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

(11) **EP 3 315 032 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.05.2018 Bulletin 2018/18

(51) Int Cl.:
A24C 5/32 *(2006.01)* ***A24C 5/47*** *(2006.01)*

(21) Application number: **17197767.1**

(22) Date of filing: **23.10.2017**

(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:
MA MD

(30) Priority: **26.10.2016 IT 201600107922**

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

(72) Inventors:
- **ESPOSTI, Marco**
  40033 Casalecchio di Reno Bologna (IT)
- **SARTONI, Massimo**
  40139 BOLOGNA (IT)
- **FEDERICI, Luca**
  40135 BOLOGNA (IT)

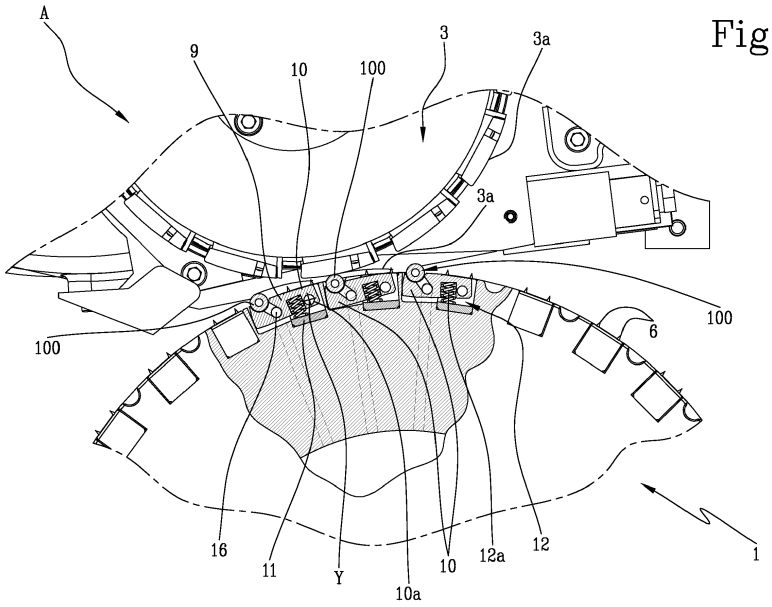
(74) Representative: **Bianciardi, Ezio**
Bugnion S.p.A.
Via di Corticella, 87
40128 Bologna (IT)

(54) CONVEYOR DRUM FOR GROUPS COMPRISING TWO COAXIAL CIGARETTE SEGMENTS SEPARATED BY AT LEAST ONE DOUBLE FILTER COMPRISING AT LEAST ONE FRAGILE FILTER ELEMENT

(57) This invention relates to a conveyor drum (1) for groups (100) comprising two coaxial cigarette segments (101) separated by at least one double filter (102) comprising at least one fragile filter element (103). The conveyor drum (1) comprises a peripheral mantle (7) provided with a plurality of receiving portions (8) distributed along the periphery of the mantle (7) and each defining a concave suction flute (8a) for housing a respective group (100).

Each receiving portion (8) has, only in a part of it designed to receive the double filter (102), at least one high-compliance section (9) designed to house the at least one fragile filter element (103) and configured to allow geometric displacement of the fragile filter element (103) in a radial direction during a step of applying a plug wrap 3a on the respective group (100) by an applicator roller (3).

Fig.3



EP 3 315 032 A1

Description

[0001] This invention relates to a conveyor drum for groups comprising two coaxial cigarette segments separated by at least one double filter comprising at least one fragile filter element.

[0002] The conveyor drum is generally used in filter tip attachment machines.

[0003] These filter tip attachment machines comprise a system for feeding groups of the type just mentioned where each double filter is attached to respective cigarette segments by a pregummed plug wrap fed into contact with the double filter itself and then wrapped around the double filter and around one end of each cigarette segment by a rolling process in which each group is turned about its axis at a rolling station.

[0004] The conveyor drum of this invention is disposed substantially tangent to an infeed roller for feeding the aforesaid groups and substantially tangent to a roller which feeds the plug wraps, so that during a configuration of machine use in which the rollers and the drum are set in synchronized rotation, the infeed roller transfers the groups to the conveyor drum at one point of the drum's rotational path and the plug wrap feed roller applies the plug wraps to the transferred groups at another point of the drum's rotational path.

[0005] Typically, in prior art filter tip attachment machines, when the group is composed of segments of uniform stiffness - for example, cigarette segments and acetate double filter - each plug wrap being transferred is pressed lightly against the group so that it adheres properly to the group and does not fall off when the group is subsequently subjected to rolling. However, if the double filter is composed of parts of non-uniform stiffness or whose stiffness is different from that of the cigarette segments - for example, where the double filter comprises an element which is made of a fragile material, that is, a delicate or brittle material such that any pressure applied to it may damage it or cause it to crumble - the problem arises as to how to apply the plug wrap without allowing the application pressure to damage the fragile element.

[0006] If the pressure applied on the group is too light, on the other hand, there is the risk that the plug wrap will not adhere properly to the group and will fall off or cause jams during subsequent rolling operations or that pieces of filter will fall out of the finished product.

[0007] In this context, the technical purpose which forms the basis of this invention is to provide a conveyor drum for groups comprising two coaxial cigarette segments separated by at least one double filter comprising at least one fragile filter element to overcome one or more of the abovementioned disadvantages of the prior art.

[0008] More particularly, this invention has for an aim to provide a conveyor drum for groups comprising two coaxial cigarette segments separated by at least one double filter comprising at least one fragile filter element to allow a plug wrap to be applied properly to the group without damaging the fragile filter element.

[0009] The technical purpose indicated and the aims specified are substantially achieved by a conveyor drum for groups comprising two coaxial cigarette segments separated by at least one double filter comprising at least one fragile filter element, comprising the technical features described in one or more of the appended claims.

[0010] The dependent claims, which are incorporated herein by reference, correspond to different embodiments of the invention.

[0011] Further features and advantages of the invention are more apparent in the detailed description below, with reference to a preferred, nonlimiting, embodiment of a conveyor drum for groups comprising two coaxial cigarette segments separated by at least one double filter comprising at least one fragile filter element as illustrated in the accompanying drawings, in which:

- Figure 1 is a schematic cross-section of a part of a filter tip attachment machine according to this invention;
- Figure 1A is a schematic perspective view of a group in a possible embodiment according to this invention;
- Figure 2 shows a schematic perspective view of a first embodiment of a conveyor drum according to this invention;
- Figure 3 is a schematic view, partly, in cross section of a detail A from Figure 1;
- Figure 4 is a schematic perspective view of a detail of a group during a first operating configuration of the drum of Figure 2;
- Figure 5 is a schematic perspective view of a detail of a group during a second operating configuration of the drum of Figure 2;
- Figure 6A is a schematic front view of a second embodiment of the drum of this invention;
- Figure 6B is a schematic side view of the drum of figure 7;
- Figure 7 is a schematic cross section of a peripheral portion of the drum in a third embodiment of this invention;
- Figure 8 is a schematic perspective view of an insert for the drum of Figure 7.

