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(54) **MACCHINA E METODO PER LA PRODUZIONE DI UN CORDONE CONTINUO DELL INDUSTRIA DEL TABACCO**

(57) The invention relates to a machine (1) for producing a continuous rope of the tobacco industry having particles (3) of a first material and particles (4) of a second material different from each other; the machine (1) has: belt conveying means (2) having an active branch (20) movable in a conveying direction (D), with two opposite lateral edges (21, 22); a first feeder (30) below the active branch (20) to feed particles of the first material (3); a second feeder (40) arranged below the active branch (20), downstream of the first feeder (30), to feed particles of the second material (4); and a compactor unit (5) between the first feeding zone (31) and the second feeding zone (41) to compact the particles (3) of the first material held on the active branch (20) by acting on the opposite lateral edges (21, 22).

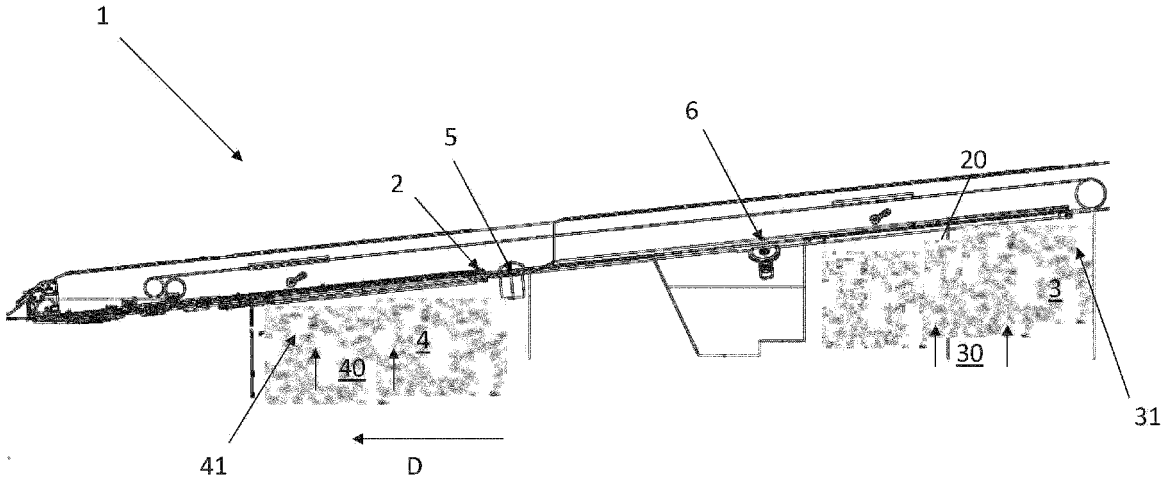

FIG.1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This Patent Application claims priority from Italian/European Patent Application No. 102021000009083 filed on April 12, 2021.

TECHNICAL FIELD

[0002] The present invention relates to a machine and to a method for producing a continuous rope of the tobacco industry, in particular a rope comprising a first aerosol-generating material and a second aerosol-generating material different from each other and arranged alternately along the development of the rope.

[0003] These continuous ropes are intended to form pieces with a first zone formed of particles of the first aerosol-generating material (for example, at one end) and a second zone, different from the first zone along the development of the piece, formed of particles of the second aerosol-generating material.

[0004] By the expression "a first aerosol-generating material" and "a second aerosol-generating material different from each other" we mean two materials that are different from each other and, for example, comprising tobacco and different additives.

[0005] A machine for producing a continuous rope of the tobacco industry, for example, intended to form cigarettes, comprises a belt the active branch of which is subject to suction and movable in a conveying direction. The machine further comprises a first feeder ("chimney") arranged below the active branch of the belt to feed particles of the first aerosol-generating material so as to form a mass that is held by the active branch of the belt; and a second feeder arranged below the active branch of the belt and downstream of the first feeder along the feed direction, to feed particles of the second aerosol-generating material so as to form a mass that is held by the active branch of the belt.

[0006] The belt is arranged such that groups of particles of the first aerosol-generating material and groups of particles of the second aerosol-generating material are alternately deposited thereon according to a given profile. The mass of particles is kept pressed on the belt by the suction during the advancement of the same belt, and adjusted to be uniform by suitable shaving assemblies arranged along the conveying direction.

[0007] In order to avoid blockage during the advancement of the aerosol-generating material held by the branch of the belt, the latter has side walls that define a containment channel characterized by a transversal width increasing along the conveying direction, in the direction that goes from the first feeder to the second feeder (we are talking around differences of the order of a few millimetres). However, it is difficult to balance this requirement without excessively reducing the receiving surface and the width of the channel at the first feeder, above all in the narrower part upstream, (which would not allow in itself an optimal reception of the particles) or excessively widening the surface and the final width (which is incompatible with the calibre of the smoking article to be manufactured). This would negatively affect the quality of the final product and would in fact hinder the continuous operation of the machine.

STATE OF THE PRIOR ART

[0008] The patent application WO2020201682A1 represents the closest state of the art and describes an apparatus for manufacturing a rod of material that can be used to generate an aerosol.

OBJECT OF THE INVENTION

[0009] The aim of the present invention is to overcome the above-mentioned drawback.

[0010] This aim is achieved by means of a machine and a method for producing a continuous rope of the tobacco industry comprising a first aerosol-generating material and a second aerosol-generating material different from each other, in accordance with the appended claims.

