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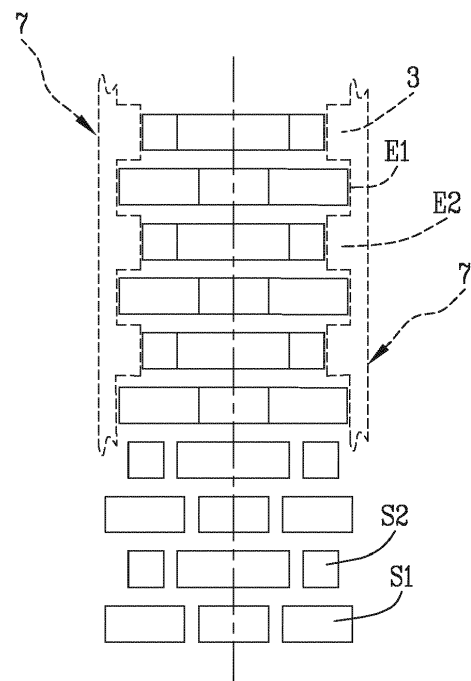
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(54) **UNIT FOR AXIAL POSITIONING, SPECIFICALLY CENTRING, FOR MACHINES FOR MAKING COMPOSITE FILTERS**

(57) A unit (1) for axial positioning, specifically centring, for machines for making composite filters, each of the composite filters comprising a plurality of segments of different materials and/or filtering properties, the unit comprising at least one conveyor drum (2) having a plurality of peripheral seats (6) for feeding at least two periodic, alternate successions (S1, S2) of groups of segments having different axial dimensions, and at least a first and second series (E1, E2) of pushing elements (3), acting in conjunction with the at least one conveyor drum (2) and movable in a direction parallel to the axis of the conveyor drum (2) to come into contact with respective ends of the groups of segments in such a way as to compact and/or centre each group of segments disposed on the conveyor drum (2), wherein the series (E1, E2) of pushing elements (3) are disposed as a function of the predetermined feed order of the groups of segments, in such a way that each series (E1, E2) of pushing elements (3) operates on the respective ordered succession (S1, S2) of groups of segments, and wherein the pushing elements (3) of the first series (E1) adopt a position that is axially less advanced compared to the pushing elements (3) of the second series (E2).

Fig.6



Description

[0001] This invention addresses the technical field of the production of articles of the tobacco industry.

[0002] More specifically, this invention concerns a unit, a machine comprising such a unit and a method for axially positioning and/or centring composite filters of the tobacco industry. The invention is also applicable to any type or combination of types of rod-shaped articles of the tobacco industry.

[0003] The term "composite filter" means a cigarette filter obtained by joining end-to-end two or more filter segments, for example, made of different materials and/or having different filtering properties.

[0004] Such composite filters are obtained by combining filter segments made of different materials and/or having different filtering properties, obtained by cutting respective lengths of filter material using cutting means and, if necessary, adding segments (for example, tubular segments) fed individually and not derived from cutting respective rods.

[0005] These segments are conveyed and combined by specific combining means in such a way as to obtain ordered sequences of segments that define groups of segments.

[0006] The groups of segments are then transferred onto a forming beam where the sequence of groups of segments defines a periodically composed, continuous rod, where the periodic composition is generally defined by a double length filter.

[0007] At present, the prior art procedures used to combine segments involve transversely conveying the entire combination intended to make the double filter, as described, for example, in EP1393640 (drum 28.5). A combination of this length may be too long for the dimensional standards of the mechanical equipment used.

[0008] For example, with regard to conveyor drum means, the group of segments may in some cases exceed the axial dimension of the transverse peripheral seats of the drum itself.

[0009] It is thus necessary to feed the conveyor drum with groups of segments having smaller axial dimensions. In particular, the Applicant has noticed that the conveyor means can be fed with two or more sub-groups formed of respective segments which will subsequently be transferred to the beam in a predetermined order to define the desired combination, in particular the double-length combination. The two or more sub-groups are fed to the drum in alternating succession repeated in such a way as to avoid the step of making the entire double length combination on the drum.

[0010] That way, the individual sub-groups are sufficiently limited in size to be housed correctly in the peripheral seats of the conveyor means.

[0011] It is not, however, possible to be sure beforehand that the specific composition of the multisegment filter will allow it to be subdivided into two or more sub-groups having the same axial dimensions.

[0012] If the axial dimensions of the two (or more) sub-groups do not coincide, more problems regarding their management may arise, for example, during the steps of centring and compacting, when the individual segments making up the sub-group are placed end to end by removing the spaces between them due to the segments having had to be transferred from one conveying device to another.

