



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.04.2019 Bulletin 2019/16

(51) Int Cl.:
A24B 3/14 (2006.01) A24D 3/02 (2006.01)

(21) Application number: **18199808.9**

(22) Date of filing: **11.10.2018**

(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**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **EUSEPI, Ivan**
40013 CASTELMAGGIORE (IT)
• **BALDANZA, Nicola**
40069 Zola Predosa (IT)
• **SARTONI, Massimo**
40139 Bologna (IT)
• **FEDERICI, Luca**
40135 Bologna (IT)

(30) Priority: **13.10.2017 IT 201700115502**

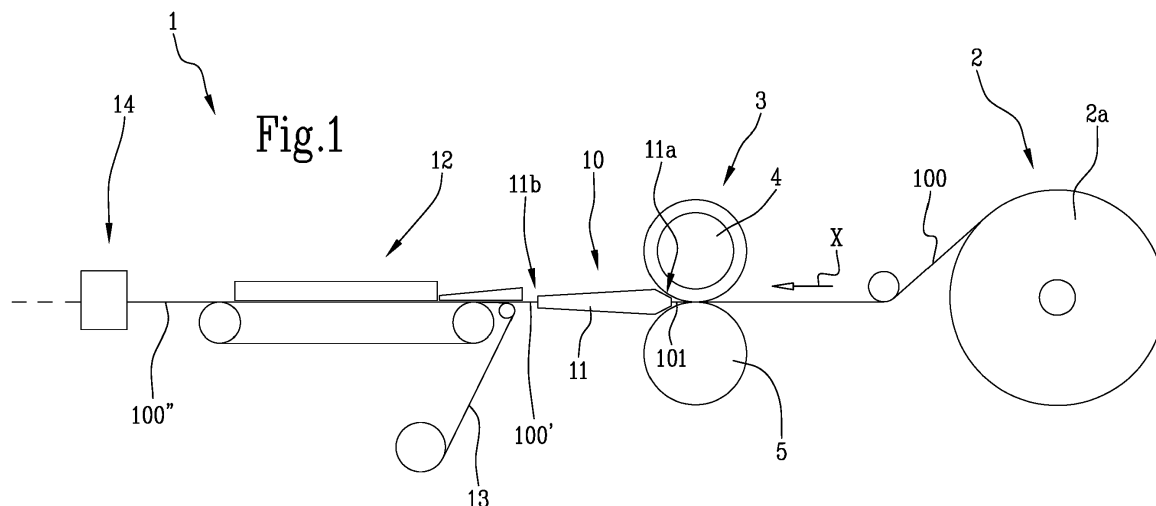
(71) Applicant: **G.D S.p.A.**
40133 Bologna (IT)

(74) Representative: **Bianciardi, Ezio**
Bugnion S.p.A.
Via di Corticella, 87
40128 Bologna (IT)

(54) **MACHINE AND METHOD FOR MAKING ROD-SHAPED SMOKING ARTICLES**

(57) This invention relates to a machine for making rod-shaped smoking articles (1), comprising: unwinding means (2) for unwinding a web (100) of material for the tobacco industry; first cutting means (3) configured to receive and cut the web (100) in such a way as to create a plurality of longitudinal strips (101); forming means (7) for making a plurality of longitudinal easy folding zones (103) in such a way that each longitudinal strip (101) has at least one longitudinal easy folding zone (103). Provid-

ed are gathering and conveying means (10) configured to gather and convey the longitudinal strips (101) in order to create at least one continuous stream (100'); a garniture tongue (12) configured to make at least one continuous rod (100'') comprising a plurality of longitudinal strips (101); and second cutting means (14) for cutting the continuous rod (100'') into a plurality of rod-shaped smoking articles. [Figure 1]



Description

[0001] This invention relates to a machine and method for making rod-shaped articles for smoking (hereinafter "rod-shaped smoking articles").

[0002] In particular, the rod-shaped smoking articles referred to herein are articles made from a web of material for the tobacco industry such as, for example: tobacco-based material (reconstituted, pre-treated, homogenized or cast-leaf tobacco), filter paper material or PLA. These articles can be used in the tobacco industry to make traditional filter cigarettes, that is, cigarettes which can be smoked by burning the end of the cigarette opposite the filter, or electronic cigarettes such as, for example: heat not burn, electronic-cig, mixed electronic-cig and tobacco.

[0003] Known in the art are crimping systems, as described in document WO 2016/071267 A1, designed to create corrugations on the web which can subsequently be compacted to create a longitudinal stream containing the crimped web; it was found, however, that the articles made according to this solution are not uniformly compacted but tend to become loose.

[0004] In other systems, a web of material for the tobacco industry is cut lengthways into longitudinal strips which are then gathered and wrapped in a web of paper to form a continuous rod containing a plurality of longitudinal strips placed side by side. It is then possible to obtain a plurality of articles from the rod, each comprising a plurality of longitudinal strips placed side by side.

[0005] For example, document US 4,889,143 describes a machine and a method for making rod-shaped smoking articles where two webs of material for the tobacco industry are unwound from rolls and fed to a cutting station configured to cut the webs into strips. The strips thus obtained are then gathered and sent to a garniture conveyor to make a continuous rod of material for the tobacco industry which can be cut to obtain a plurality of rod-shaped articles.

[0006] The Applicant has found that the articles obtained according to the teachings of the prior art are not optimally compacted and tend to loosen up when subjected to subsequent processes. As a result, the end products may also be non-uniform and of poor quality.

[0007] In effect, in many cases, the longitudinal strips wrapped in the paper web to make the continuous rod do not form a structurally stable element because the strips are not disposed in such a way as to fill the rod correctly, resulting in gaps or zones of different density.

[0008] That also means that material falls out of the tips of some of the articles.

[0009] In this context, the technical purpose which forms the basis of this invention is to propose a machine and a method for making rod-shaped smoking articles to overcome one or more of the above mentioned drawbacks of the prior art.

[0010] More specifically, this invention has for an aim to provide a machine for making rod-shaped smoking

articles and which is capable of making longitudinal strips which allow the smoking article to be effectively filled.