[0012] With reference to the accompanying drawings, the numeral 1 denotes in its entirety a conveyor drum, hereinafter referred to simply as drum 1, made according to the teachings of this invention.

[0013] Figure 1 schematically illustrates a part of a filter tip attachment machine M comprising the drum 1, an infeed roller 2 for feeding groups 100, an applicator roller 3 for applying plug wraps 3a and a wrapping roller 4 for wrapping the groups 100 in the respective plug wraps 3a at a rolling station 5.

[0014] More specifically, the drum 1, the infeed roller 2, the applicator roller 3 and the wrapping roller 4 have axes of rotation which are parallel to each other.

[0015] The infeed roller 2 has a plurality of uniformly distributed, peripheral flutes 2a, each adapted to receive

and retain a respective group 100 (in known manner not illustrated).

[0016] As can be seen in Figure 1A, the group 100 comprises two cigarette segments 101 which are coaxial and separated by at least one double filter 102. In other terms, the two cigarette segments 101 are aligned with each other lengthways with the double filter 102 interposed between them.

[0017] In the embodiment illustrated, the double filter 102 comprises a fragile filter element 103, made of charcoal for example.

[0018] The infeed roller 2 is configured to rotate, under the action of drive means not illustrated, clockwise in Figure 1, in the direction indicated by the arrow F2, and is disposed tangentially to the drum 1, which rotates anticlockwise in Figure 1, in the direction indicated by the arrow F1, to transfer the groups 100 to the drum 1.

[0019] The applicator roller 3 is configured to rotate, under the action of drive means not illustrated, clockwise in Figure 1, in the direction indicated by the arrow F3, and is disposed substantially tangentially to a peripheral point of the drum 1, to feed a series of pregummed plug wraps 3a, obtained in known manner not illustrated, to the groups 100.

[0020] More particularly, the applicator roller 3 holds the plug wraps 3a by the ungummed side so that as each plug wrap 3a reaches a respective group 100, that plug wrap 3a is applied in "flag-like manner" to the respective group 100. The expression "flag-like manner" means that the plug wrap 3a adheres to the group 100 only by a reduced portion of it, specifically, as shown in Figure 5, by its front edge 3a'. The rest of the plug wrap 3a remains raised, thanks to temporary supporting means 6 (as will become clearer as this description continues), thus preventing the plug wrap 3a from sticking to the outside surface of the drum 1.

[0021] In a possible embodiment of the filter tip attachment machine M illustrated in Figure 1, the drum 1 transfers the groups 100, with the plug wraps 3a applied to them, to the wrapping roller 4 which in turn feeds them to the rolling station 5.

[0022] In each group 100, the rolling station 5 connects the cigarette segments 101 to the double filter 102 by wrapping the plug wrap 3a, for example in known manner not illustrated, around the double filter and around the ends of the cigarette segments 101 adjacent thereto. The drum 1 comprises an annular peripheral mantle 7, made of metal and provided with a plurality of receiving portions 8 spaced at equal angular intervals round the circumference of the mantle 7.

[0023] Each receiving portion 8 defines a concave suction flute 8a for housing a respective group 100; in other words, each concave suction flute 8a has a substantially arcuate or semi-circular shape. Each flute 8a has a longitudinal direction of extension parallel to the axis of rotation X of the drum 1.

[0024] Advantageously, each receiving portion 8 has, only in a part of it designed to receive the double filter 102, at least one high-compliance section 9 designed to house the at least one fragile filter element 103 and configured to allow geometric displacement of the fragile filter element 103 in a radial direction during a step of applying a plug wrap 3a on the respective group 100.

[0025] In other words, the entire section of the receiving portion 8 used to receive the double filter 102 has increased compliance properties compared to the rigid parts of the receiving portion 8 used to support the cigarette segments 101.

[0026] Thanks to this invention, therefore, when the plug wrap 3a is applied on the group 100, the high-compliance section 9, in which at least the fragile filter element 103 is positioned, allows the filter element 103 to be translated radially towards the axis X of the drum 1 without being excessively compressed or damaged and thus enabling the front edge 3a' of the plug wrap 3a to adhere correctly even at the fragile filter element 103.

[0027] Thus, when the plug wrap 3a is released on the respective group 100 housed in the receiving portion 8, some parts of the concave suction flute 8a remain fixed, allowing the compressible portions of the group 100 (more particularly, the cigarette segments 101) to be partly compressed, whilst the high-compliance section 9 is movable or deformable, as will become clearer as this description continues, to prevent crushing the fragile filter element 103.

[0028] Advantageously, the high-compliance sections 9 adapt to the pressure received from the tangential impact between the drum 1 and the feed roller 3 during the step of applying the plug wraps 3a, thus compensating for the greater rigidity of the fragile filter element 103. This guarantees that the elements of the group 100 will effectively adhere to the plug wrap 3a and the elastic effect offered by the high-compliance section 9 guarantees that the group 100 will not be damaged and, more particularly, that the outer portions of the group 100, on which the front edge of the plug wrap 3a is applied, will be correctly aligned.

[0029] In a first embodiment of this invention, with reference to Figures 2-5, each high compliance section 9 comprises a respective oscillating or "levered" support 10.

[0030] The levered support 10 is hinged at one end to a respective peripheral portion 11 of the drum 1 to rotate about a respective axis of oscillation Y parallel to the axis X of the drum 1 and having, at the other end, a respective portion of the concave suction flute 8a.

[0031] Preferably, the levered support 10 is hinged to a pin 10a.

[0032] Advantageously, the levered support 10 is rotatable about the axis of oscillation Y between a raised position, illustrated in Figure 4, where it disposes the portion of the concave suction flute 8a away from the axis X of the drum 1 and a lowered position, illustrated in Figure 5, where it disposes the portion of the concave suction flute 8a nearer to the axis X of the drum 1.

[0033] As may be noted in Figure 5, during the step of

applying the plug wrap 3a, the fragile filter element 103 is not deformed like the rest of the group 100 but moves towards the axis X of the drum 1 following rotation of the levered support 10 about the respective axis of oscillation Y.

[0034] As a result of lowering the high-compliance section 9 of the concave suction flute 8a, the fragile filter element 103 does not undergo any deformation or structural damage under the compressive action applied by the feed roller 3.

[0035] Each fragile filter element 103 undergoes a geometric displacement such that its top surface, intended to come into contact with the plug wrap 3a, is aligned with the top surface of the rest of the group 100 (composed of cigarette segments 101 and double filter 104), intended to come into contact with the plug wrap 3a and subjected to compression during application.

[0036] Thus, the gummed zone of the plug wrap 3a is applied uniformly. Advantageously, the drum 1 further comprises elastic means 12 acting on the levered support 10 to keep the levered support 10 in the raised configuration.

