **tunnettu** siitä, että siinä on puristin (37) ja/tai viistelaite (38), jo(t)ka on järjestetty pienentämään onton putken (11) ulkopuolisen reunan (22) paksuutta.

16. Jonkin patenttivaatimuksista 10-15 mukainen juomapillien valmistuslaite (5), **tunnettu** siitä, että juomapillien valmistuslaite (5) on järjestetty valmistamaan samanaikaisesti ainakin kaksi onttoa putkea (11), erityisesti toistensa kanssa rinnakkaisesti.

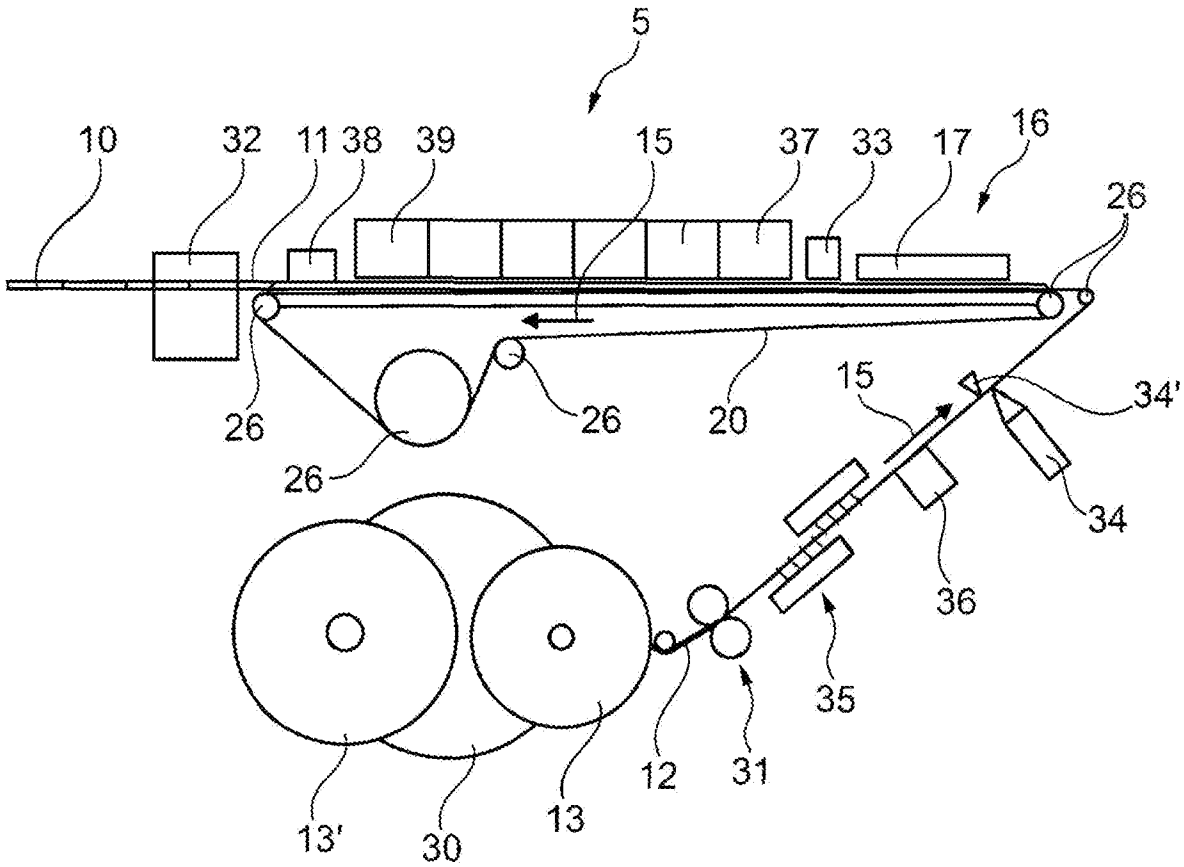
5
10
32
11
38
39
15
37
33
17
16
26
26
26
26
20
15
34'
34
36
35
12
31
13'
30
13