[0011] A further aim of this invention is to provide a method for making rod-shaped smoking articles and which allows improving the filling uniformity of the smoking articles, thus improving the quality of the end product.

[0012] The technical purpose indicated and the aims specified are substantially achieved by a machine and a method for making rod-shaped smoking articles, comprising the technical features described in one or more of the appended claims.

[0013] In particular, this invention provides a machine for making rod-shaped smoking articles, comprising:

- unwinding means for unwinding at least one roll of web of material for the tobacco industry, where the web is adapted to be unwound along a longitudinal feed direction;
- first cutting means for cutting the web, located downstream of the unwinding means and configured to receive and cut the web in such a way as to create a plurality of longitudinal strips along the longitudinal feed direction, where the first cutting means comprise at least a first roller and a second roller acting in conjunction with each other and configured to create the plurality of longitudinal strips on the web sliding between the rollers;
- gathering and conveying means configured to gather and convey the longitudinal strips from the first cutting means to create at least one continuous stream;
- a garniture tongue configured to receive the continuous stream and to progressively wrap it in a paper web to make at least one continuous rod, where the continuous rod comprises a plurality of longitudinal strips;
- second cutting means for cutting the continuous rod, located downstream of the garniture tongue and configured to cut the continuous rod into a plurality of rod-shaped smoking articles;

[0014] Advantageously, the machine also comprises forming means for making a plurality of longitudinal easy folding zones in such a way that each longitudinal strip has at least one longitudinal easy folding zone.

[0015] Thanks to the longitudinal easy folding zones, the longitudinal strips according to this invention can be easily folded during the steps of gathering and conveying so that adjacent longitudinal strips adhere effectively to each other, thus making a continuous stream and a continuous rod of high quality in which the longitudinal strips are closely pressed together and optimally compacted to fill the smoking article uniformly.

[0016] Thanks to this invention therefore, the longitudinal strips are prevented from coming apart and material will not fall out of the tips of the smoking articles.

[0017] The invention also provides a method for making rod-shaped smoking articles, comprising the following steps:

- unwinding at least one roll of web of material for the tobacco industry along a longitudinal feed direction;
- cutting the web in such a way as to create a plurality of longitudinal strips along the longitudinal feed direction;
- gathering and conveying the longitudinal strips to make a continuous stream;
- forming at least one continuous rod by progressively wrapping the continuous stream in a paper web;
- cutting the at least one continuous rod into a plurality of rod-shaped smoking articles.

[0018] Advantageously, the method also comprises a step of forming a plurality of longitudinal easy folding zones in such a way that each longitudinal strip has at least one longitudinal easy folding zone.

[0019] In other words, forming a plurality of longitudinal easy folding zones makes it possible to improve the manufacturing quality of the smoking articles.

[0020] The dependent claims, which are incorporated herein by reference, correspond to different embodiments of the invention.

[0021] Further features and advantages of this invention are more apparent in the detailed description below, with reference to a preferred, but non-exclusive embodiment of a machine for making rod-shaped smoking articles, as illustrated in the accompanying drawings, in which:

- Figure 1 is a functional diagram of a machine for making rod-shaped smoking articles according to this invention;
- Figure 2 is a schematic front view of the first cutting means of the machine of Figure 1;
- Figures 2A-2C and 3A-3C are schematic enlarged views of a detail B from Figure 2, showing possible embodiments of the forming means for making a plurality of longitudinal easy folding zones according to this invention, in a non-operating and an operating configuration, respectively;
- Figures 4A-4C show schematic plan views of possible embodiments of a longitudinal strip according to this invention; and
- Figures 5A-5B are, respectively, a schematic front view and a schematic plan view of an alternative embodiment of the gathering and conveying means according to this invention.

[0022] With reference to the accompanying drawings, the numeral 1 denotes in its entirety a machine for making rod-shaped smoking articles and hereinafter referred to simply as machine 1.

[0023] The machine 1 comprises unwinding means 2 for unwinding at least one roll 2a of web 100 of material for the tobacco industry such as, for example, tobacco based material, filter paper or PLA.

[0024] The web 100 is adapted to be unwound along a longitudinal feed direction, indicated by the arrow X in

Figure 1.

[0025] Downstream of the unwinding means 2, the machine 1 preferably comprises one or more systems for adjusting the tension of the web 100 (for example, an unwinding feedback sensor) and/or one or more systems, not illustrated, for centring the web 100.

[0026] The machine 1 comprises first cutting means 3 for cutting the web 100, located downstream of the unwinding means 2, and configured to receive and cut the web 100 in such a way as to create a plurality of longitudinal strips 101 along the longitudinal feed direction "X". The first cutting means 3 comprise at least a first roller 4 and a second roller 5 acting in conjunction with each other and configured to create the plurality of longitudinal strips 101 on the web 100 sliding between the rollers 4, 5.

[0027] Preferably, at least one between the first roller 4 and the second roller 5 comprises a plurality of cutting discs 6, preferably rotary (alternatively, they may be fixed, while the roller 4, 5 rotates) configured to make longitudinal strips 101 having straight or wavy or zig-zag edges 102.

[0028] In other words, the cuttings discs 6 create longitudinal cutting lines defining the edges 102 of the longitudinal strips 101.

[0029] Still more preferably, each cutting disc 6 has a straight or wavy or zig-zag cutting profile.

[0030] The distance between each cutting profile of one cutting disc 6 and the next corresponds to the width of the longitudinal strips 101.

[0031] Advantageously, making longitudinal strips with wavy or zig-zag edges 102 allows improving the cohesion between the longitudinal strips 101 during subsequent processes so as to prevent material from falling out of the tips of the articles.

[0032] With reference in particular to the example embodiment shown in Figure 2, only the first roller 4 is provided with cutting discs 6, whilst the second roller 5 is "plain": that is to say, it has a substantially flat surface, without grooves or other cutting discs 6.

[0033] Advantageously, the machine 1 according to this invention comprises forming means 7 for making a plurality of longitudinal easy folding zones 103 in such a way that each longitudinal strip 101 has at least one longitudinal easy folding zone 103.