[0037] Once the plug wrap 3a has been applied, therefore, the levered support 10 is no longer subjected to any compressive force and returns to the raised position.

[0038] With reference to Figure 3, the elastic means 12 are preferably interposed between the peripheral portion 11 and the levered support 10.

[0039] Preferably, as illustrated in Figure 3, the elastic means 12 comprise, for each levered support 10, at least one respective helical spring 12a.

[0040] In an embodiment not illustrated, the elastic means 12 may comprise, for each levered support 10, respective elastic means made of rubber - for example, compliant and resilient rubber pads. Preferably, the respective peripheral portion 11 of the drum 1 comprises a supporting block 13 removably fixable to the conveyor drum 1 within a corresponding peripheral seat 14 of the mantle 7 extending parallel to the axis X of the drum 1 and included between two consecutive receiving portions 8.

[0041] Preferably, the supporting block 13 comprises means 15 for removable connection to the mantle 7 - for example, hex socket head screws 15a or quick disconnect couplings.

[0042] The supporting block 13 with levered supports 10 thus constitutes a removable supporting element which is installed as a changeover part in respective receiving parts of the outside surface of the mantle 7.

[0043] Preferably, the outside surface of the supporting block 13 is provided with the aforementioned temporary supporting means 6, in the form of needles or pins designed to support the trailing section of the plug wrap 3a, still loose.

[0044] With reference to Figure 2, each receiving portion 8, in the sections of it without high compliance, is preferably defined by metallic relief portions 7a of the mantle 7, preferably made as one piece with the mantle 7.

[0045] The relief portions 7a are advantageously spaced from each other, along a direction parallel to the axis X of the drum 1 by a cavity 7b for snugly inserting the high-compliance section 9.

[0046] Furthermore, preferably and advantageously, the relief portions 7a are circumferentially spaced from each other by the aforementioned peripheral seats 14 of the mantle 7, which are designed to receive the supporting blocks 13.

[0047] Preferably, each levered support 10 has at least one through hole 16 used to create a negative air pressure. The through hole 16, at one end of it, leads into the respective section of the concave suction flute 8a and, at the other end of it, is in communication with the negative pressure source, not illustrated, inside the drum 1.

[0048] In a possible variant embodiment of the invention, the high-compliance section 9 is defined preferably by an insert made of an elastic material, more preferably, made of rubber, which is stably connected to the mantle 7 and externally defining at least a respective section of the concave suction flute 8a.

[0049] In other terms, and with reference to Figure 2, each insert may be shaped to be inserted into the previously defined cavity 7b and to be stably fixed thereto.

[0050] With reference to Figures 6A an 6B, in a second embodiment of the invention, each receiving portion 8 is defined by a respective insert 17 extending along the full length of the concave suction flute 8a. The insert 17 is applied removably to the mantle 7 and has rigid portions 18, preferably metallic, disposed on opposite sides of the high-compliance section 9, which is made preferably of rubber. Preferably, each insert 17 has, along a circumferential direction of the mantle 7, a front portion 17a defining the concave suction flute 8a and a rear portion 17b provided with means 6 for temporarily supporting the plug wrap 3a applied to the group 100.

[0051] Preferably, each insert 17 has, at least at one of the rigid portions 18, connecting means 15 for removable connection to the mantle 7 - for example, hex socket head screws 15a.

[0052] Preferably, the high-compliance section 9 is stably fixed to the rigid portions 18 or co-moulded therewith.

[0053] In other terms, in the embodiment just described, the mantle 7 is substantially smooth and, on its surface, it is easy to apply and remove the inserts 17, which thus constitute a versatile and conveniently interchangeable element in the event of replacement. For example, if the group 100 needs to be varied for production reasons, the entire drum 1 need not be replaced and, instead, it is possible to simply replace the inserts 17 with new inserts 17 suitable for the features of the new group 100 to be transferred.

[0054] Preferably, in this embodiment, the inserts 17 are disposed one after the other in succession along the periphery of the mantle 7, without any separating elements, such as protrusions or the like on the mantle 7, being interposed between them. In this situation, there-

fore, the mantle 7 (with the inserts 17 removed) may have a substantially uniform outside surface.

[0055] With reference to Figures 7 and 8, in a third embodiment of the invention, each receiving portion 8 is preferably defined by a respective insert 19 extending along the full length of the concave suction flute 8a and disposed alternately between two consecutive fixed peripheral portions 21 of the drum 1 defined by metallic relief portions of the mantle 7 extending parallel to the axis X of the drum 1 along the periphery of the mantle 7.

[0056] The insert 19 is applied removably to the mantle 7 and has rigid portions 20, preferably metallic, disposed on opposite sides of the high-compliance section 9, which is made preferably of rubber. Preferably, the high-compliance section 9 is stably fixed to the rigid portions 20 or co-moulded therewith.

[0057] Preferably, each of the peripheral portions 21 comprises means 6 for temporarily supporting the plug wrap 3a applied to the group 100.

[0058] In other terms, each insert 19 defines a block which is removably fixable to the drum 1 within a corresponding peripheral seat 14 of the mantle 7 extending parallel to the axis X of the drum 1 and included between two consecutive receiving portions 21.

[0059] Advantageously, therefore, thanks to the embodiment just described, the insert 19 can be easily replaced to suit the features of the group 100 to be transferred, allowing quick changeovers to adapt the drum 1 to different types of groups.

[0060] This invention achieves the proposed aims by providing the user with a drum 1 for groups 100 which allows the plug wraps 3a to be applied rapidly and effectively without causing structural damage to the fragile filter elements 103 forming part of the group 100.

[0061] More particularly, the invention provides a drum 1 which is capable of improving the efficiency and versatility of filter tip attachment machines M, thus overcoming the disadvantages of the prior art.

Claims

1. A conveyor drum (1) for groups (100) comprising two coaxial cigarette segments (101) separated by at least one double filter (102) comprising at least one fragile filter element (103), the conveyor drum (1) being configured to operate in conjunction with an applicator roller (3) for applying a plug wrap (3a) to the group (100); the conveyor drum (1) comprising a peripheral mantle (7) provided with a plurality of receiving portions (8) distributed along the periphery of the mantle (7), each receiving portion (8) defining a concave suction flute (8a) for housing a respective group (100), **characterized in that** each receiving portion (8) has, only in a part of it designed to receive the double filter (102), at least one high-compliance section (9) designed to receive the at least one fragile filter element (103) and configured to allow geometric displacement of the at least one fragile filter element (103) in a radial direction during a step of releasing a plug wrap (3a) onto the respective group (100).

2. The conveyor drum (1) according to claim 1, wherein the at least one high-compliance section (9) comprises a levered support (10) hinged at one end to a respective peripheral portion (11) of the conveyor drum (1) to rotate about a respective axis of oscillation (Y) parallel to the axis (X) of the conveyor drum (1) and having, at the other end, a respective portion of the concave suction flute (8a); the levered support (10) being rotatable about the axis of oscillation (Y) between a raised position, where it disposes the portion of the concave suction flute (8a) away from the axis (X) of the conveyor drum (1) and a lowered position, where it disposes the portion of the concave suction flute (8a) nearer to the axis (X) of the conveyor drum (1); the conveyor drum (1) further comprising elastic means (12) acting on the levered support (10) to keep the levered support (10) in the raised configu ration.

