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(54) **CONVEYING AND FORMING METHOD AND APPARATUS FOR FORMING A STREAM OF TOBACCO INDUSTRY SEGMENTS**

(57) The object of the application is a conveying and forming apparatus (1) for forming a stream (S) of tobacco industry segments (A), comprising in particular a third conveyor (10) comprising separating discs (11), the separating disc (11) having third flutes (12) for receiving the segments (A) from a second drum conveyor (8), and the third flutes (12) of the separating disc (11) are arranged with a third pitch (t3), the separating discs (11) having axes of rotation (m) positioned non-coaxially and at least two third flutes (12) of the separating discs (11) are positioned non-coaxially, the third flutes (12) holding the segments (A) in the group (G) in a non-coaxial spiral configuration. The object of the application is further a method of forming at least one stream (S) of the segments.

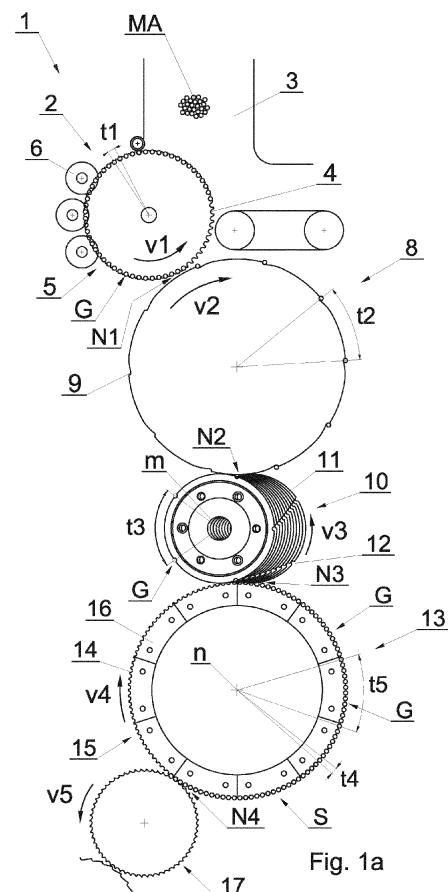


Fig. 1a

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Description

[0001] The object of the invention is a conveying and forming method and apparatus for forming a stream of tobacco industry segments. The method and apparatus according to the invention are used in the tobacco industry for the production of segmented products.

[0002] Conveying apparatuses known from the prior art convey rods that are cut during conveying, convey the segments formed after cutting the rods and form at least one stream of segments. European patent applications EP1016350A2, EP1213105A2, EP1584247A1, EP1757195A2 relate to a process of manufacturing cigarettes with a segmented mouthpiece and of manufacturing multi-segment filter rods, these applications disclose drum conveyor systems in which the cutting of the rods into segments, the separation of the segments transversely to their axis and the alignment of the segments are carried out. Disclosed apparatuses form a single stream and two parallel moving streams. The disclosed apparatuses are capable of producing a stream or streams of short segments only by doubling the segment cutting, separating and aligning units.

[0003] Several types of segments made of different materials are used in currently manufactured smoker products, whereas such products may comprise even up to five types of material and there is a demand for shorter and shorter segments in the filter section of the product. For example, there is a demand to form a single stream of 10mm long segments which are cut in half during the cutting of the intermediate product, resulting in 5mm long segments in the finished product. Known apparatuses for conveying segments and forming a stream are arranged to separate several segments from one another. An engineering problem occurring in the prior art is to obtain a separated stream of segments obtained from a single semi-finished product, segments being separated transversely, in the direction of conveying, where the semi-finished product is cut, for example, into 8, 10, 12 segments, the segments being 10mm or less in length. Forming a stream of short segments is problematic due to the need to hold the segment under vacuum for a short length and the need to transfer such short segments between drum conveyors. A transverse separation to the axis of the segments is hardly feasible with short segments as the segments may rub against each other, creating an increased frictional force. The frictional force acting transversely to the segment axis can cause segment rotation or damage.