[0034] Advantageously, the longitudinal easy folding zones 103 allow improving the step of gathering and conveying the longitudinal strips 101 which can be folded more easily so as to make rod-shaped smoking articles which are more compact and cohesive, with better filling uniformity.

[0035] Advantageously, the longitudinal easy folding zones 103 allow weakening the structure of the material so it can be folded more easily during the subsequent step of gathering.

[0036] In a possible embodiment not illustrated in the accompanying drawings, the forming means 7 for making a plurality of longitudinal easy folding zones 103 can be disposed upstream of the first cutting means 3.

[0037] However, with reference to the embodiments illustrated in Figures 2A-2C and 3A-3C, the forming means 7 for making a plurality of longitudinal easy folding zones 103 are located on at least one between the first roller 4 and the second roller 5 and comprise at least one between:

- a plurality of crimping discs 8 configured to compress the web 100 in such a way that each longitudinal easy folding zone 103 has at least one longitudinal crimp;
- a plurality of reduced diameter scoring discs 9 configured to partly cut the thickness of the web 100 in such a way that each longitudinal easy folding zone 103 has at least one longitudinal score line.

[0038] It should be noted that the expression "reduced diameter" is used to mean that the diameter of the reduced diameter scoring discs 9 is smaller than the diameter of the cutting discs 6.

[0039] Preferably, also, the cutting discs 6 are alternated with the crimping discs 8 and/or with the reduced diameter scoring discs 9, so that each longitudinal strip 101 comprises at least one crimp or one longitudinal score line.

[0040] As shown in particular in Figures 2A, 3A, the first roller 4 is provided with cutting discs 6 whose cutting profiles are straight, whilst the second roller 5 is provided with crimping discs 8 which are offset relative to the cutting discs 6 so as to make longitudinal strips 101 of the type shown in Figure 4B, where the longitudinal easy folding zones 103 made on the underside of the web 100 create longitudinal strips 101 which have a triangular cross section and which are easy to fold.

[0041] As shown in particular in Figures 2B, 3B, the first roller 4 is provided with cutting discs 6 whose cutting profiles are straight, with alternately interposed crimping discs 8, whilst the second roller 5 is of the plain type so as to make longitudinal strips 101 of the type shown for example in Figure 4B, where each longitudinal strip 101 has two longitudinal easy folding zones 103 made on the top side of the web 100 to facilitate folding of the longitudinal strips 101 themselves.

[0042] As shown in particular in Figures 2C, 3C, the first roller 4 is provided with cutting discs 6 whose cutting profiles are straight, with two alternately interposed reduced diameter scoring discs 9, whilst the second roller 5 is of the plain type so as to make longitudinal strips 101 of the type shown for example in Figure 4C, where each longitudinal strip 101 has two easy folding zones 103 made on the top side of the web 100 to facilitate folding of the longitudinal strips 101 themselves.

[0043] Thanks to this invention, therefore, it is possible to make longitudinal strips 101 of various shapes and sizes which are advantageously easy to fold, facilitating cohesion and allowing the smoking article being made to be filled uniformly.

[0044] Compared to a longitudinal strip made by prior

art machines, each longitudinal strip of this invention has at least one longitudinal easy folding zone.

[0045] With reference to Figure 1, the machine 1 according to the invention also comprises gathering and conveying means 10 configured to gather and convey the longitudinal strips 101 from the first cutting means 3 to create at least one continuous stream 100'.

[0046] Preferably, the gathering and conveying means 10 comprise at least one funnel-shaped member 11 having an infeed cross section 11a suitable for receiving the longitudinal strips 101 and an outfeed cross section 11b suitable for expelling the continuous stream 100' formed as the longitudinal strips 101 are fed through the funnel-shaped member 11.

[0047] Still more preferably, the gathering and conveying means 10 comprise at least two funnel-shaped members 11 horizontally juxtaposed or at least partly superposed.

[0048] With reference to the embodiment illustrated in Figures 5A and 5B, the gathering and conveying means 10 comprise three funnel-shaped elements 11: two below, juxtaposed horizontally; and one above, partly superposed on the two below.

[0049] Advantageously, that way, the longitudinal strips 101 to be gathered and conveyed can be distributed in a simple and ordered manner in order to avoid entanglement.

[0050] The machine 1 may preferably also comprise suction means, not illustrated, associated with the gathering and conveying means 10 and configured to facilitate gathering of the longitudinal strips 101 by sucking them towards the outfeed section 11b.

[0051] Downstream of the gathering and conveying means 10, the machine 1 comprises a garniture tongue 12 configured to receive the continuous stream 100' and to progressively wrap it in a paper web 13 to make at least one continuous rod 100". The continuous rod comprises a plurality of longitudinal strips 101 having at least one longitudinal easy folding zone 103 so as to improve the cohesion of the longitudinal strips 101 while they are being compacted, thus obtaining optimum filling uniformity.

[0052] Downstream of the garniture tongue 12, the machine then comprises second cutting means 14 for cutting the continuous rod 100" and configured to cut the continuous rod 100" into a plurality of rod-shaped smoking articles, not illustrated in the accompanying drawings

[0053] Preferably, the machine 1 comprises at least one device (not illustrated) for applying an additive (for example a liquid or metal particles) on the web 100 and/or on the longitudinal strips 101.

[0054] The additive may be applied in liquid or spray form or dispersed as granules/flakes. The additive may have a flavouring effect (for example, vanilla, menthol, etc.) or a filtering effect (for example, activated carbon, sepiolite, silica gel, etc.) or it may contribute to the creation of aerosols and vapours (for example, glycerine, etc.) or improve the flowability of the materials to facilitate

gathering and formation of the continuous rod 100" (for example, oils, water, alcohol, glycerine, etc.) or, in the case of metal particles, it may be capable of heating the tobacco by an electromagnetic induction effect.

[0055] Preferably, the machine 1 may comprise a device (not illustrated in the accompanying drawings) for reducing the electrostatic charge of the material for the tobacco industry, more preferably located upstream of the first cutting means 3.