[0011] Advantageously, the machine and the method according to the present invention enable a continuous rope with particles of the first aerosol-generating material and the second aerosol-generating material to be manufactured which ensures the quality of the final product.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] These and other advantages will be made clearer in the following description with the aid of the accompanying drawings:

- Figure 1 is a schematic and partial view of a machine according to the invention;
- Figure 2 is an enlargement of a part of Figure 1;
- Figure 3 is a schematic and partial top view, of a part of the machine according to the invention;
- Figure 4 is a cross-sectional and partial view, of a machine according to the invention, in a different embodiment;
- Figures 5A-5D represent as many smoking articles obtainable from a machine and from a method according to the invention.

PREFERRED EMBODIMENT OF THE INVENTION

[0013] With reference to the attached Figures 1, 2 and 3, a machine for producing a continuous rope of the tobacco industry (shown schematically and partially) has been designated by 1. In particular, the rope is of the type comprising particles 3 of a first aerosol-generating material and particles 4 of a second aerosol-generating material different from each other and arranged according

to a predetermined sequence (and a predetermined profile) along the development of the rope. The particles 3, 4 of the first and second materials comprise, for example, tobacco and different additives.

[0014] This type of machine, in particular, allows to manufacture a continuous rope intended to form pieces of articles A of the tobacco industry (for example, cigarettes) that contain, on the inside thereof, two aerosol-generating materials arranged with a predetermined profile and given sequence.

[0015] It should be noted that with the expression "articles of the tobacco industry" we mean articles of any type pertaining to this sector, for example, traditional cigarettes or articles of the "heat not burn" (HNB) type which provide only for heating and not for combustion of the article itself.

[0016] Some examples of these smoking articles A (in detail, cigarettes) obtainable with the machine according to the invention are illustrated in Figures 5A-5D.

[0017] In detail, the represented smoking articles A have a longitudinal development, a first end P (or tip end) and a second end E (at which, in the illustrated example, a filter F is present).

[0018] In Figures 5A and 5B, the particles 3 of the first material are arranged at the first end P of the corresponding smoking article A with different profiles from each other, whereas in Figures 5C and 5D, the particles 3 of the first material are arranged at the second end E of the corresponding smoking article A with different profiles from each other. Conversely, in Figures 5C and 5D the particles 4 of the second material are arranged at the first end P of the corresponding smoking article A with profiles different from each other, whereas in Figures 5A and 5B the particles 4 of the second material are arranged at the second end E of the corresponding smoking article A with profiles different from each other.

[0019] The machine 1 according to the invention comprises:

- belt conveying means 2 having an active branch 20 subject to suction that is movable in a conveying direction D and comprises two opposite lateral edges 21, 22;
- a first feeder 30 arranged below the active branch 20 of the belt 2 for feeding particles 3 of the first material in a first feeding zone 31 so that the particles are held on the active branch 20 of the belt 2;
- a second feeder 40 arranged below the active branch 20 of the belt 2 and downstream of the first feeder 30 along the conveying direction D, for feeding particles 4 of the second material in a second feeding zone 41 so that the particles are held on the active branch 20 of the belt 2.

[0020] In particular, the machine 1 comprises a compactor unit 5 arranged along the conveying direction D between the first feeding zone 31 and the second feeding zone 41 and arranged to compact the particles 3 of the first material held on the active branch 20 of the belt 2 by acting on opposite lateral edges 21, 22 of the active branch 20 of the belt 2.

[0021] In other words, the compactor unit 5 only contacts the particles 3 of the first material and not the active branch 20 of the belt 2.

[0022] Namely, the compactor unit 5 compacts or acts by bringing the particles 3 of the first material closer together (pressing them together).

[0023] Advantageously, the compactor unit 5 allows to restore the compaction of the particles 3 of the first material before the feeding of the particles 4 of the second material. On the one hand, this aspect avoids machine blockages, on the other hand, it guarantees an optimal quality of the final product.

[0024] Preferably, the opposite lateral edges 21, 22 of the active branch 20 of the belt 2 comprise two side walls 21, 22.

[0025] Preferably, the belt 2 is configured so that the particles 3 of the first material and particles 4 of the second material are held on the relative active branch 20 according to a predetermined sequence, in particular according to an alternation between particle masses of the two materials, first 3 and second 4 with a given profile (for example, so that the articles A such as those in Figures 5A-5D can be derived therefrom).

[0026] It is specified that the term "belt conveying means 2 having an active branch 20 subject to suction" means that the active branch 20 may comprise through-holes (not visible in the attached Figures) sized so as to allow the passage of air, but not to allow the passage of the particles of aerosol-generating material.

[0027] For example, the suction holes, connected or connectable to the suction source, have a cross-sectional dimension of less than 1 mm, preferably less than 0.8 mm, whereas the particles of the (first and second) material have, for example, a cross-sectional dimension greater than 0.9 mm, even more preferably greater than 1 mm.

[0028] By "active branch" 20 of the belt 2 we mean, in this context, the branch of the belt 2 which is operational, namely, which in this case holds the particles 3 of the first material and the particles 4 of the second material.