[0013] In effect, during the operations by which the groups of segments are centred and compacted, prior art typically uses centring means which are specifically configured to interact with segment groups having the same axial length and which are unsuitable when the axial dimension is not uniform for all the sub-groups in succession.

[0014] Centring means of this kind, configured to compact groups of segments of uniform overall length, are described in WO2017/85658 and WO2017/009747, configured for engaging the ends of the segment groups, directly and indirectly, respectively.

[0015] In this context, the technical purpose which forms the basis of this invention is to propose a unit, a machine comprising such a unit and a method for axially positioning and/or centring composite filters to overcome the above mentioned drawbacks of the prior art.

[0016] More specifically, this invention has for an aim to provide a unit, a machine comprising such a unit and a method for axially positioning and/or centring composite filters to allow axially positioning and/or compacting at least two successions of groups of composite filters fed alternately and periodically, where each succession of groups of segments has a different longitudinal length.

[0017] The technical features of the invention, according to the above aim, are clearly described in the appended claims and its advantages are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a nonlimiting example embodiment of the invention and in which:

- Figure 1 shows a top view, of a first embodiment of a positioning unit according to this invention;
- Figure 2 shows a perspective view of a components of the unit of Figure 1;
- Figures 3A-3C show front views of details of the unit of Figure 1;
- Figures 4A and 4B show two distinct steps of a method for positioning/centring and compacting using the unit of Figures 1;
- Figure 5 shows a front view, of a further embodiment of a positioning unit according to this invention;
- Figure 6 shows a step of the method for positioning/centring and compacting using the unit of Figure 5.

[0018] The reference numeral 1 in the accompanying drawings generically denotes a unit for axially positioning and/or centring, and for compacting composite filters of the tobacco industry, hereinafter in this disclosure simply

called unit 1.

[0019] More specifically, the unit 1 is configured to perform axial positioning and/or centring and compacting of at least two successions of groups of filter segments, where such groups are made up of at least two segments and have different overall axial dimensions.

[0020] The term "group of segments" is used in this disclosure to mean a set of filter segments made of different materials and/or having different filtering properties, disposed in longitudinal alignment according to a predetermined ordered succession. The group of segments may, however, be made up of segments without filtering properties, since the invention is also applicable outside the field of cigarette filters.

[0021] A first embodiment of the invention is shown in Figures 1, 2, 3A-3C and 4A-4B.

[0022] In this embodiment, the unit 1 uses two tangent conveyor drums 2a, 2b movable in rotation about respective axes of rotation Xa and Xb which are parallel to each other, as shown in Figure 1. The conveyor drums 2a, 2b each have a conveyor surface 4 and two opposite lateral faces 5 and also, on the conveyor surface 4, a plurality of peripheral seats 6 configured to receive and transversely convey groups of segments in a predetermined feed order.

[0023] Preferably, for reasons that are explained below, the peripheral seats 6 are made in such a way as to extend to at least one of the two lateral faces 5.

[0024] The groups of segments are conveyed, in the respective peripheral seats 6, in such a way as to create at least two periodic successions S1 and S2, alternated with each other and each comprising specific groups of segments in a configuration such that the groups of segments of the two successions have different longitudinal dimensions (according to an operating principle visible in Figures 4a and 4b). In other words, the end surfaces of the groups of segments housed in adjacent seats 6 are not aligned with each other but staggered.

[0025] In the specific embodiment, the groups of segments of the first succession S1 have a longer longitudinal dimension than the groups of segments of the second succession S2.

[0026] During use, the first conveyor drum 2a is configured to be fed with these at least two successions S1, S2 of groups of segments by respective feed stations situated upstream, in which the individual segments that will make up these groups are made and assembled. These feed stations preferably form part of a filter segment combining machine.

[0027] Further, the first conveyor drum 2a is configured to transfer the successions S1, S2 of groups of segments directly to the second conveyor drum 2b. In embodiments not illustrated, the two drums 2a, 2b might not be adjacent to each other and might have other conveyors situated between them.

[0028] In the embodiment illustrated, the first conveyor drum 2a acts in conjunction with a first series E1 of pushing elements 3, while the second conveyor drum 2b acts

in conjunction with a second series E2 of pushing elements 3, where the pushing elements 3 are configured for axially compacting the groups of segments in the respective seats 6.