[0056] Preferably, the machine 1 may comprise at least one detecting sensor (not illustrated in the accompanying drawings) configured to detect jamming and/or breaks in the longitudinal strips 101, more preferably located between the first cutting means 3 and the gathering and conveying means 10.

[0057] For example, the detecting sensor may be an optical sensor (vision system, standard or diffuse photo-cells), an acoustic sensor (ultrasonic) or a capacitive sensor.

[0058] In an alternative embodiment, the detecting sensor may be located downstream of the garniture tongue 12 and be configured to detect the density of the continuous rod 100".

[0059] According to a further aspect of it, this invention provides a method for making rod-shaped smoking articles, comprising the following steps:

- unwinding the roll 2a of web 100 of material for the tobacco industry along a longitudinal feed direction "X";
- cutting the web 100 in such a way as to create the plurality of longitudinal strips 101 along the longitudinal feed direction "X";
- forming a plurality of longitudinal easy folding zones 103 in such a way that each longitudinal strip 101 has at least one longitudinal easy folding zone 103, preferably made simultaneously with the step of cutting the web 100;.
- gathering and conveying the longitudinal strips 101 to make a continuous stream 100';
- forming the continuous rod 100" by progressively wrapping the continuous stream 100' in the paper web 13;
- cutting the continuous rod 100" into a plurality of rod-shaped smoking articles.

[0060] Advantageously, the step of making the longitudinal easy folding zones 103 allows making compact, cohesive smoking articles capable of improving the efficiency of the production process and the quality of the end product.

[0061] Also part of the invention is a rod-shaped smoking article comprising a plurality of longitudinal strips 101 obtained from a web 100 of material for the tobacco industry, where the longitudinal strips 101 extend longitudinally in the rod-shaped smoking article and are wrapped in a paper web 13, and where each longitudinal strip 101 is at least partly folded along a longitudinal easy

folding zone 103 made on the longitudinal strip 101 itself.

[0062] This invention achieves the preset aims, overcoming the disadvantages of the prior art, by providing the user with a machine 1 for making rod-shaped smoking articles by making longitudinal strips 101 capable of improving rod filling uniformity, and with a method which can improve the efficiency of the production process.

[0063] The rod-shaped smoking article according to this invention is thus uniformly filled, well compacted and cohesive and free of problems due to material falling out of the tips and which can advantageously be used to make high-quality products.

15 Claims

1. A machine for making rod-shaped smoking articles (1), comprising:

- unwinding means (2) for unwinding at least one roll (2a) of web (100) of material for the tobacco industry; the web (100) being adapted to be unwound along a longitudinal feed direction (X);
- first cutting means (3) for cutting the web (100), located downstream of the unwinding means (2) and configured to receive and cut the web (100) in such a way as to create a plurality of longitudinal strips (101) along the longitudinal feed direction (X), the first cutting means (3) comprising at least a first roller (4) and a second roller (5) acting in conjunction with each other and configured to create the plurality of longitudinal strips (101) on the web (100) sliding between the rollers (4, 5);
- gathering and conveying means (10) configured to gather and convey the longitudinal strips (101) from the first cutting means (3) to create at least one continuous stream (100');
- a garniture tongue (12) configured to receive at least one continuous stream (100') and to progressively wrap it in a paper web (13) to make at least one continuous rod (100"), the at least one continuous rod (100") comprising a plurality of longitudinal strips (101);
- second cutting means (14) for cutting the at least one continuous rod (100"), located downstream of the garniture tongue (12) and configured to cut the at least one continuous rod (100") into a plurality of rod-shaped smoking articles;
- forming means (7) for making a plurality of longitudinal easy folding zones (103) in such a way that each longitudinal strip (101) has at least one longitudinal easy folding zone (103).

wherein the forming means (7) for making a plurality of longitudinal easy folding zones (103) are located on the first roller (4) and comprise at least one between:

- a plurality of crimping discs (8) configured to compress the web (100) in such a way that each longitudinal easy folding zone (103) has at least one longitudinal crimp;
- a plurality of reduced diameter scoring discs (9) configured to partly cut the thickness of the web (100) in such a way that each longitudinal easy folding zone (103) has at least one longitudinal score line;

5

10

and wherein the first roller (4) also comprises a plurality of cutting discs (6), preferably rotary, configured to make longitudinal strips (101) having straight or wavy or zig-zag edges (102), the second roller (5) being plain.

15

2. The machine (1) according to claim 1, wherein each cutting disc (6) has a straight or wavy or zig-zag cutting profile.

20

3. The machine (1) according to claim 1, wherein the cutting discs (6) are alternated with the crimping discs (8) and/or with the reduced diameter scoring discs (9), so that each longitudinal strip (101) comprises at least one crimp or one score line.

25

4. The machine (1) according to one or more of the preceding claims, wherein the gathering and conveying means (10) comprise at least one funnel-shaped member (11) having an infeed cross section (11a) suitable for receiving the longitudinal strips (101) and an outfeed cross section (11b) suitable for expelling the continuous stream (100') formed as the longitudinal strips (101) are fed through the funnel-shaped member (11), the gathering and conveying means (10) preferably comprising at least two funnel-shaped members (11) horizontally juxtaposed or at least partly superposed.

30

35

5. The machine (1) according to one or more of the preceding claims, comprising suction means associated with the gathering and conveying means (10) and configured to facilitate gathering of the longitudinal strips (101).

40

45

6. The machine (1) according to one or more of the preceding claims, comprising at least one device for applying an additive on the web and/or on the longitudinal strips (101) - for example a liquid or metal particles.

50

7. The machine (1) according to one or more of the preceding claims, comprising a device for reducing the electrostatic charge of the material for the tobacco industry, preferably located upstream of the first cutting means (3).

55

8. The machine (1) according to one or more of the

preceding claims, comprising at least one detecting sensor configured to detect jamming and/or breaks in the longitudinal strips (101), the at least one detecting sensor being preferably located between the first cutting means (3) and the gathering and conveying means (10).