[0029] As mentioned in the introductory part, in order to avoid blockages during the advancement of the material 3, 4 held by the active branch 20 of the belt 2, preferably the two side walls 21, 22 mentioned above define a containment channel characterized by a transversal width L1, L2 increasing along the conveying direction D, in the direction that goes from the first feeder 30 to the second feeder 40 (we are talking around differences of the order of a few millimetres). Particular reference is made to Figure 4, where this increasing transverse width L1, L2 has been indicated by way of example in the case of two belts 2, 2', i.e. in a machine 1 for the simultaneous manufacturing of two continuous ropes (a situation that will be described in the following) . For example, this width varies from a value L1 of approximately 6 mm to a

value L2 of approximately 8 mm.

[0030] Preferably, the compactor unit 5 comprises a first element 51 and a second element 52 arranged opposite to each other along the conveying direction D.

[0031] According to the preferred embodiment, the first element 51 and the second element 52 are rotatable respectively around at least one first rotation axis H and at least one second rotation axis K (see Figures 2 and 3) passing through the same, respectively in a first rotation direction V1 and in a second rotation direction V2, which are opposite to each other (indicated only in Figure 3).

[0032] With reference to the attached Figures, the first rotation axis H and the second rotation axis K are substantially vertical (in any case transverse, preferably perpendicular to the conveying direction D) (see Figure 2, with reference to the first rotation axis H).

[0033] According to one embodiment, the first element 51 comprises a first roller 51 and the second element 52 comprises a second roller 52. In detail, the first roller 51 and the second roller 52 are idle and are dragged into rotation in the first rotation direction V1 and in the second rotation direction V2, respectively, by the advancement of the active branch 20 of the belt 2 along the conveying direction D. This embodiment is of particular constructive and functional simplicity. In fact, in this way, the synchrony between the (angular speed of) rotation of the first roller 51 and of the second roller 52 with the advancement (namely the advancement speed) of the active branch 20 of the belt 2 along the conveying direction D is guaranteed.

[0034] According to the preferred embodiment illustrated, the first element 51 comprises a first roller 51 and the second element 52 comprises a second roller 52; furthermore, the compactor unit 5 further comprises motor means M (indicated only in Figure 2) for motorizing the first roller 51 and the second roller 52 in rotation in the first rotation direction V1 and the second rotation direction V2, respectively, during the advancement of the belt 2 along the conveying direction D. This specification reduces friction and promotes sliding of the particles 3 of the first material along the conveying direction D. Preferably, the (angular) speed of rotation of the first roller 51 and of the second roller 52 is synchronous with the advancement speed of the active branch 20 of the belt 2 along the conveying direction D. The rotation speed of the first roller 51 and of the second roller 52 also follows any variations in the speed of the particles 3 of the first material along the conveying direction D (due, for example, to variations in production speed or to a different length of the pieces to be produced).

[0035] According to an alternative embodiment not illustrated, the first element 51 and the second element 52 of the compactor unit 5 respectively comprise a first motorized belt and a second motorized belt, arranged along the conveying direction D and having a straight and inclined (or slightly curved) profile so as to compact the particles 3 of the first material held on the active branch 20 of the belt 2 by acting on the opposite lateral edges 21, 22 of the active branch 20 of the belt 2.

[0036] In general, the first element 51 and the second element 52 of the compactor unit 5 may have a profile conformed so as to receive any particles 3 of the first material that should detach from the active branch 20 of the belt 2 during compression. In other words, the lateral surface of the first element 51 and of the second element 52 that contacts the particles 3 of the first material may be slightly inclined or curved to receive any particles 3 of the first material that should detach from the active branch 20 of the belt preventing them from falling downwards. According to an example not illustrated, the belt conveying means 2 comprise at least a first belt and a second belt arranged in succession to each other along the conveying direction D; the first belt being arranged to receive the particles 3 of the first material from the first feeder 30 and the second belt being arranged to receive the particles 4 of the second material from the second feeder 40. In this case, the compactor unit 5 is arranged between the first belt and the second belt.

[0037] Preferably, the machine 1 further comprises at least one shaving assembly 6 (visible in Figures 1 and 2) arranged along the conveying path at a certain distance from the active branch 20 of the belt 2, upstream of the compactor unit 5. The shaving assembly 6 is configured to determine a partial removal of the particles 3 of the first material held by the active branch 20 of the belt 2. The shaving assembly 6 and the belt 2 may be movable in respective distancing and approaching, in order to vary the distance thereof. According to a variation, the shaving assembly 6 is movable away from and towards the belt 2, which is fixed. According to a different variation, the belt 2 is movable away from and towards the shaving assembly 6, which is fixed. According to a further variant, the shaving assembly 6 and the belt 2 are both movable away from and towards each other in order to vary the relative distance.

[0038] Advantageously, this characteristic allows adjustment of the thickness of the mass of particles 3 of the first material held by the active branch 20 of the belt 2.

[0039] A further shaving assembly (not illustrated) may be provided, arranged along the conveying direction D at a certain distance from the belt 2, downstream of the second feeding zone 41, to determine partial removal of the particles 4 of the second material held by the active branch of the belt 2. Also in this case, the shaving assembly may be movable away from and towards the belt 2 in order to vary the relative distance thereof.