[0029] In other words, the configuration described is such as to centre and compact the first succession S1 of groups of segments on the first conveyor drum 2a by means of the first series E1 of pushing elements 3, and the second succession S2 of groups of segments on the second conveyor drum 2b by means of the second series E2 of pushing elements 3.

[0030] The pushing elements 3, which are movable at least in a direction parallel to the axis of rotation X of the conveyor drum 2, are housed in respective seats 6, or operate in proximity thereto, to adopt an engaged configuration and a disengaged configuration relative to the segments contained in the seats 6.

[0031] In the engaged configuration, the pushing elements 3 adopt an axially advanced position along the axis of the drum to come into contact with the respective ends of the groups of segments of the respective successions S1, S2 in such a way as to compact and/or centre each group of segments disposed on the conveyor drum 2. In such a situation, according to a preferred solution, the series E1, E2 of pushing elements 3 are defined by pairs of pushing elements 3 disposed on opposite sides of the drum so as to be able to effectively compact the respective groups of segments.

[0032] Also, in the engaged configuration, the pushing elements belonging to the first series E1 adopt an axially less advanced position than the pushing elements belonging to the second series E2 since they have to engage groups of segments having a larger axial dimension.

[0033] In the disengaged configuration, on the other hand, the pushing elements 3 adopt an axially retracted position, away from the peripheral seats 6, hence from the respective groups of segments, to enable groups of segments to be loaded onto the conveyor drum 2 and groups of segments to be unloaded from it.

[0034] More specifically, the at least two series E1, E2 of pushing elements 3 are disposed according to the predetermined feed order of the successions S1, S2 so that each series of pushing elements 3 operates on the respective ordered succession S1, S2 of groups of segments.

[0035] In other words, the pushing elements 3 are disposed in such a way as to engage the respective succession S1, S2 of the groups of segments for which they are configured.

[0036] That way, each series E1, E2 of pushing elements 3 will interact only with the respective group of segments having the specific axial dimension with which it is configured to operate.

[0037] Moreover, the pushing elements 3 of each series E1, E2 are disposed in such a way that each series of pushing elements 3 operates on non-consecutive peripheral seats 6 of the conveyor drum 2.

[0038] According to an aspect of this invention, each conveyor drum 2a, 2b is associated with two respective conveying members 7a, 7b which are disposed to confront a respective lateral face 5 of the conveyor drums 2a, 2b.

[0039] In other words, two conveying members 7a are associated with the first conveyor drum 2a and two conveying members 7b are associated with the second conveyor drum 2b.

[0040] The conveying members 7a, 7b are preferably disc-shaped and can have a diameter substantially equal to the diameter of the respective conveyor drum 2a, 2b.

[0041] More specifically, the conveying members 7a, 7b are provided with respective pushing elements 3 of the same series E1, E2, disposed along the transverse conveying direction of the groups of segments and in such a way that each is associated with a respective seat 6 of the drum.

[0042] In effect, the pushing elements 3 are installed on a peripheral portion of the respective conveying members 7a, 7b.

[0043] In other words, the conveying members 7a associated with the conveyor drum 2a mount a first series E1 of pushing elements 3 so as to operate on the first succession S1 of groups of segments, while the conveying members 7b associated with the conveyor drum 2b mount a second series E2 of pushing elements 3 so as to operate on the second succession S2 of groups of segments.

[0044] In practice, the first succession S1 of groups of segments is axially positioned and compacted on the first conveyor drum 2a, which is acted upon by the first series E1 of pushing elements 3 (as shown in Figure 4A), while the second succession S2 of groups of segments is processed on the second conveyor drum 2b by the pushing elements 3 of the second series E2 (as shown in Figure 4B).

[0045] In an alternative embodiment, not illustrated in the accompanying drawings, the pushing elements 3 of the second series E2 act on the first conveyor drum 2a to operate on the second succession S2 of the groups of segments which are smaller in length, while the pushing elements 3 of the first series E1 act on the second conveyor drum 2b to operate on the first succession S1 of the groups of segments which are larger in length.

[0046] The conveying members 7a, 7b are movable in rotation about a respective axis of rotation Ya, Yb in synchrony with the respective conveyor drum 2a, 2b so that each pushing element 3 acts only on one respective peripheral seat 6, which the pushing element 3 is associated with, and is axially movable alternately along the seat 6 during each rotation of the drum 2.

[0047] More specifically, each peripheral seat 6 is acted upon by two pushing elements 3, of the same series E1 or E2 and each belonging to a respective conveying member 7a, 7b. The two pushing elements 3 operate in coordinated and preferably symmetrical manner in such a way as to simultaneously engage, each time, respec-

tive opposite ends of the same group of segments.