3. The conveyor drum (1) according to claim 2, wherein the elastic means (12) are interposed between the peripheral portion (11) and the levered support (10).

4. The conveyor drum (1) according to claim 2 or 3, wherein the elastic means (12) comprise, for each levered support (10), at least one respective helical spring (12a).

5. The conveyor drum (1) according to one or more of claims 2-4, wherein the respective peripheral portion (11) of the conveyor drum (1) comprises a supporting block (13) removably fixable to the conveyor drum (1) within a corresponding peripheral seat (14) of the mantle (7) extending parallel to the axis (X) of the conveyor drum (1) and included between two consecutive receiving portions (8).

6. The conveyor drum (1) according to one or more of the preceding claims, wherein each receiving portion (8), in the sections of it without high compliance, is defined by metallic relief portions (7a) of the mantle (7), the relief portions (7a) being spaced from each other, along a direction parallel to the axis (X) of the conveyor drum (1), by a cavity (7b) for inserting the high-compliance section (9).

7. The conveyor drum (1) according to one or more of claims 2-6, wherein the levered support (10) has at least one through hole (16) for creating negative air pressure, wherein the through hole (16), at one end of it, leads into the respective section of the concave suction flute (8a) and, at the other end of it, is in communication with the negative pressure source

inside the conveyor drum (1).

8. The conveyor drum (1) according to claim 1, wherein the at least one high-compliance section (9) is formed from an insert of elastic material stably connected to the mantle (7) and externally defining at least a respective section of the concave suction flute (8a), the insert being preferably made at least partly of rubber.

9. The conveyor drum (1) according to claim 8, wherein the longitudinal dimension of the insert, parallel to the axis (X) of the conveyor drum (1), corresponds to the axial dimension of the high-compliance section (9) defined by the insert, and wherein the insert is preferably made entirely of rubber.

10. The conveyor drum (1) according to claim 9, wherein each receiving portion (8), in the sections of it without high compliance, is defined by metallic relief portions (7a) of the mantle (7), the relief portions (7a) being spaced from each other, along a direction parallel to the axis (X) of the conveyor drum (1), by a cavity (7b) for inserting the insert.

11. The conveyor drum (1) according to claim 1, wherein each receiving portion (8) is defined by a respective insert (17, 19) extending along the full length of the concave suction flute (8a), and wherein the insert (17, 19) is applied removably to the mantle (7) and has rigid portions (18, 20) disposed on opposite sides of the at least one high-compliance section (9) made preferably of rubber.

12. The conveyor drum (1) according to claim 11, wherein each insert (17) has, along a circumferential direction of the mantle (7), a front portion (17a) defining the concave suction flute (8a) and a rear portion (17b) provided with means (6) for temporarily supporting the plug wrap (3a) applied to the group (100).

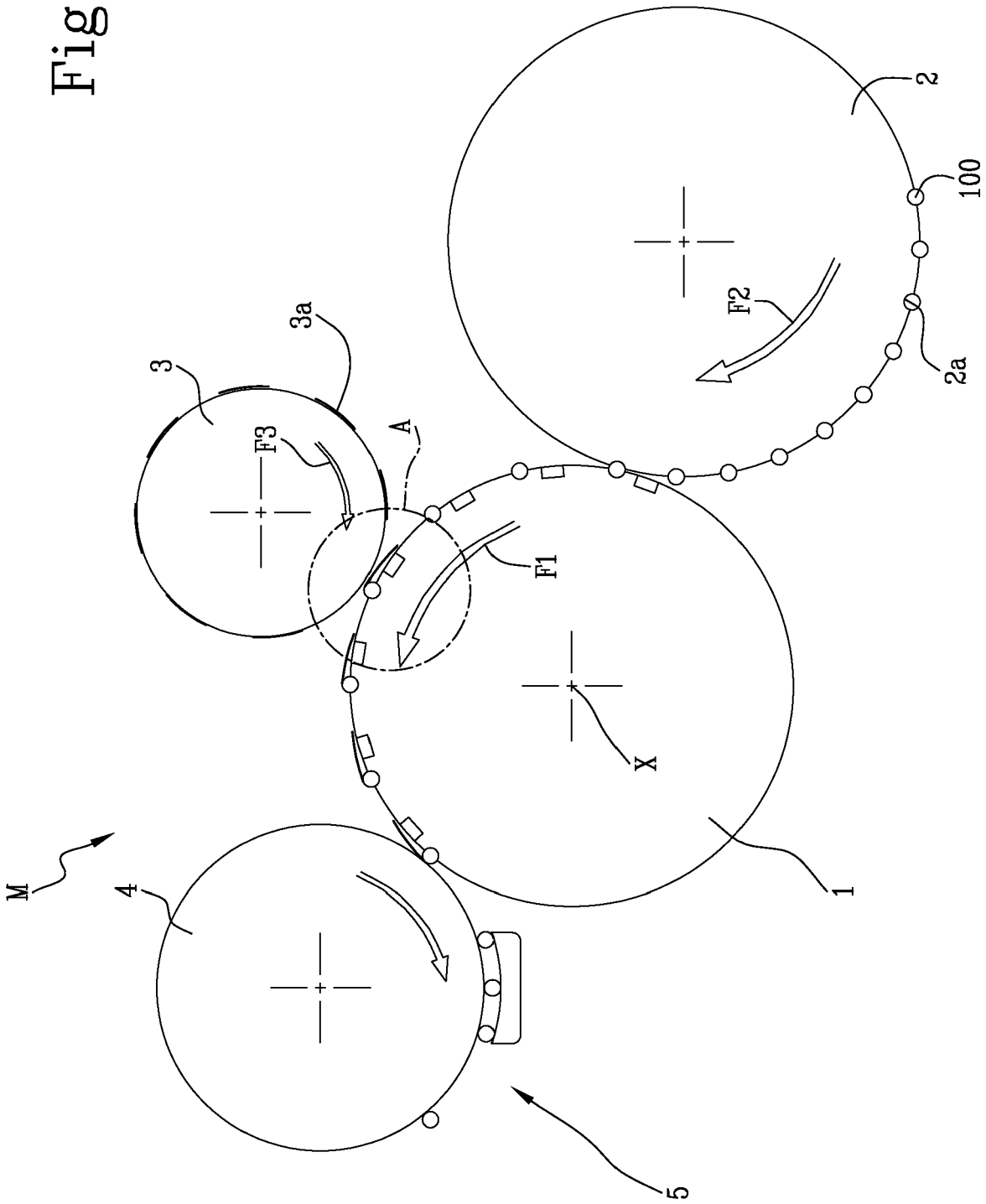
13. The conveyor drum (1) according to claim 14 or 15, wherein each insert (17) has, at least at one of the rigid portions (18), connecting means (15) for removable connection to the mantle (7).