[0040] According to a variant, the machine 1 is arranged to produce simultaneously two continuous ropes of the tobacco industry, each comprising particles 3 of the first aerosol-generating material and particles 4 of the second aerosol-generating material different from each other and arranged according to a predetermined sequence along the development of the respective rope itself. Reference is made to Figure 4, where two belts 2, 2' with corresponding side walls 21, 21', 22, 22' are visible. In this case, clearly, the machine 1 will provide two

compactor units (not visible from the section illustrated in Figure 4) each dedicated to compacting particles 3 of the first material held on the active branch of the corresponding belt 2, 2'.

[0041] In this case, it is preferable that the compactor unit associated with each belt 2, 2' has as small a dimension as possible: this can be achieved, for example, by using the first motorized belt and the second motorized belt mentioned above as the first element 51 and second element 52 of each compactor unit. Alternatively, the two belts may be staggered from each other in height, and the first roller 51 and the second roller 52 as described above may be provided for each compactor unit 5 so as not to interfere with each other.

[0042] What is mentioned above for the remaining machine parts will be suitably arranged for producing two continuous ropes of the tobacco industry.

[0043] The present invention furthermore relates to a method for producing a continuous rope of the tobacco industry, the latter comprising particles 3 of a first aerosol-generating material and particles 4 of a second aerosol-generating material different from each other and arranged according to a predetermined sequence along the development of the rope.

[0044] The method comprises the steps of:

- providing belt conveying means 2 having an active branch 20 subject to suction that is movable in a conveying direction D, comprising two opposite lateral edges 21, 22;
- feeding particles 3 of the first material in a first feeding zone 31 so that the particles are held on the active branch 20 of the belt 2;
- feeding particles 4 of the second material in a second feeding zone 41, downstream of the first feeding zone 31, so that the particles are held on the active branch 20 of the belt 2;

[0045] In particular, the method comprises the step of laterally compacting the particles 3 of the first material between the first feeding zone 31 and the second feeding zone 41 at opposite lateral edges 21, 22 of the active branch 20 of the belt 2.

[0046] Advantageously, the proposed method ensures the quality of the final product as it allows compaction of the particles 3 of the first material upstream of the feeding of the particles 4 of the second material, ensuring the correct flow of the particles without the formation of blockages.

[0047] Preferably, the compacting step is carried out by means of at least a first element 51 and a second element 52 arranged opposite to each other along the conveying direction D.

[0048] According to the preferred embodiment, the first element 51 and the second element 52 are rotatable respectively around at least one first rotation axis H and at least one second rotation axis K (see Figures 2 and 3) passing through the same respectively in a first rotation direction and in a second rotation direction V2, which are opposite to each other (indicated only in Figure 3) . According to this embodiment, the compaction step is carried out by means of the step of bringing the first element 51 and the second element 52 into rotation in the first and second rotation directions V2, respectively.

[0049] According to an embodiment, the first element 51 comprises a first idle roller 51 and the second element 52 comprises a second idle roller 52. In this case, the compacting step comprises the step of dragging the first roller 51 and the second roller 52 into rotation in the first rotation direction V1 and in the second rotation direction V2, respectively, with the advancement of the belt 2 (namely, its active branch 20) along the conveying direction D. This embodiment is of particular constructive and functional simplicity.

[0050] According to the preferred illustrated embodiment, the first element 51 comprises a first motorized roller 51 and the second element 52 comprises a second motorized roller 52. The compacting step comprises the step of controlling the rotational activation of the first roller 51 and the second roller 52 respectively in the first rotation direction V1 and in the second rotation direction V2 simultaneously with the advancement of the belt 2 (namely, its active branch 20) along the conveying direction D. Advantageously, this specification reduces friction and promotes the sliding of the particles 3 of the first material along the conveying direction D.

[0051] The method is preferably implemented by means of the machine 1 as previously described. For further advantages, reference should be made to the foregoing description with reference to the machine 1.

Claims

1. A machine (1) for producing a continuous rope of the tobacco industry, the rope comprising particles (3) of a first aerosol-generating material and particles (4) of a second aerosol-generating material different from each other and arranged according to a predetermined sequence along the development of the rope;
   the machine (1) comprises:

   - belt conveying means (2) having an active branch (20) subject to suction that is movable in a conveying direction (D) and comprises two opposite lateral edges (21, 22);
   - a first feeder (30) arranged below the active branch (20) of the belt (2) for feeding particles (3) of the first material in a first feeding zone (31) so that the particles (3) are held on the active branch (20) of the belt (2); **and**
   - a second feeder (40) arranged below the active branch (20) of the belt (2) and downstream of the first feeder (30) along the conveying direction (D) for feeding particles (4) of the second

material in a second feeding zone (41) so that the particles (4) are held on the active branch (20) of the belt (2);

characterized in that it comprises a compactor unit (5) arranged along the conveying direction (D) between the first feeding zone (31) and the second feeding zone (41) and arranged to compact the particles (3) of the first material held on the active branch (20) of the belt (2) by acting on the opposite lateral edges (21, 22) of the active branch (20) of the belt (2).

2. The machine (1) according to the preceding claim, wherein the compactor unit (5) comprises a first element (51) and a second element (52) arranged opposite to each other along the conveying direction (D) .

3. The machine (1) according to the preceding claim, wherein the first element (51) and the second element (52) are rotatable respectively around at least a first rotation axis (H) and at least a second rotation axis (K) passing through them respectively in a first rotation direction (VI) and in a second rotation direction (V2), opposite to each other.