[0004] The object of the invention is a conveying and forming apparatus for forming a stream of tobacco industry segments, comprising: a first drum conveyor having first flutes for conveying groups of the segments, the first flutes being arranged with a first pitch and holding the segments in the group in a coaxial configuration.

[0005] The apparatus according to the invention is further provided with a second drum conveyor having second flutes for receiving the groups of the segments

from the first drum conveyor, the second flutes being arranged with a second pitch and holding the segments in the group in the coaxial configuration, the second pitch being greater than the first pitch. The apparatus according to the invention is further provided with a third conveyor comprising separating discs, the separating disc having third flutes for receiving the segments from the second drum conveyor, the third flutes of the separating disc being arranged with a third pitch, the separating discs having axes of rotation positioned non-coaxially, and at least two third flutes of the separating discs being positioned non-coaxially, the third flutes holding the segments in the group in a non-coaxial spiral configuration. The apparatus according to the invention is further provided with a fourth drum conveyor having fourth flutes for receiving the segments from the third conveyor, the fourth flutes being arranged with a fourth pitch and arranged to shift the segments in a non-coaxial spiral configuration, the fourth drum conveyor being provided with an aligning mechanism arranged to shift the segments in the fourth flutes in a direction parallel to the axis of rotation of the fourth drum conveyor so as to change the non-coaxial spiral configuration on the circumferential surface of the drum conveyor to a circular configuration, forming at least one stream of the segments.

[0006] Preferably, the apparatus according to the invention is characterised in that the second pitch of the second flutes of the second drum conveyor is at least twice as great as the first pitch of the first drum conveyor.

[0007] The object of the invention is further a method of forming at least one stream of the tobacco industry segments, comprising steps wherein a group of segments is conveyed in a coaxial configuration of the segments in the first flutes of the first drum conveyor, the first flutes being arranged with the first pitch. Subsequently, the group of the segments is transferred to the second flute of the second drum conveyor and then the group is conveyed in the second flute of the second drum conveyor while maintaining the coaxial configuration of the segments, the second pitch of the second flutes of the second drum conveyor being greater than the first pitch of the first flutes of the first drum conveyor. In the next step, the segments of the group from the second flute of the second drum conveyor are transferred to the third flutes of the separating discs of the third conveyor and the configuration of the segments in the group is changed to the non-coaxial spiral configuration, and then the group of the segments in the non-coaxial spiral configuration is conveyed on the third conveyor provided with the separating discs, the third flutes of the separating disc being arranged with the third pitch, after which the segments are transferred to the fourth flutes of the fourth drum conveyor in the non-coaxial spiral configuration. In further steps, the segments are conveyed in the fourth flutes of the fourth drum conveyor in the non-coaxial spiral configuration, the segments are aligned on the fourth drum conveyor by means of the aligning mechanism by shifting the segments axially in the fourth flutes in a

direction parallel to the rotation axis of the fourth drum conveyor so as to change the non-coaxial spiral configuration on the circumferential surface of the drum conveyor to the circular configuration, thus forming at least one stream of the segments.

[0008] Preferably, the method according to the invention is characterised in that the segments are conveyed on the second drum conveyor with the second pitch which is at least twice as great as the first pitch on the first drum conveyor.

[0009] An advantage of the invention is achieving the axial separation of all segments using a single drum conveyor.

[0010] The object of the invention is shown in more detail in a preferred embodiment in a drawing in which:

Fig. 1a shows a conveying and forming apparatus according to the invention,

Fig. 1b shows the stages of forming a segment stream,

Fig. 2 shows the stages of forming two streams.

[0011] Fig. 1a shows an apparatus according to the invention in a preferred embodiment. The shown conveying and forming apparatus for forming a stream **S** of segments comprises a group of conveyors, the conveying and forming apparatus being situated between a rod hopper and a receiving conveyor, the rods **MA** being cut into individual segments **A** delivered to the receiving conveyor.