14. The conveyor drum (1) according to one or more of claims 11 - 13, wherein the high-compliance section (9) is stably fixed to the rigid portions (18, 20) or co-moulded therewith.

15. The conveyor drum (1) according to claim 11, wherein the insert (19) is alternated respectively between two consecutive fixed peripheral portions (21) of the conveyor drum (1) defined by metallic relief portions of the mantle (7) extending parallel to the axis (X) of the conveyor drum (1) along the periphery of the mantle (7) itself, the peripheral portions (21) being

provided with means (6) for temporarily supporting the plug wrap (3a) applied to the group (100).

Fig.1



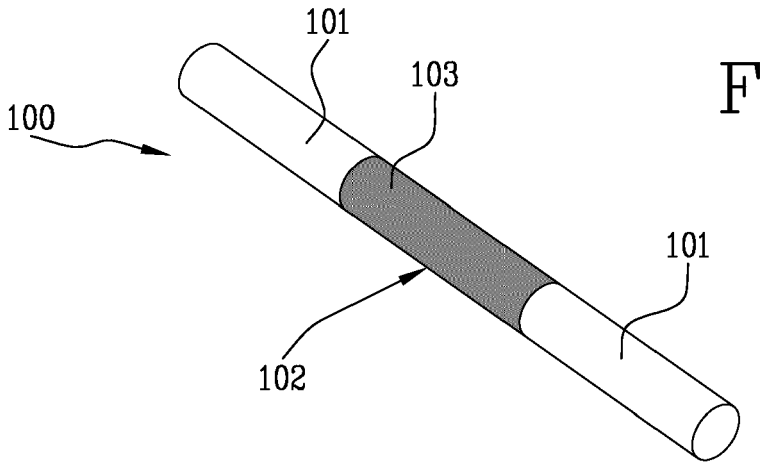


Fig.1A

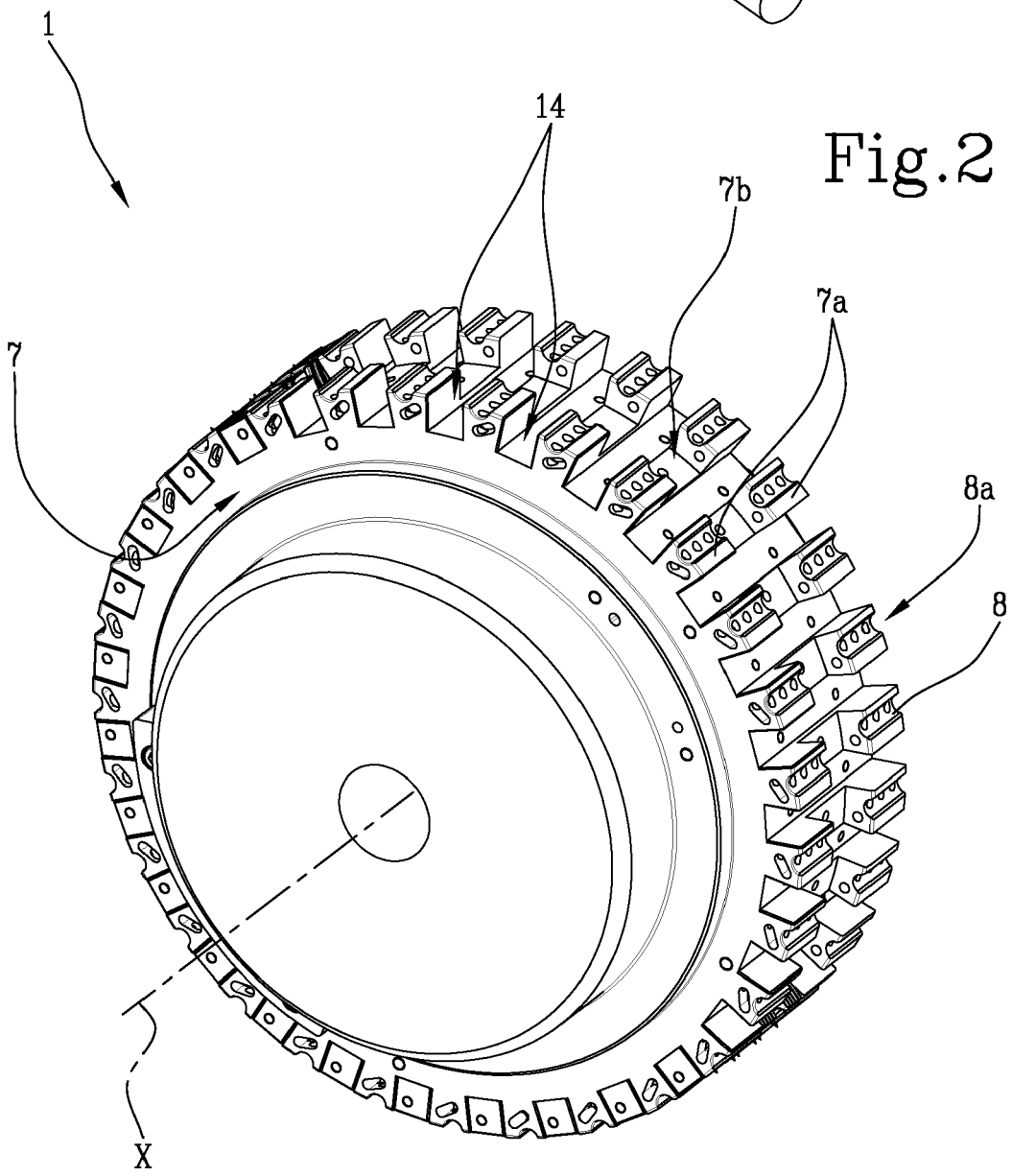


Fig.2

Fig.3

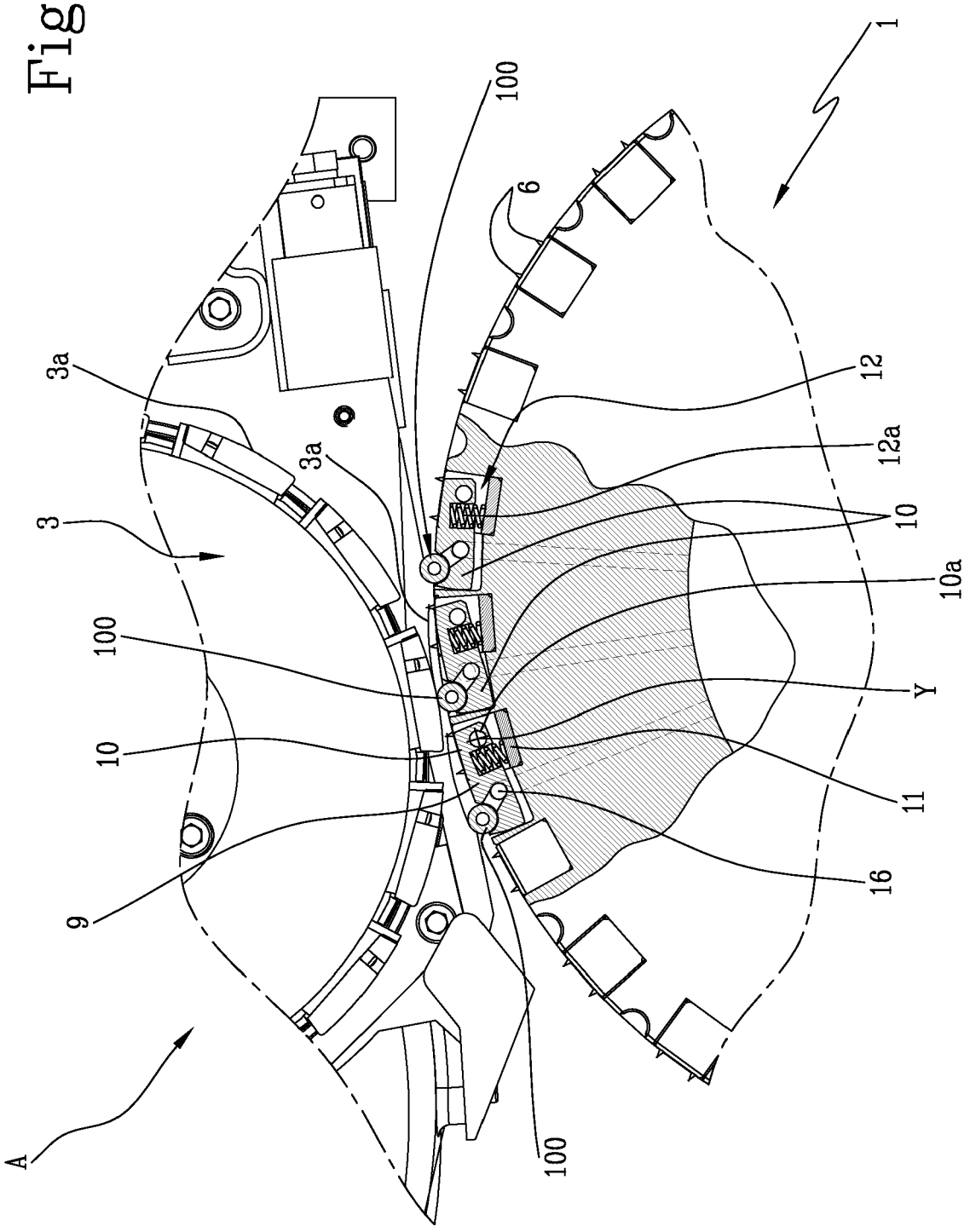
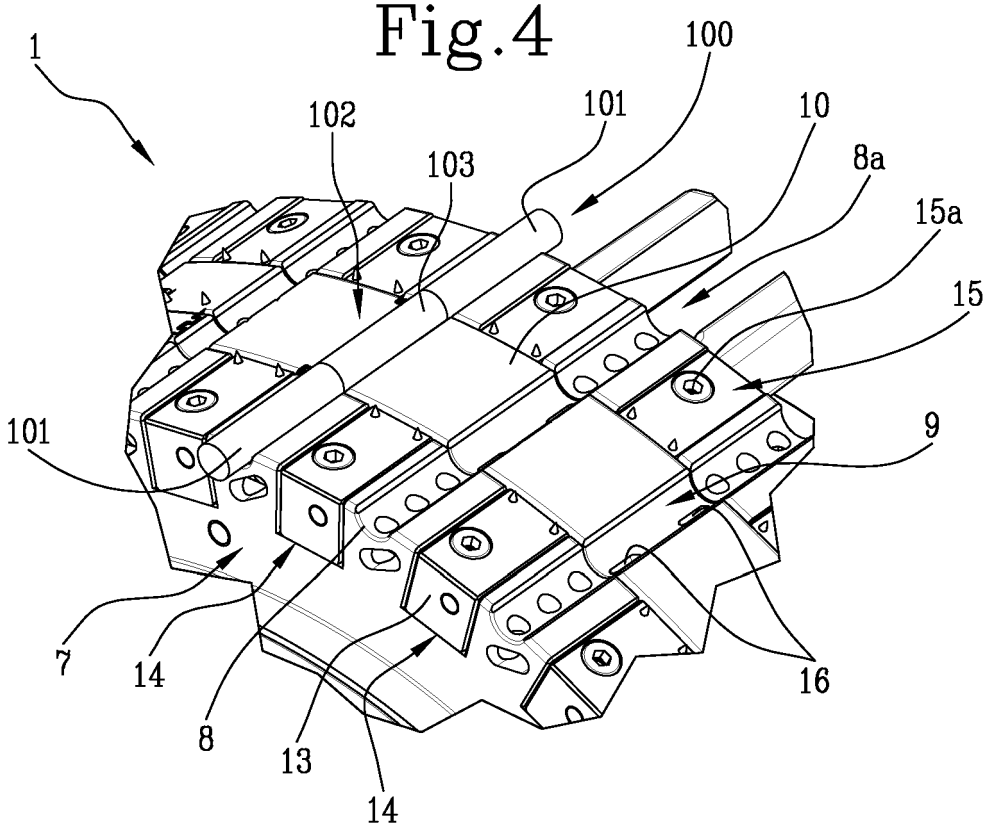


Fig.4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15a
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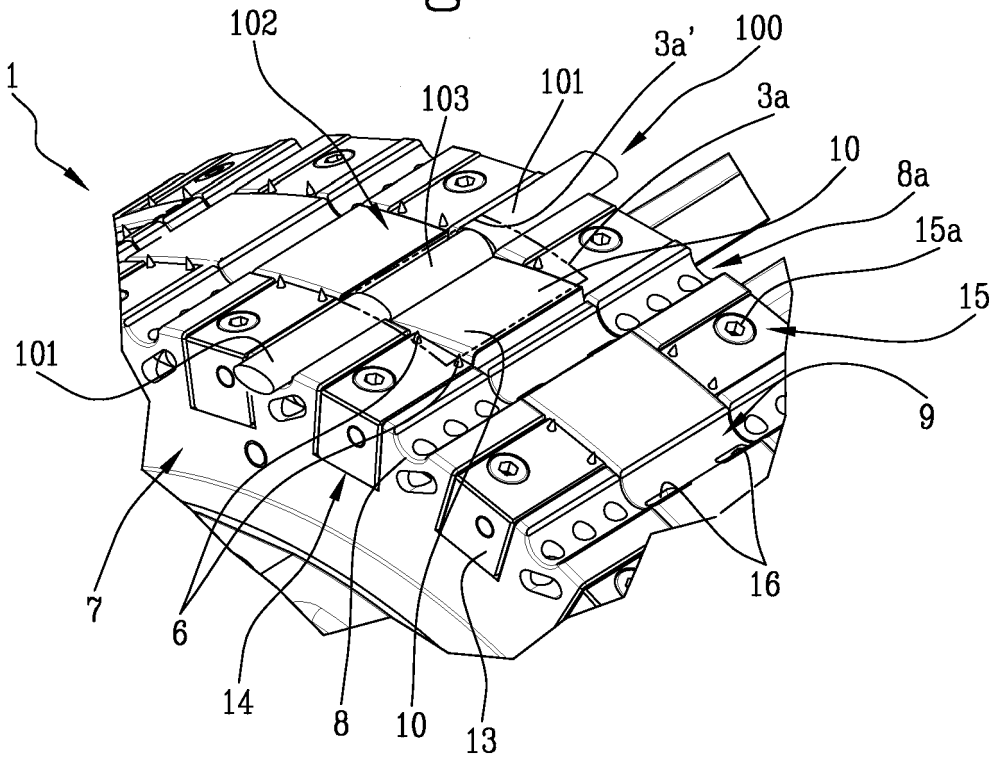
14
16