4. The machine (1) according to the preceding claim, wherein the first element (51) comprises a first roller (51) and the second element (52) comprises a second roller (52); the first roller (51) and the second roller (52) being idle and dragged into rotation respectively in the first rotation direction (VI) and in the second rotation direction (V2) by the advancement of the active branch (20) of the belt (2) along the conveying direction (D).

5. The machine (1) according to claim 3, wherein the first element (51) comprises a first roller (51) and the second element (52) comprises a second roller (52); the compactor unit (5) further comprises motor means (M) for motorizing the first roller (51) and the second roller (52) into rotation respectively in the first rotation direction (VI) and in the second rotation direction (V2) during the advancement of the active branch (20) of the belt (2) along the conveying direction (D).

6. The machine (1) according to any one of the preceding claims, wherein the belt conveying means (2) comprises at least a first belt and a second belt arranged in succession to each other along the conveying direction (D); the first belt being arranged to receive the particles (3) of the first material from the first feeder (30) and the second belt being arranged to receive particles (4) of the second material from the second feeder (40); and in which the compactor unit (5) is arranged between the first belt and the second belt.

7. A method for producing a continuous rope of the tobacco industry, the rope comprising particles (3) of a first aerosol-generating material and particles (4) of a second aerosol-generating material different from each other and arranged according to a predetermined sequence along the development of the rope;
the method comprises the steps of:

- providing belt conveying means (2) having an active branch (20) subject to suction that is movable in a conveying direction (D) and comprising two opposite lateral edges (21, 22);
- feeding in a first feeding zone (31) particles (3) of the first material so that the particles (3) are held on the active branch (20) of the belt (2); **and**
- feeding in a second feeding zone (41), downstream of the first feeding zone (31), particles (4) of the second material so that the particles (4) are held by the active branch (20) of the belt (2); **characterized in that** it further comprises the step of laterally compacting the particles (3) of the first material between the first feeding zone (31) and the second feeding zone (41), on the opposite lateral edges (21, 22) of the active branch (20) of the belt (2).

8. The method according to the preceding claim, wherein the compacting step is carried out by at least a first element (51) and a second element (52) arranged opposite to each other along the conveying direction (D).

9. The method according to claim 8, wherein the first element (51) and the second element (52) are rotatable respectively around at least a first rotation axis (H) and at least a second rotation axis (K) passing through them respectively in a first rotation direction (VI) and in a second rotation direction (V2), opposite to each other, and wherein the compacting step is carried out by the step of bringing the first element (51) and the second element (52) into rotation respectively in the first rotation direction (VI) and in the second rotation direction (V2) .

10. The method according to claim 9, wherein the first element (51) comprises a first roller (51) and the second element (52) comprises a second roller (52), the first roller (51) and the second roller (52) being idle; and wherein the compacting step comprises the step of dragging the first roller (51) and the second roller (52) into rotation respectively in the first rotation direction (VI) and in the second rotation direction (V2) by the advancement of the active branch (20) of the belt (2) along the conveying direction (D).

11. The method according to claim 9 (10?), wherein the first element (51) comprises a first roller (51) and the

second element (52) comprises a second roller (52), the first roller (51) and the second roller (52) being motorized; and wherein the compacting step comprises the step of activating the rotation of the first roller (51) and the second roller (52) respectively in the first rotation direction (VI) and in the second rotation direction (V2) during the advancement of the active branch (20) of the belt (2) along the conveying direction (D) .