[0012] The conveying and forming apparatus **1** for forming the stream **S** of the tobacco industry segments **A** shown in the embodiment in Fig. 1a comprises a first drum conveyor **2** situated under the hopper **3** and is arranged to receive the rods **MA** and to convey the rods **MA** in flutes **4**. At the circumferential surface **5** of the first drum conveyor **2**, there are situated circular knives **6**. The circular knives **6** cut the rods **MA** into individual segments **A** when conveying the rods **MA** on the drum conveyor **2**, whereas from one rod **MA** after cutting a group **G** of the segments **A** is formed. Fig. 1b shows the successive stages of conveying and cutting the rod **MA**, forming, conveying and reconfiguring the group **G** of the segments **A** for individual conveyors of the conveying and forming apparatus **1**. The group **G** of the segments **A** formed after cutting the rod **MA** comprises the segments **A** situated coaxially, the group **G** of the segments **A** is conveyed further to the first transfer point **N1**. The first flutes **4** are arranged on the circumferential surface **5** of the first drum conveyor **2** with the first pitch **t1**.

[0013] The second drum conveyor **8** is provided with second flutes **9** for receiving the groups **G** of the segments **A** from the first drum conveyor **2**. The second flutes **9** are arranged with a second pitch **t2** greater than the first pitch **t1**. At the first transfer point **N1**, the distance between adjacent moving groups **G** is altered from a dis-

tance equal to the pitch **t1** to a distance equal to the pitch **t2**. After transferring the group **G** to the drum conveyor **8**, the coaxial configuration of the segments **A** in the group **G** remains unchanged, whereas the circumferential speed **v2** of the second flutes **9** is greater than the circumferential speed **v1** of the first flutes **4**, the second circumferential speed **v2** of the second flutes **9** is at least twice the first circumferential speed **v1** of the first flutes **4**, in the embodiment shown, the second speed **v2** is more than ten times the first speed **v1**. The segments **A** in the group **G** of the second flute **9** remain in the same coaxial configuration with an increased distance equal to the pitch **t2**. The group **G** of the segments **A** is transferred to the third conveyor **10** at the second transfer point **N2**.

[0014] The third conveyor **10** comprises separating discs **11**, the axes of rotation **m** of the individual separating discs **11** being situated parallel to each other, in the embodiment shown, the axes of rotation **m** of the separating discs **11** are situated non-coaxially. In the case of forming two streams as shown in Fig. 2, the separating discs can be situated coaxially in pairs. The third conveyor **10** is a separating disc conveyor, whereas the number of separating discs **11** in the third conveyor **10** corresponds to the number of segments **A** in the group **G**. The separating disc **11** has third flutes **12** for receiving the segments **A** from the second drum conveyor **8**, the third flutes **12** of the separating disc **11** being arranged with a third pitch **t3**, the third flutes **12** of the adjacent separating discs **11** being situated non-coaxially and holding the segments **A** in the group **G** in a non-coaxial configuration, the segments **A** of the group **G** being positioned along a spiral line. The separating discs **11** of the third conveyor **10** have different diameters, and the pitch **t3** for each separating disc **11** is selected such that the third flutes **12** are equally spaced from one another over the circumference of the separating disc **11**. The diameters of the individual separating discs **11** vary slightly, and the third pitch **t3** for the individual separating discs **11** has a different value. The separating discs **11** have a uniform rotational speed, and the third circumferential speed **v3** is dependent on the diameter of the separating disc **11**, the speed **v3** of the third flutes being similar to the speed **v2** of the second flutes **9** on the second drum conveyor **8**, whereas one of the separating discs **11** may have a speed equal to the speed **v2**. The segments **A** are transferred to the fourth conveyor **13** at the third transfer point **N3**, whereas for each segment **A** in the group **G** this will be a different point **N3** shifted relative to the adjacent point by a small value resulting from the non-coaxiality of the separating discs **11**.