Fig.5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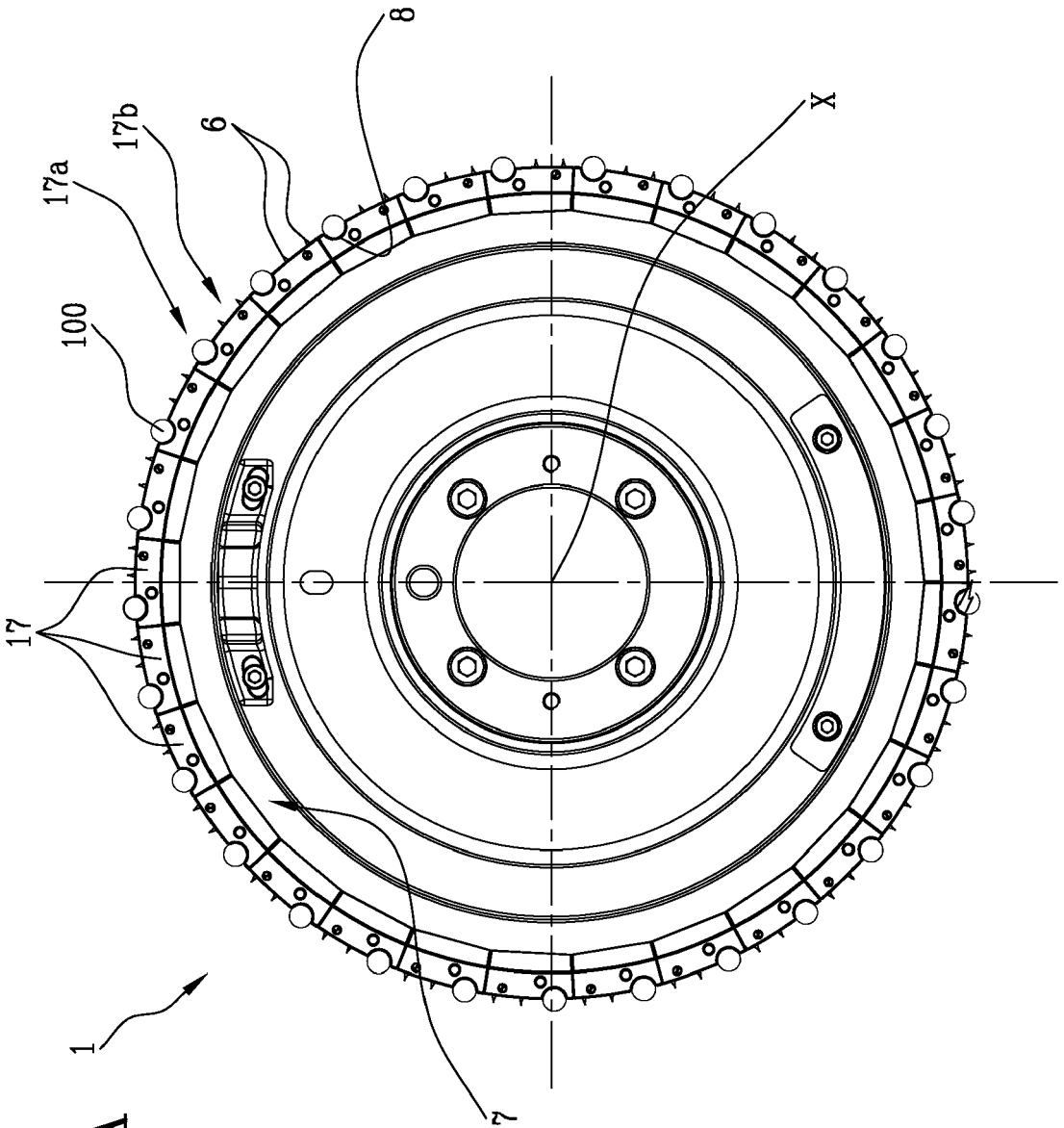