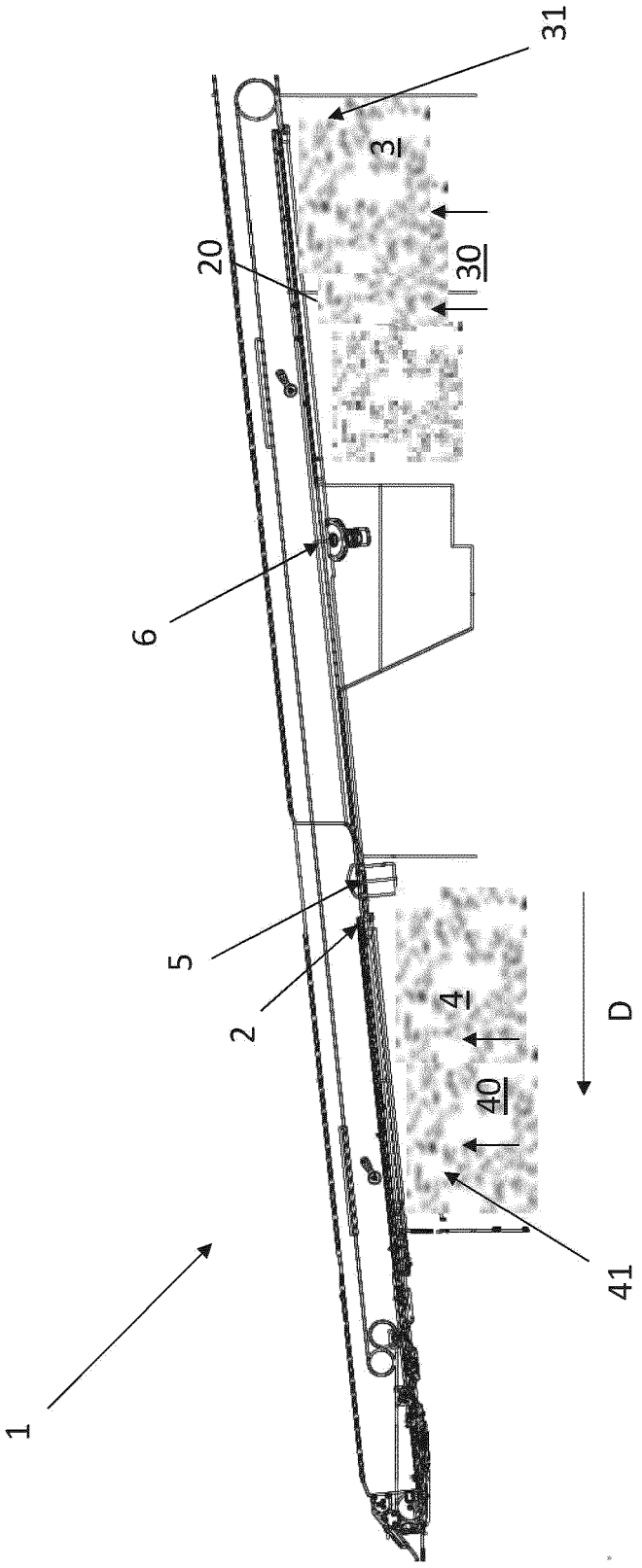
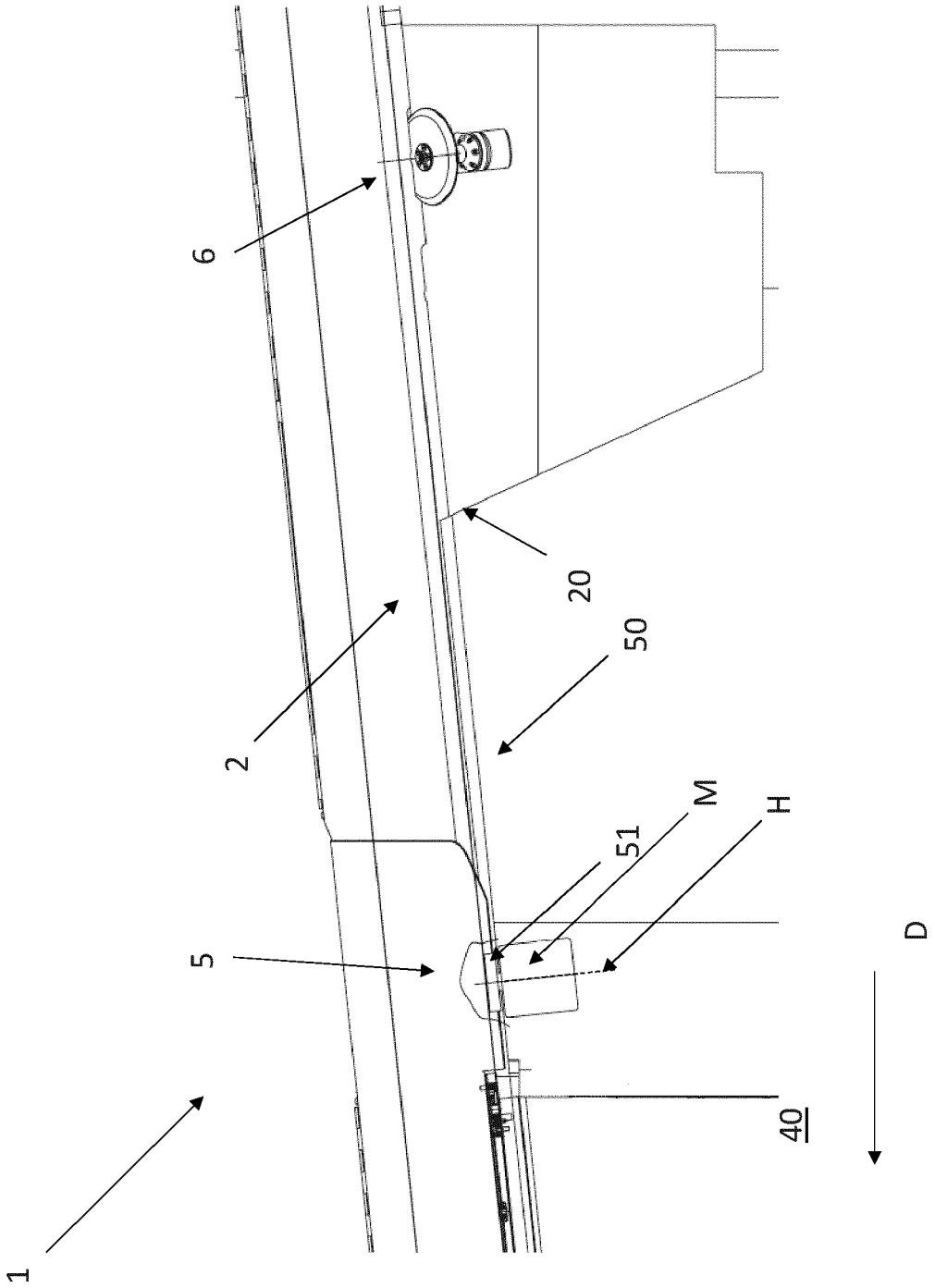