[0015] The fourth drum conveyor **13** is provided with fourth flutes **14** for receiving the segments **A** from the third conveyor **10** and aligning the segments **A**, whereas the alignment is understood as aligning the segments **A** one after another along a circular path on the circumferential surface **13A** of the fourth drum conveyor **13A**. On the fourth drum conveyor **13**, the spiral configuration is changed to a circular configuration. The segments **A** of

the group **G** are successively received from the third conveyor **10** in successive fourth flutes **14**, the fourth flutes **14** being arranged with a fourth pitch **t4**, while the groups **G** are arranged with a fifth pitch **t5**, the fourth pitch **t4** being equal to the fifth pitch **t5** divided by the number of segments in the group **G**. The speed **v4** of movement of the fourth flutes **14** is equal to the speed **v3** of movement of the third flutes **12** on the third drum conveyor **10**. The fourth flutes **14** hold the segments **A** in the group **G** in the spiral configuration on the circumferential surface **15** of the drum conveyor **13**. The fourth drum conveyor **13** is provided with an aligning mechanism **16** known from the prior art, arranged to shift the segments **A** axially in the flutes **14** of the fourth drum conveyor **13**. In the embodiment shown, the aligning mechanism **16** aligns the segments **A** in the circular configuration on the circumferential surface **15** of the drum conveyor **13**, which is shown in **Fig. 1b** in a developed view as a rectilinear stream **S**. The resulting stream **S** is transferred towards the fourth transfer point **N4** and further to the receiving conveyor **17**. The speed **v5** of the flutes of the receiving conveyor **17** is equal to the speed **v4** of the flutes **14** of the fourth drum conveyor **13**.

[0016] **Fig. 2** shows, in simplified terms, the formation of two streams of the segments **A** using the conveying and forming apparatus **1**. The method according to the invention is shown with diagrammatic illustration of the steps wherein the rods **MA** are fed. The rods **MA** are then cut into the segments **A** to form the groups **G**. The groups **G** of the segments **A** are spaced at a greater distance than that with which the rods **MA** are conveyed. In a further step, the segments **A** are separated transversely, in the direction of conveying, and are then spaced transversely so that, in the preferred embodiment, at least two segments **A** occupy a coaxial position. In the embodiment shown, the group **G** comprises two subgroups of segments in a developed view situated slantwise, and spirally on the surface of the conveyor. Subsequently, the segments **A** are aligned to a configuration in a developed view of two rectilinear streams **S** of the segments **A**, i.e. to the circular configuration on the conveyor, transferred to further production stages.

Claims

1. A conveying and forming apparatus (**1**) for forming a stream (**S**) of tobacco industry segments (**A**), comprising:

a first drum conveyor (**2**) having first flutes (**4**) for conveying groups (**G**) of the segments (**A**), the first flutes (**4**) being arranged with a first pitch (**t1**) and holding the segments (**A**) in the group (**G**) in a coaxial configuration,

a second drum conveyor (**8**) having second flutes (**9**), for receiving the groups (**G**) of the segments (**A**) from the first drum conveyor (**2**),

the second flutes (**9**) being arranged with a second pitch (**t2**) and holding the segments (**A**) in the group (**G**) in the coaxial configuration, the second pitch (**t2**) being greater than the first pitch (**t1**),

a third conveyor (**10**) comprising separating discs (**11**), the separating disc (**11**) having third flutes (**12**) for receiving the segments (**A**) from the second drum conveyor (**8**), the third flutes (**12**) of the separating disc (**11**) being arranged with a third pitch (**t3**), the separating discs (**11**) having axes of rotation (**m**) positioned non-coaxially, and at least two third flutes (**12**) of the separating discs (**11**) being positioned non-coaxially, the third flutes (**12**) holding the segments (**A**) in the group (**G**) in a non-coaxial spiral configuration,

a fourth drum conveyor (**13**) having fourth flutes (**14**) for receiving the segments (**A**) from the third conveyor (**10**), the fourth flutes (**14**) being arranged with a fourth pitch (**t4**) and arranged to shift the segments (**A**) in a non-coaxial spiral configuration, the fourth drum conveyor (**13**) being provided with an aligning mechanism (**16**) arranged to shift the segments (**A**) in the fourth flutes (**14**) in a direction parallel to the axis of rotation (**n**) of the fourth drum conveyor (**13**) so as to change the non-coaxial spiral configuration on the circumferential surface (**15**) of the drum conveyor (**13**) to a circular configuration, forming at least one stream (**S**) of the segments (**A**).