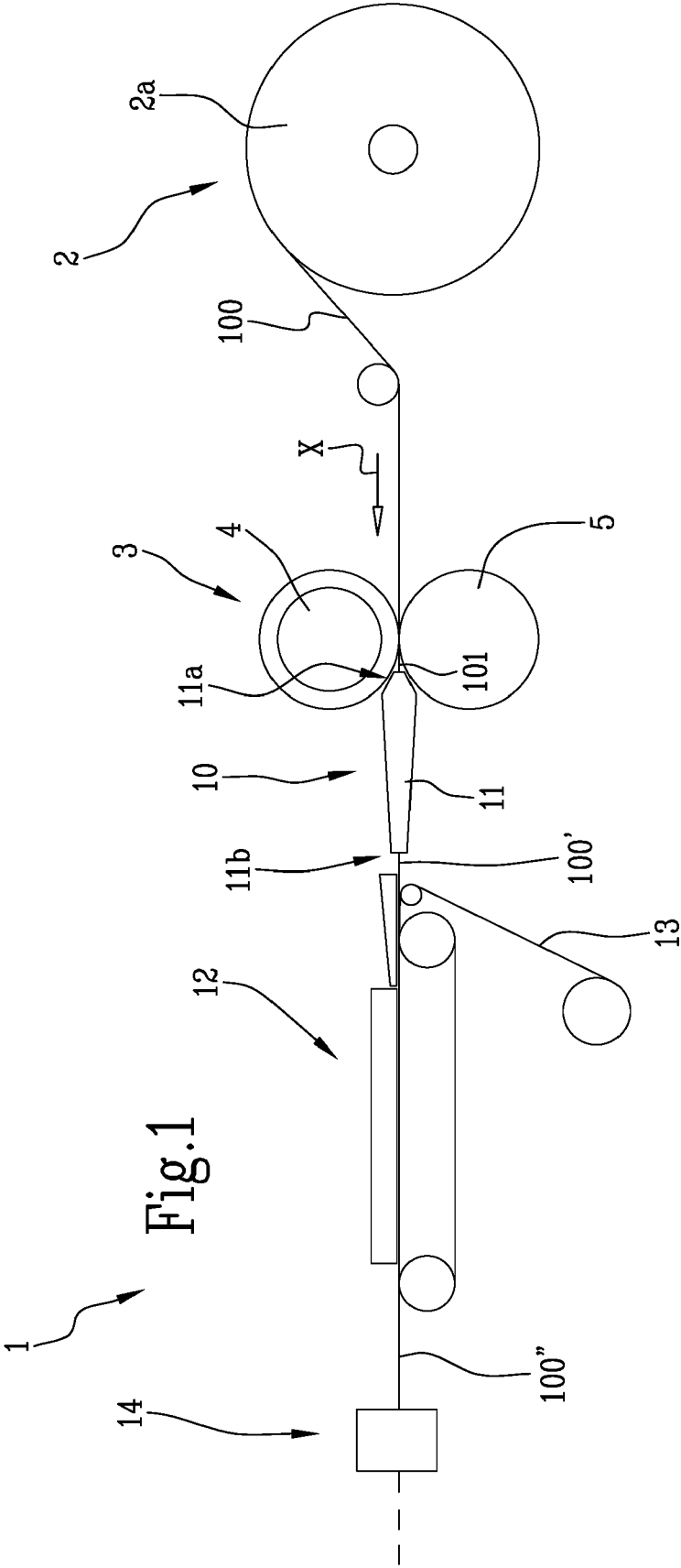


Fig.2

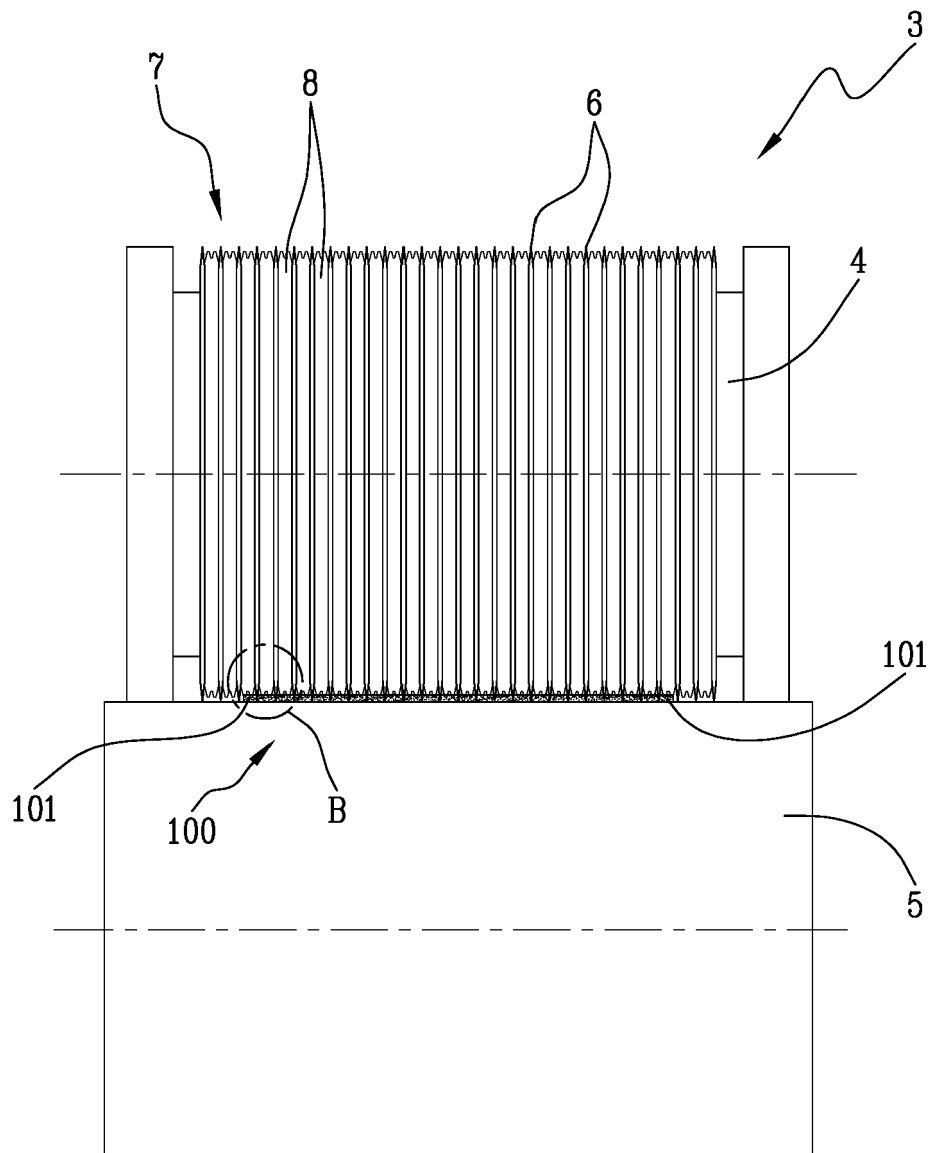


Fig.2A

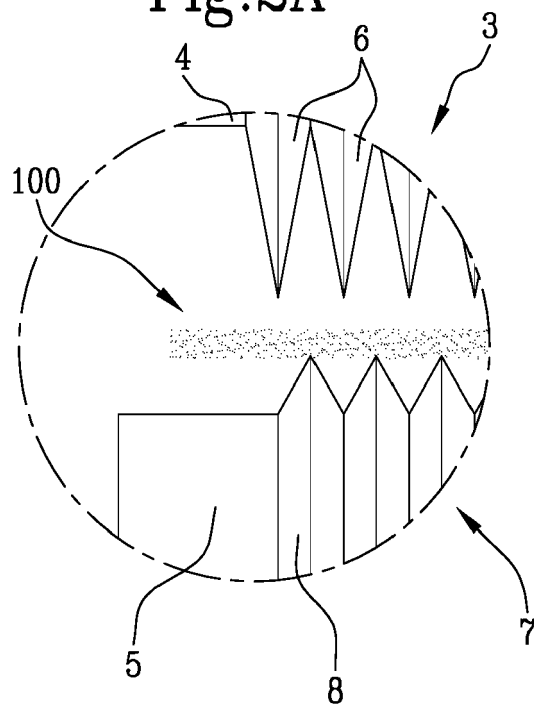


Fig.3A

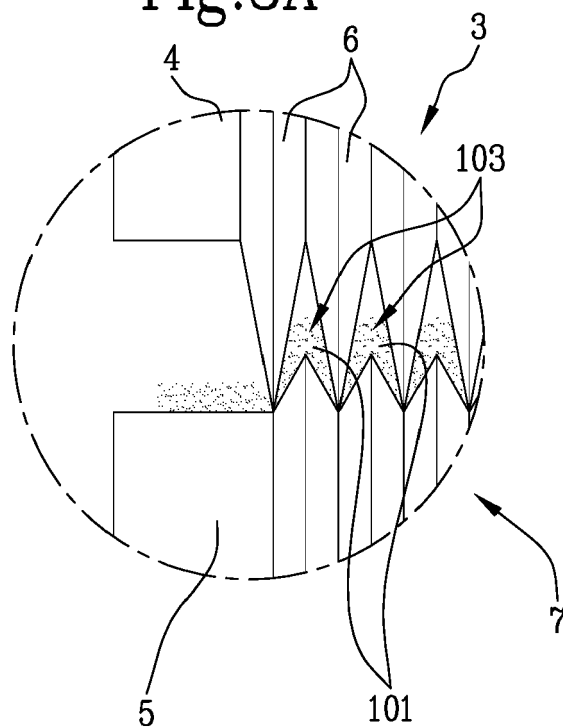