[0048] Preferably, each pushing element 3 is made as one with the respective conveying member 7a, 7b, extending axially away therefrom and being rigidly connected to the other pushing elements 3 of the same series E1, E2.

[0049] More specifically, the pushing elements 3 are structurally configured in such a way as to define an alternation of protuberances and/or recesses, as shown in Figure 2.

[0050] Figure 3A shows a detail of the conveying members 7a with the pushing elements 3 of the first series E1, which are configured to operate on the first succession S1 of groups of segments.

[0051] Figure 3b shows a detail of an alternative embodiment of the conveying members 7a, where the pushing elements 3 of the first series E1 are made as one with the conveying members 7a and are not defined by protuberances and/or recesses but by a circular crown.

[0052] Figure 3C shows a detail of the conveying members 7b with the pushing elements 3 of the second series E2, which are configured to operate on the second succession S2 of groups of segments. As may be seen, the pushing elements 3 of the conveying members 7b have a configuration such as to allow adopting a more advanced axial position so as to be able to operate on a succession of groups of segments with a smaller axial length, that is, the second succession S2 of groups of segments.

[0053] The axes of rotation Ya, Yb of the conveying members 7a, 7b are inclined relative to the axis of rotation Xa, Xb of the respective conveyor drum 2a, 2b so that the pushing elements 3 of each series E1, E2 are movable periodically along the respective peripheral seat 6, between the engaged configuration and the disengaged configuration, and progressively engage the respective succession S1, S2 of groups of segments in the engaged configuration corresponding to the position where the opposite pushing elements 3 are closest together.

[0054] In other words, the conveying members 7a, 7b associated with the same conveyor drum 2a, 2b have an axis of rotation Ya, Yb that is inclined relative to the axis of rotation Xa, Xb of the respective conveyor drum 2a, 2b mirror symmetrically about the conveying direction of the groups of segments, so that the two pushing elements 3, associated with the same peripheral seat 6, are moved periodically between the engaged configuration and the disengaged configuration.

[0055] In a further embodiment, not illustrated in the accompanying drawings, each pushing element 3 is configured to operate movably (and preferably individually) relative to the conveying member 7 periodically, being driven to move between the engaged configuration and the disengaged configuration by a respective actuating member, for example, pneumatic or cam-driven. In this embodiment, the axis of rotation Ya, Yb of each conveying member 7a, 7b may coincide with, or be parallel to, the axis of rotation Xa, Xb of the respective conveyor

drum 2a, 2b, the progressive engagement and disengagement with the respective group of segments being accomplished through the periodic movement of each pushing element 3.

[0056] In a further embodiment, shown in Figures 5 and 6, there is a single conveyor drum 2 which, in use, is fed with two alternate successions S1, S2 of groups of segments having different axial lengths.

[0057] The lateral faces 5 of the conveyor drum 2 confront respective conveying members 7 movable in rotation about respective axes of rotation Y which are inclined relative to the axis of rotation X of the conveyor drum 2.

[0058] In this embodiment, in both of the two conveying members 7, the first and second series E1, E2 of pushing elements 3 are disposed alternately so they are associated with the two respective successions S1, S2 of groups of segments, as shown in Figure 3A.

[0059] In other words, the two series E1, E2 of pushing elements 3 are disposed in such a way as to follow the arrangement of the two successions S1, S2 of groups of segments: that is to say, the pushing elements 3 of the first series E1 are alternated with the pushing elements 3 of the second series E2.

[0060] In this case, too, each peripheral seat 6 has two pushing elements 3 of the same series E1, E2 associated with it, so that the two pushing elements 3 operate in coordinated fashion on the respective ends of each group of segments present in the peripheral seat 6.

[0061] Furthermore, in this case, too, the two series E1, E2 of pushing elements 3 are configured in such a way that the first series E1 of pushing elements 3, in the engaged configuration, adopt a position that is axially less advanced in order to centre and compact the first succession S1 of groups of segments with the larger axial length, while the second series E2 of pushing elements 3, in the engaged configuration, adopt a position that is axially more advanced in order to centre and compact the second succession S2 of groups of segments with the smaller axial length.

[0062] In variant embodiments not illustrated but falling within the scope of the same inventive concept, the groups of segments having different axial dimensions may be greater than two in number, for example, three or four. In this situation, a succession of blocks of four groups of segments each, having different lengths, is created on the drum or on each drum. In this situation, there may be a single positioning and/or centring drum acting in conjunction with two axially opposite conveying members, both provided with four series of pushing elements of different lengths; alternatively, there may be four drums (adjacent to or, generally speaking, downstream of each other), each of which acts in conjunction with two axially opposite conveying members provided with a single series of pushing elements having the specific axial dimension corresponding to the group of segments to be compacted.