2. The apparatus as in claim 1, characterised in that the second pitch (**t2**) of the second flutes (**9**) of the second drum conveyor (**8**) is at least twice as great as the first pitch (**t1**) of the first drum conveyor (**2**).
3. A method of forming at least one stream (**S**) of the tobacco industry segments (**A**), comprising steps wherein

a group (**G**) of segments (**A**) is conveyed in a coaxial configuration of the segments (**A**) in the first flutes (**4**) of the first drum conveyor (**2**), the first flutes (**4**) being arranged with the first pitch (**t1**),

the group (**G**) of the segments (**A**) is transferred to the second flute (**9**) of the second drum conveyor (**8**),

the group (**G**) is conveyed in the second flute (**9**) of the second drum conveyor (**8**) while maintaining the coaxial configuration of the segments (**A**), the second pitch (**t2**) of the second flutes (**9**) of the second drum conveyor (**8**) being greater than the first pitch (**t1**) of the first flutes (**4**) of the first drum conveyor (**2**),

the segments (**A**) of the group (**G**) from the

second flute (9) of the second drum conveyor (8) are transferred to the third flutes (12) of the separating discs (11) of the third conveyor (10) and the configuration of the segments (A) in the group (G) is changed to the non-coaxial spiral configuration, 5
the group (G) of the segments (A) in the non-coaxial spiral configuration is conveyed on the third conveyor (10) provided with separating discs (11), the third flutes (12) of the separating disc (11) being arranged with the third pitch (t3), 10
the segments (A) are transferred to the fourth flutes (14) of the fourth drum conveyor (13) in the non-coaxial spiral configuration,
the segments (A) are conveyed in the fourth flutes (14) of the fourth drum conveyor (13) in the non-coaxial spiral configuration, 15
the segments (A) are aligned on the fourth drum conveyor (13) by means of the aligning mechanism (16) by shifting the segments (A) axially in 20
the fourth flutes (14) in a direction parallel to the rotation axis (n) of the fourth drum conveyor (13) so as to change the non-coaxial spiral configuration on the circumferential surface (15) of the drum conveyor (13) to the circular configuration, 25
thus forming at least one stream (S) of the segments (A).

4. The method as in claim 3, **characterised in that** the segments (A) are conveyed on the second drum conveyor (8) with the second pitch (t2) which is at least twice as great as the first pitch (t1) on the first drum conveyor (2). 30