Fig.2B

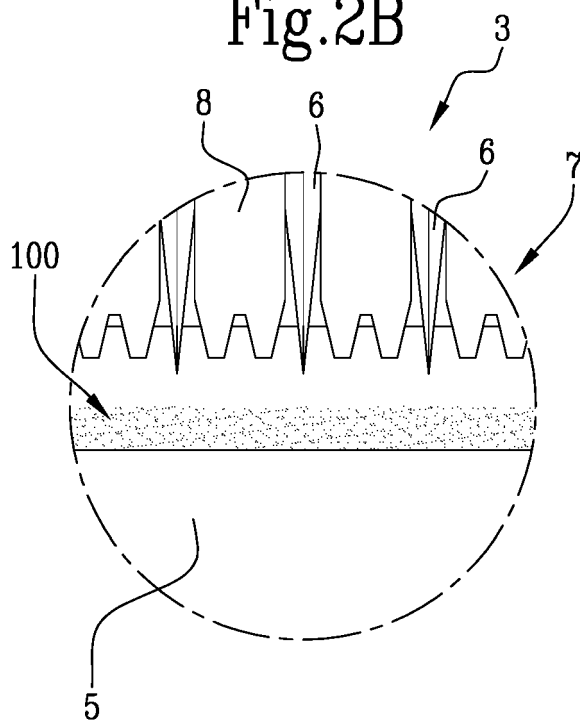


Fig.3B

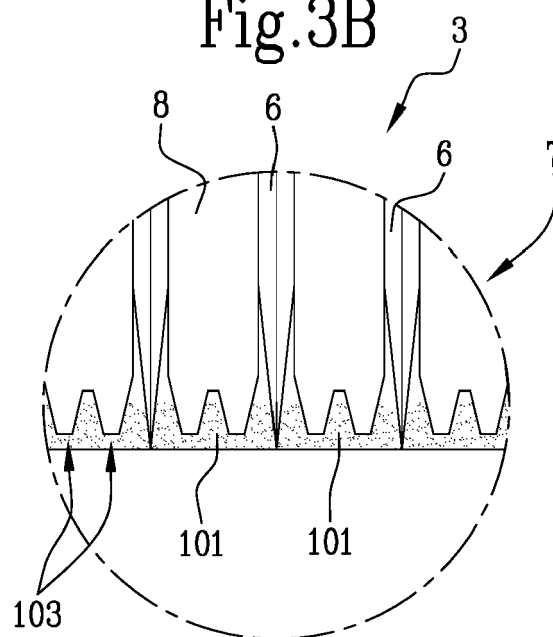


Fig.2C

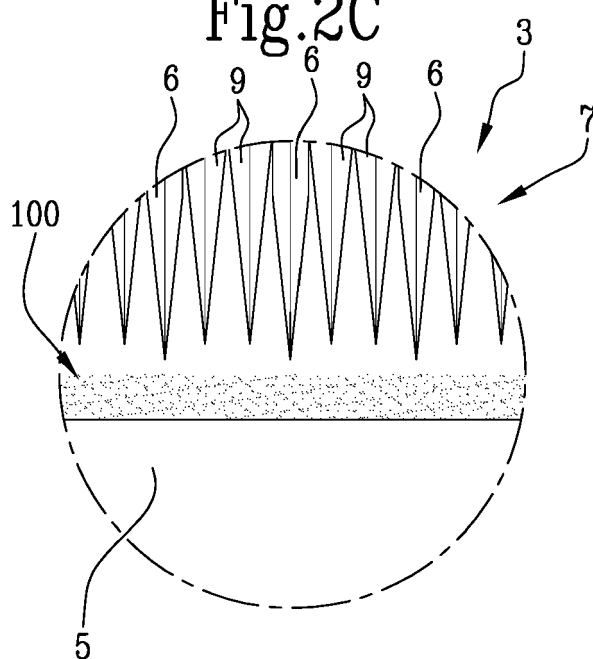
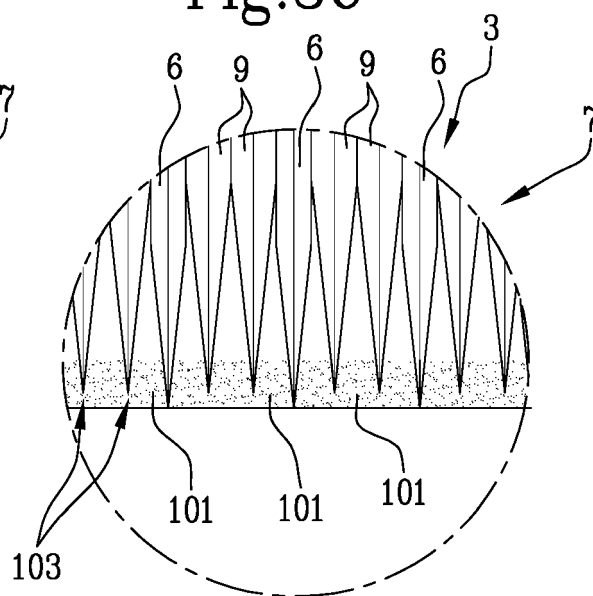