Fig. 1

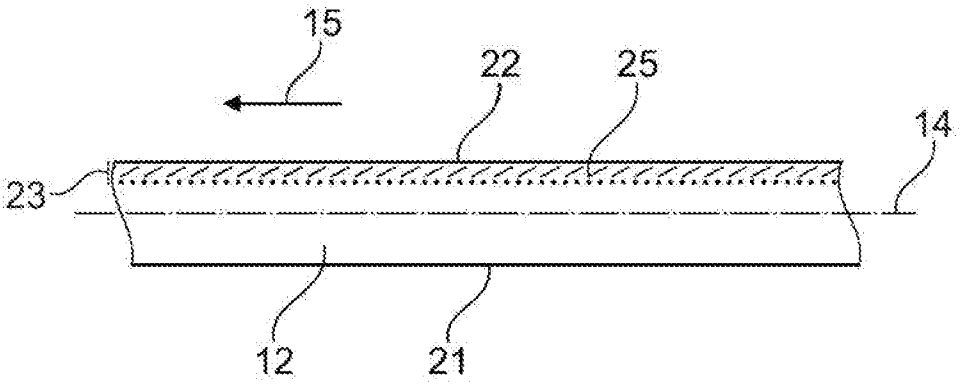

Fig. 2

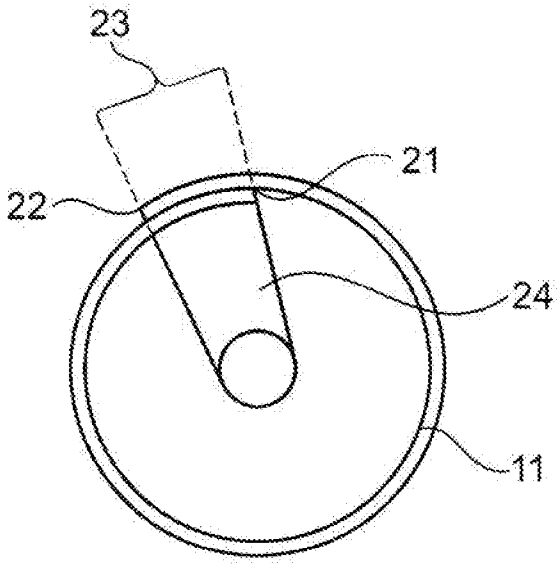

Fig. 3

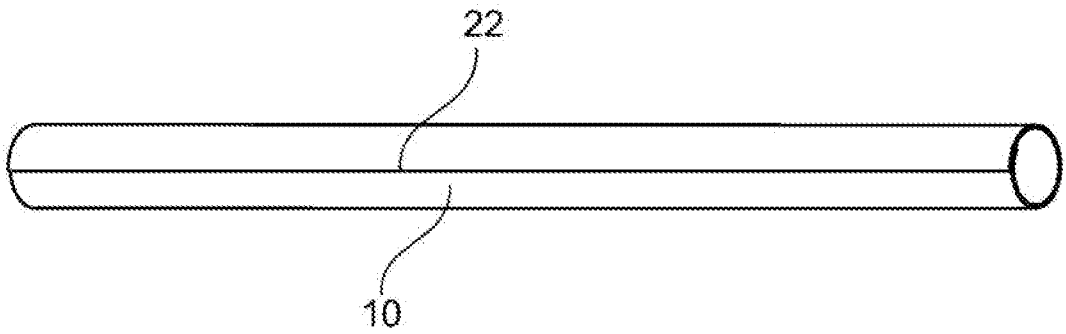

Fig. 4

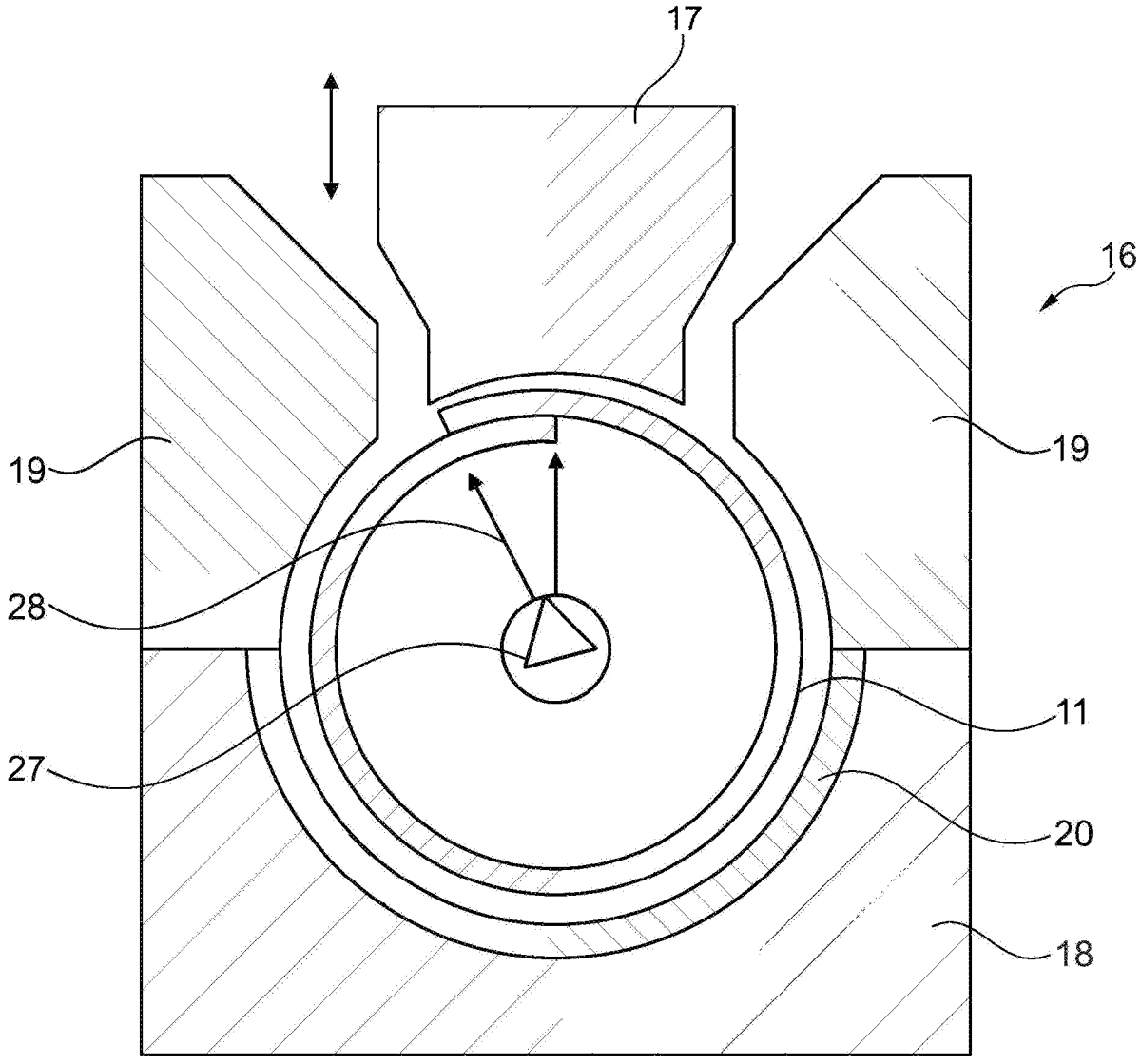

Fig. 5