Fig.6A

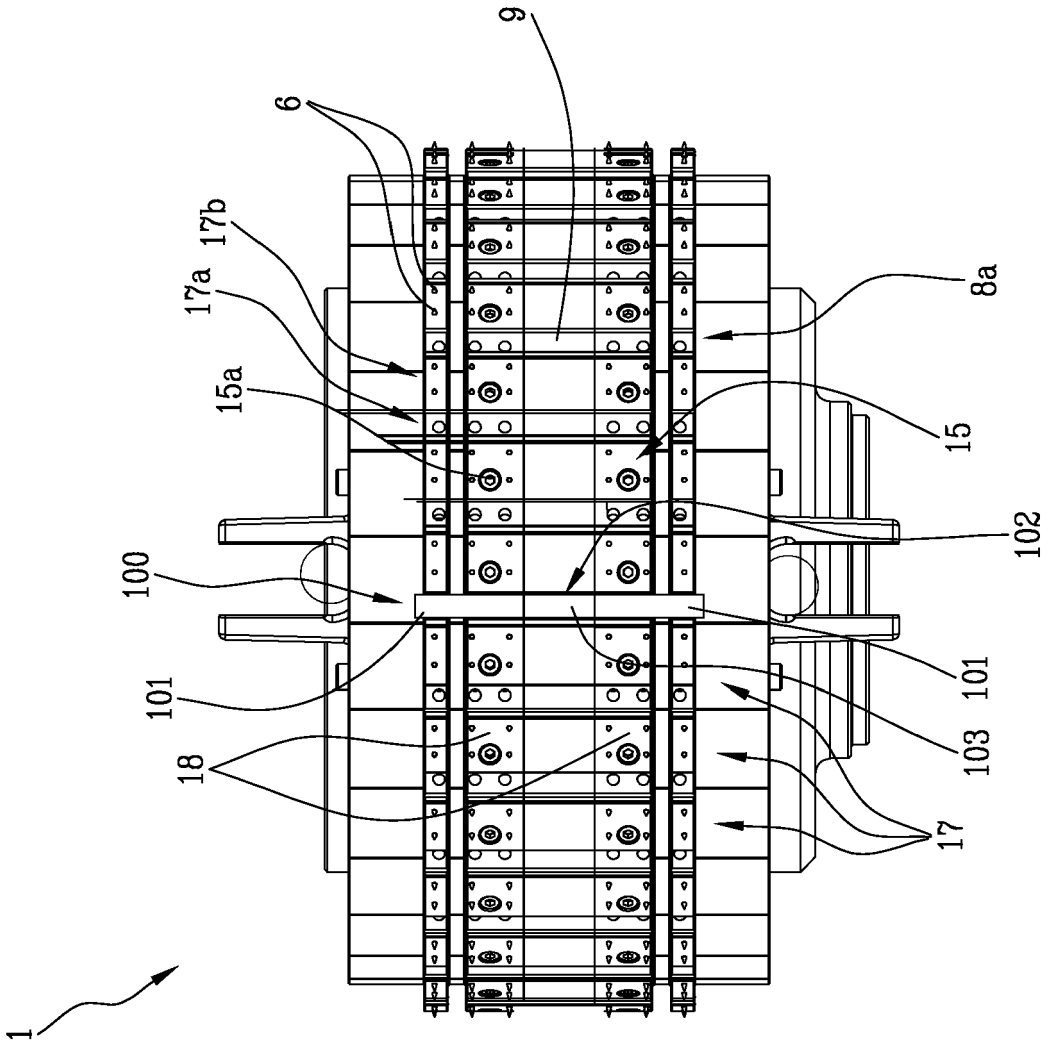


Fig.6B

Fig.7

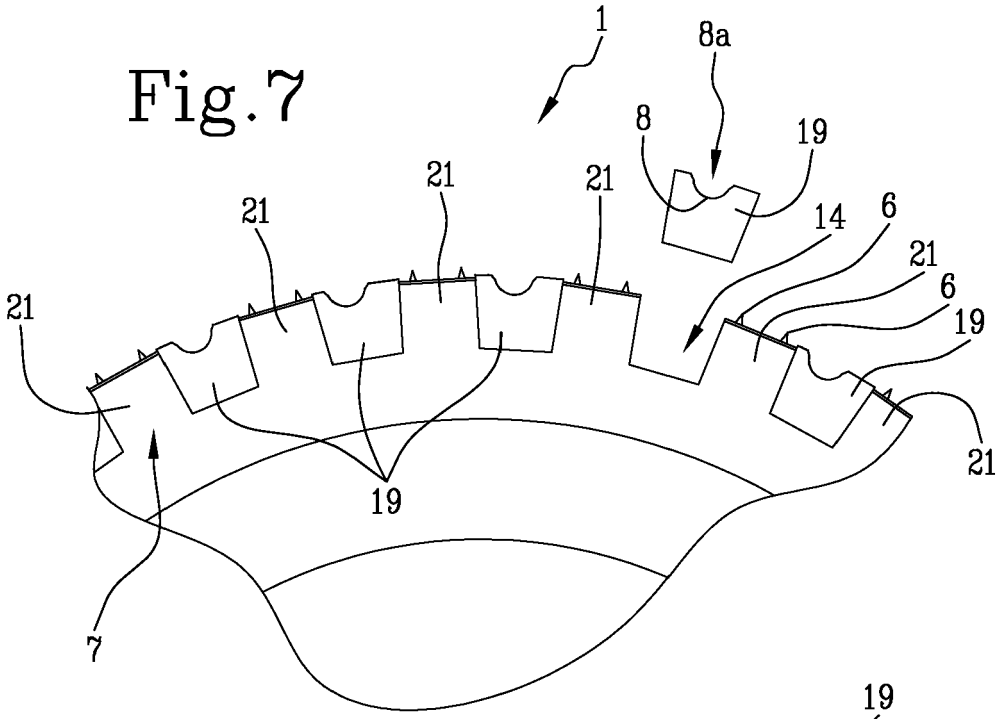
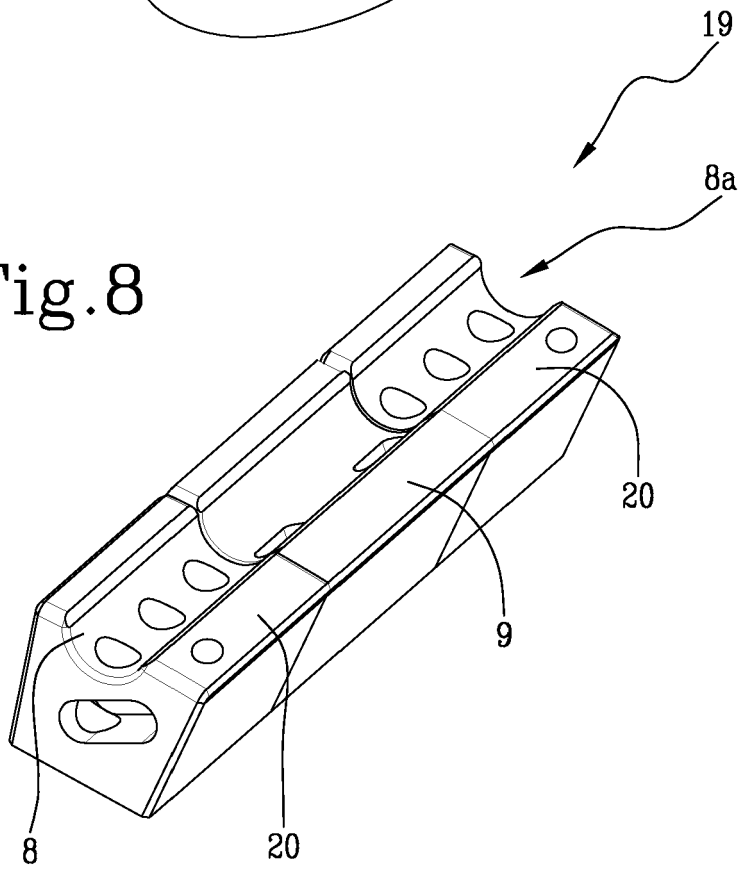


Fig.8



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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 7767

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	US 2015/351450 A1 (SINISI MARIO [CH] ET AL) 10 December 2015 (2015-12-10) * paragraphs [0007], [0028], [0049] - [0051]; figures 1-3 *	1-15	INV. A24C5/32 A24C5/47
A	EP 1 596 674 A1 (GD SPA [IT]) 23 November 2005 (2005-11-23) * claim 1; figure 1 *	1-15	
A	DE 667 740 C (FILTER TIPS LTD) 19 November 1938 (1938-11-19) * page 2, lines 74-84; figures 1-2 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

A24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 February 2018	Schwarzer, Bernd

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