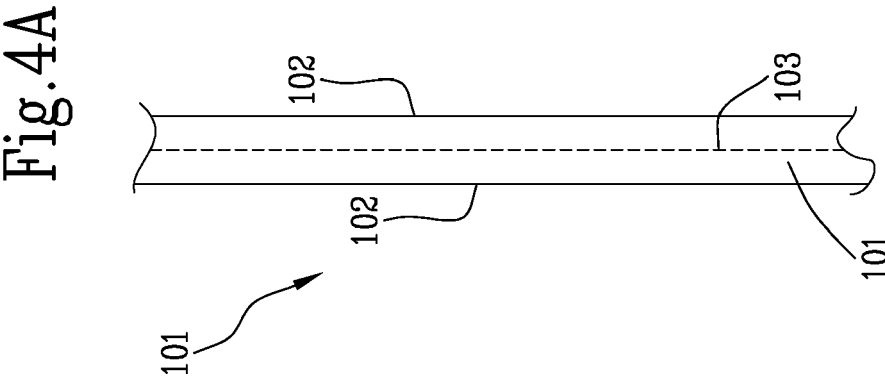
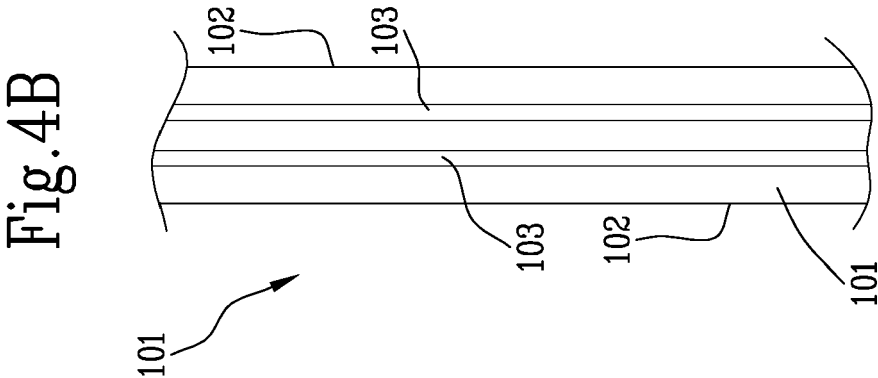
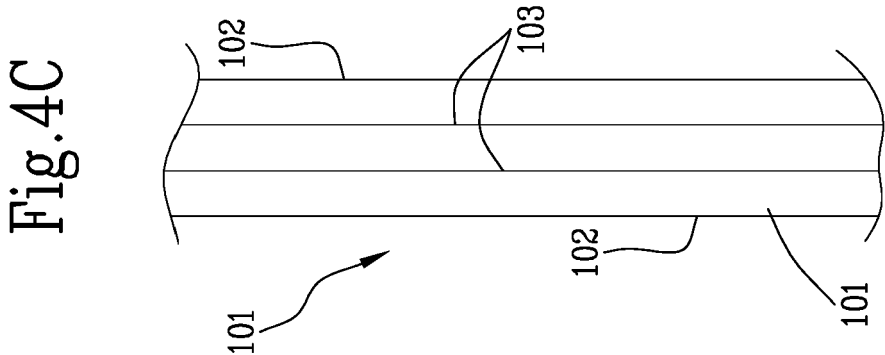
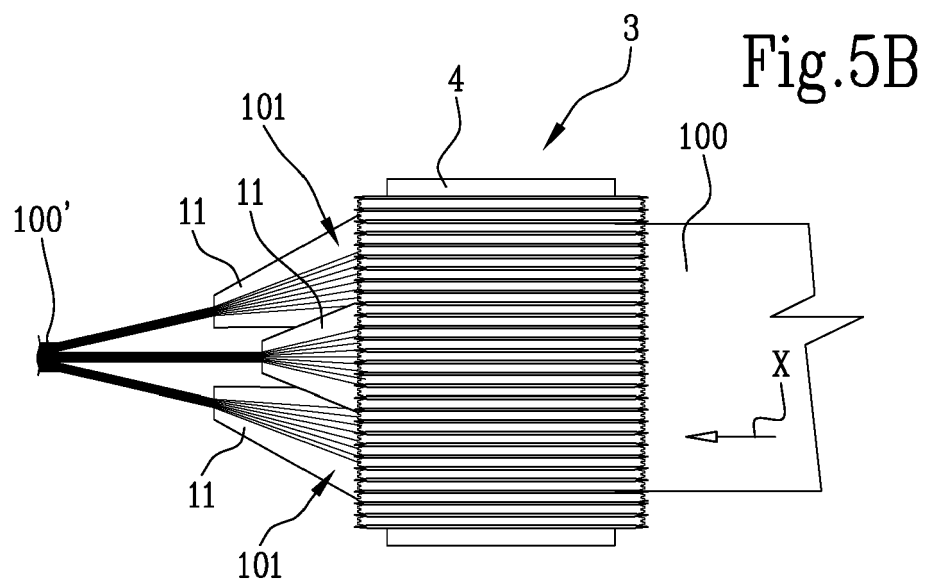
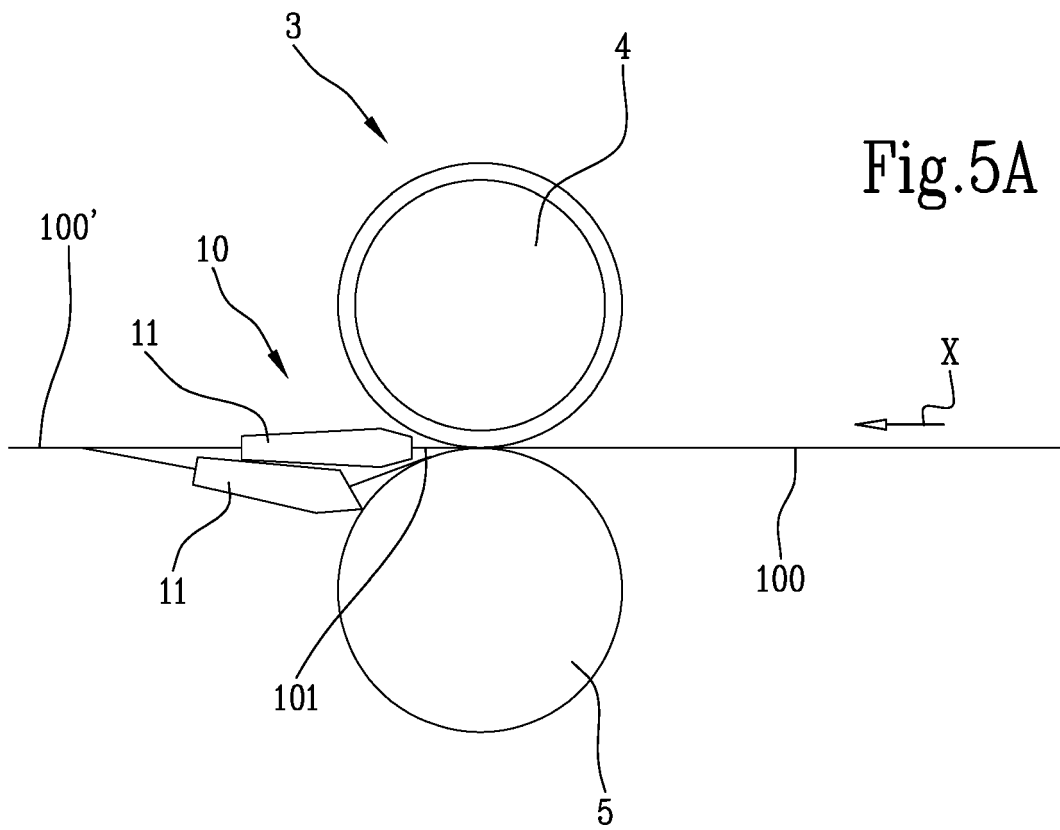