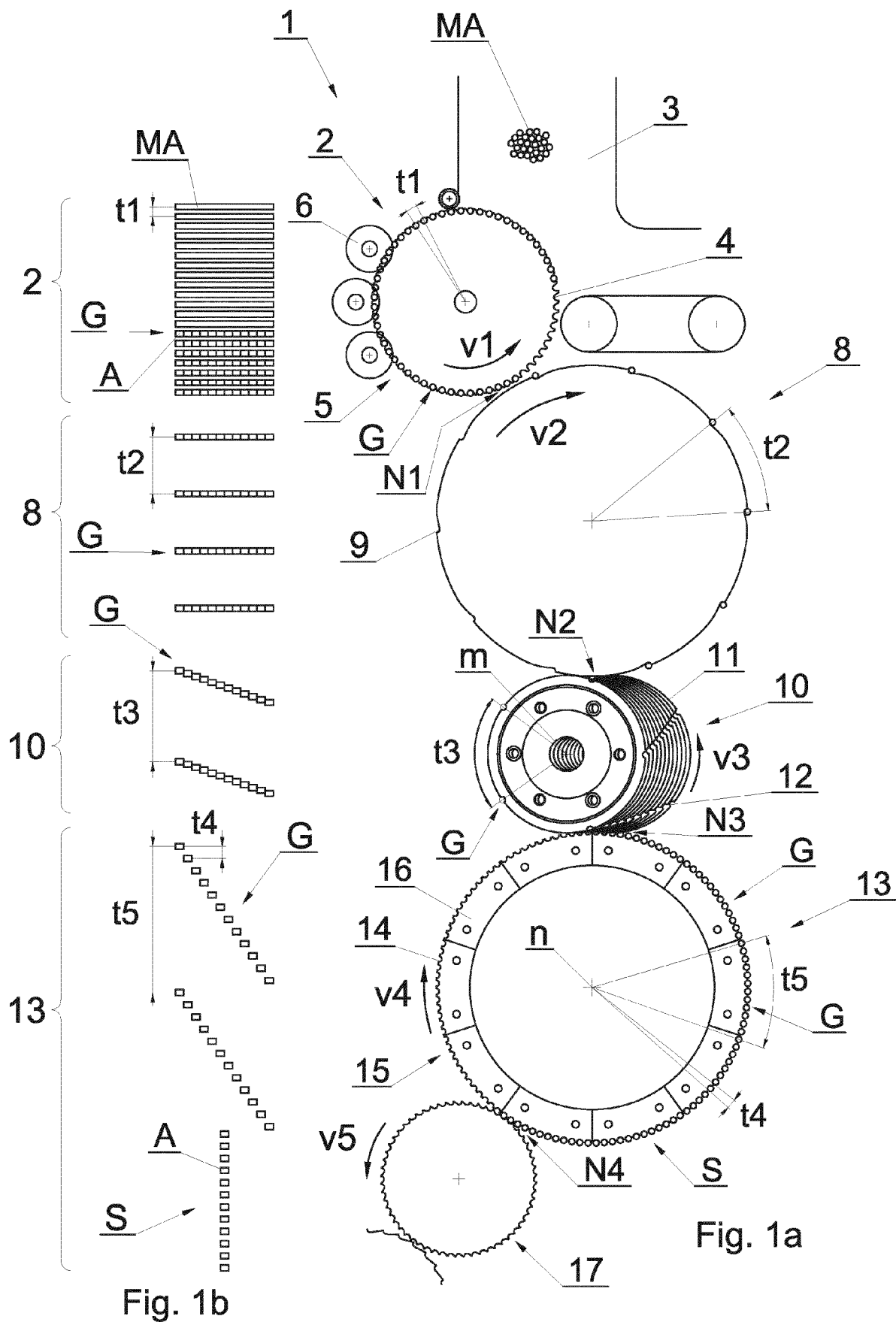
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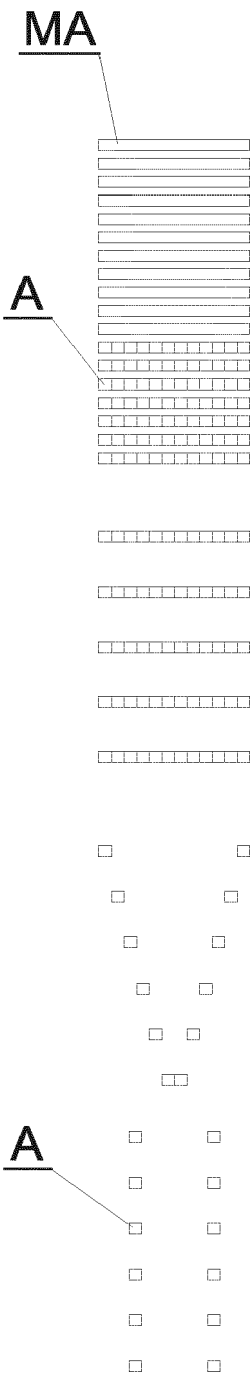


Fig. 2



EUROPEAN SEARCH REPORT

Application Number

EP 23 18 3439

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			TECHNICAL FIELDS SEARCHED (IPC)
			A24C A24D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 November 2023	Examiner Cardan, Cosmin
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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

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