FIG.1

FIG.2



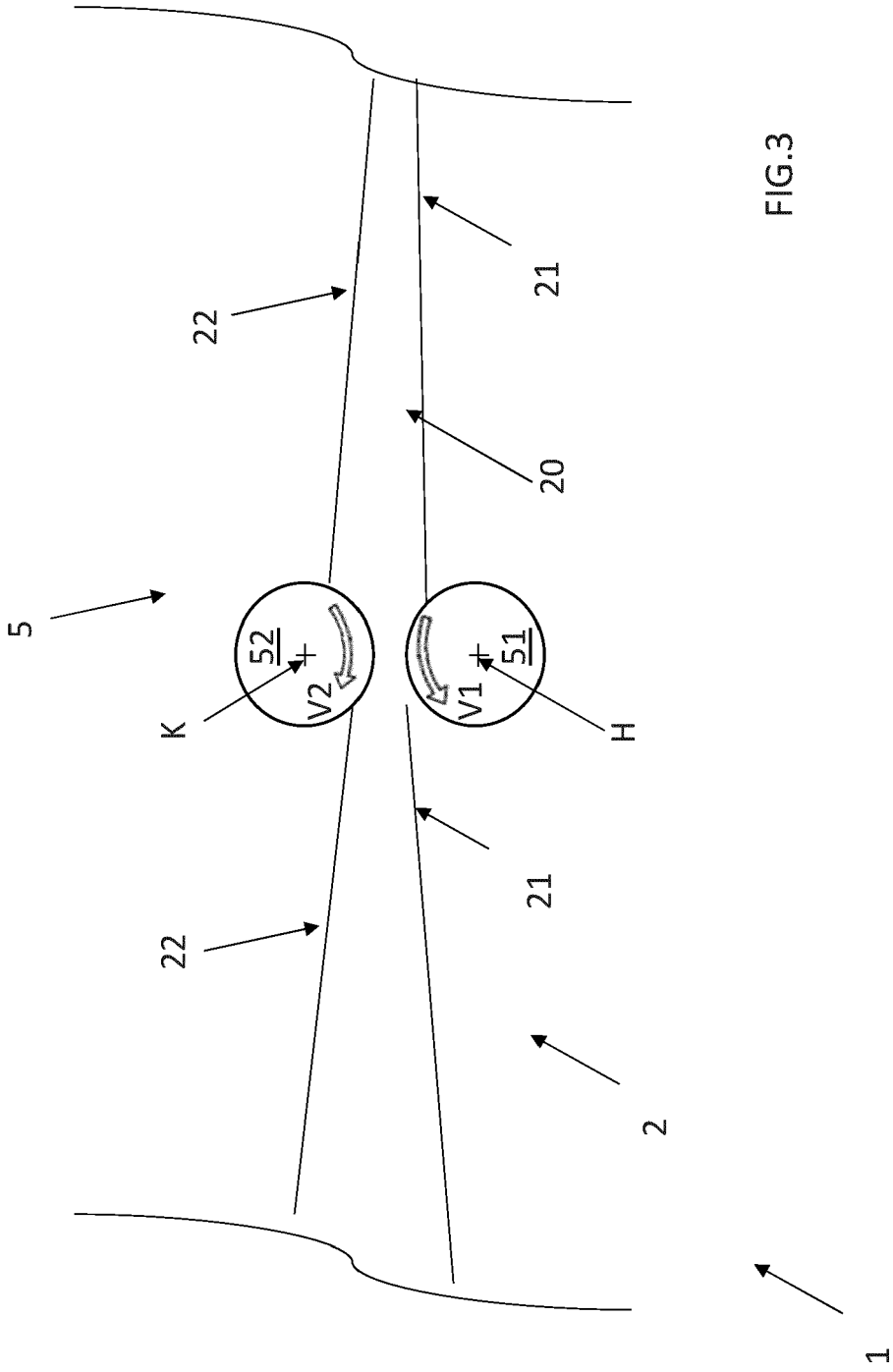


FIG.3

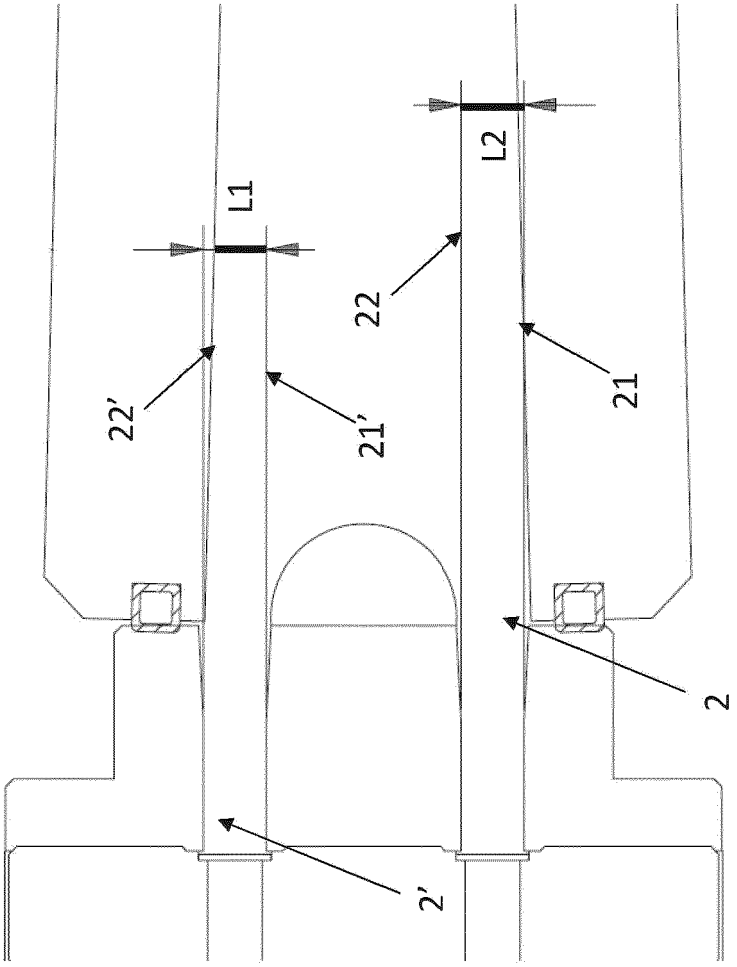


FIG.4

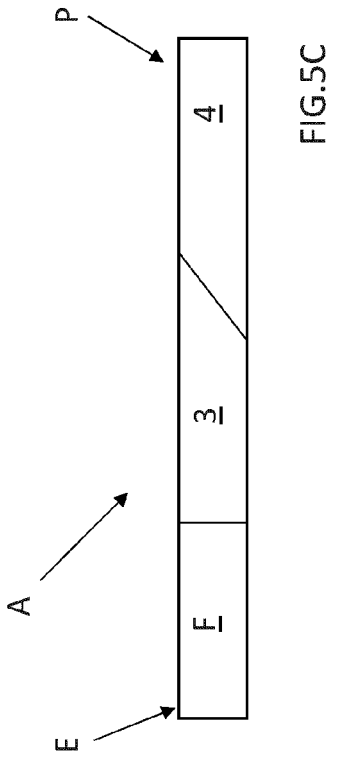


FIG.5C

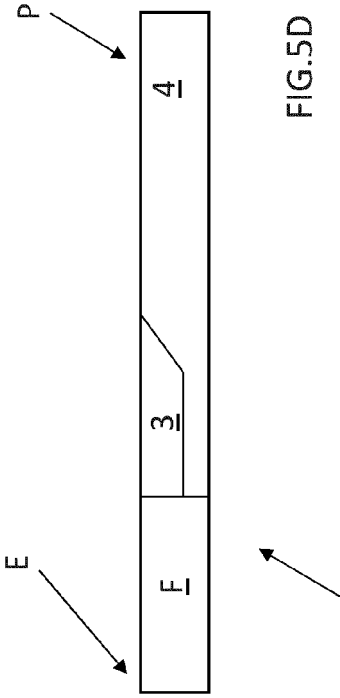


FIG.5D

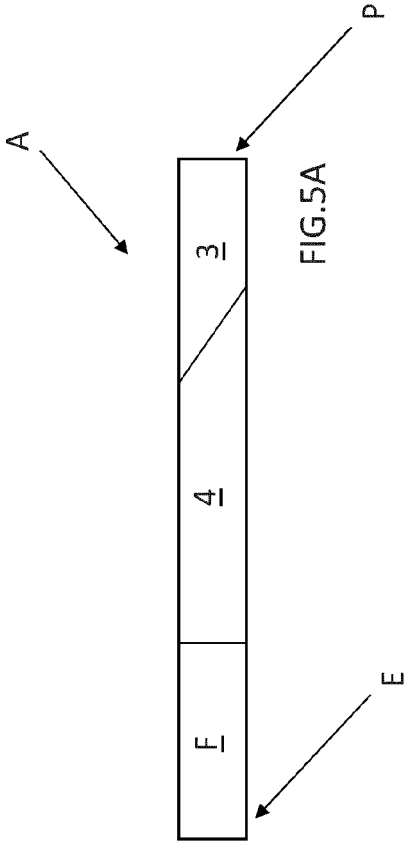


FIG.5A

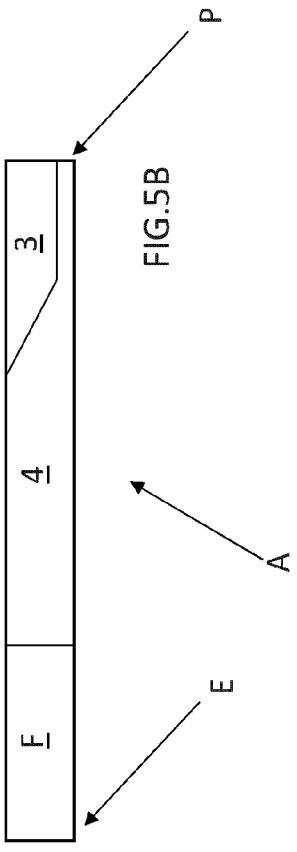


FIG.5B

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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 7415

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,D	WO 2020/201682 A1 (BRITISH AMERICAN TOBACCO INVESTMENTS LTD [GB]) 8 October 2020 (2020-10-08) * page 10, line 32 - page 14, line 27; figures *	1-11	INV. A24C5/18
A	GB 2 182 541 A (GD SPA) 20 May 1987 (1987-05-20) * page 2, line 7 - line 102; figures *	1-11	

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	8 September 2022	Marzano Monterosso

CATEGORY OF CITED DOCUMENTS

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