Fig.3C









EUROPEAN SEARCH REPORT

Application Number
EP 18 19 9808

5

10

15

20

25

30

35

40

45

50

55

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|--|---|---|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
| A | GB 2 284 138 A (ROTHMANS INTERNATIONAL LTD [GB]) 31 May 1995 (1995-05-31) * page 5, line 25 - page 6, line 18; figures 2,3 * * page 10, line 6 - line 21; figures 8,9 * * page 12, line 17 - line 24 * * page 13, line 35 - page 14, line 21; figures 12,13 * * page 8, line 4 - line 22 * ----- | 1-8 | INV. A24B3/14 A24D3/02 |
| A | US 3 226 280 A (ADOLF MULLER PAUL) 28 December 1965 (1965-12-28) * column 1, line 66 - column 2, line 8; figures * * column 4, line 5 - line 11 * ----- | 1-8 | |
| A | US 2 164 702 A (GLENN DAVIDSON) 4 July 1939 (1939-07-04) * page 2, column 2, line 75 - page 3, column 2, line 26; figures * ----- | 1-8 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC) |
| | | | A24B A24D |
| The present search report has been drawn up for all claims | | | |
| Place of search Munich | | Date of completion of the search 21 February 2019 | Examiner Caballero Martínez |
| CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | |

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 19 9808

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-02-2019

10

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|---|---|---------------------|----------------------------|---------------------|
| GB 2284138 | A | 31-05-1995 | NONE | |
| US 3226280 | A | 28-12-1965 | NONE | |
| US 2164702 | A | 04-07-1939 | NONE | |

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

- WO 2016071267 A1 [0003]
- US 4889143 A [0005]