[0063] Also an object of this invention is a machine for making composite filters comprising the unit for axial po-

sitioning described in the foregoing.

[0064] More specifically, the machine comprises a plurality of feed lines for feeding respective filter segments having different filtering properties and/or made of different materials, and a combining apparatus, disposed downstream of the feed lines and configured to form, at the exit, at least two successions of groups having different overall axial dimensions.

[0065] The combining apparatus is located upstream of the unit for axial positioning.

[0066] Advantageously, thanks to the presence of the unit for axial positioning and/or compacting, the machine according to this invention is also capable of correctly making and conveying multisegment articles, especially if the articles have variable axial dimensions.

[0067] Also an object of this invention is a method for axial positioning and/or centring and for compacting groups of segments.

[0068] The method comprises a first step of conveying the groups of segments in a predetermined feed order so as to create at least two periodic, alternate successions S1, S2 of groups of segments having different axial dimensions.

[0069] The method also comprises engaging at least one end of each group with a respective pushing element of a first or second series E1, E2 of pushing elements 3 so that each group of segments belonging to a first succession S1 is engaged by a respective pushing element 3 belonging to the first series E1 of pushing elements 3 and the group of segments belonging to a second succession S2 is engaged by a respective pushing element 3 belonging to the second series E2 of pushing elements 3.

[0070] In order to engage groups of segments of non-uniform length, the maximum positions to which each series E1, E2 of pushing elements 3 can be advanced are different.

[0071] In an aspect of the invention described in the foregoing, without departing from the scope thereof, one of the two successions S1, S2 may be a succession of axially aligned single segments, instead of groups of segments. In this situation, the overall length of each group of segments of one succession is different from the length of the single segments of the other succession. In this case, of course, the axial pushing action applied by the respective series E1, E2 of pushing elements 3 does not have the function of compacting but only that of centring the single segments (axial positioning).

[0072] This invention achieves the preset aims by overcoming the disadvantages of the prior art and providing a unit for axial positioning and/or compacting groups of segments, capable of correctly processing alternate successions S1, S2 having non-uniform longitudinal length and considerably increasing the flexibility of using the compacting unit. More specifically, the at least two series of pushing elements may adopt different axially advanced positions to come into contact with the respective successions of groups of segments.

Claims

1. A unit (1) for axial positioning, specifically centring, for machines for making composite filters, each of the composite filters comprising a plurality of segments of different materials and/or filtering properties, the unit comprising:
 - at least one conveyor drum (2; 2a, 2b) having a plurality of peripheral seats (6) configured to receive and transversely convey segments or groups of segments in a predetermined feed order so as to create at least two periodic, alternate successions (S1, S2) of segments or groups of segments having different overall axial dimensions;
 - at least a first and second series (E1, E2) of pushing elements (3), acting in conjunction with the at least one conveyor drum (2; 2a, 2b) and movable at least in a direction parallel to the axis of the conveyor drum (2; 2a, 2b) and disposed and/or configured to adopt an engaged configuration, in which the pushing elements (3) adopt an axially advanced position to come into contact with respective ends of the segments or groups of segments in such a way as to compact and/or centre each segment or group of segments disposed on the conveyor drum (2; 2a, 2b), and a disengaged configuration, in which the pushing elements (3) adopt an axially retracted position away from the segments or groups of segments to allow loading and unloading the segments or groups of segments onto/from the conveyor drum (2; 2a, 2b);

wherein the at least two series (E1, E2) of pushing elements (3) are disposed as a function of the predetermined feed order of the segments or groups of segments, in such a way that each series (E1, E2) of pushing elements (3) operates on the respective ordered succession (S1, S2) of segments or groups of segments, and wherein, in the engaged configuration, the pushing elements (3) of the first series (E1) adopt a position that is axially less advanced compared to the pushing elements (3) of the second series (E2).
2. The unit (1) according to claim 1, wherein the pushing elements (3) of each series (E1, E2) are disposed in such a way as to operate on non-consecutive peripheral seats (6) of the conveyor drum (2; 2a, 2b).
3. The unit (1) according to claim 1 or 2, wherein the pushing elements (3) of one same series (E1, E2) of pushing elements (3) are mounted on a single conveying member (7) facing the conveyor drum (2).
4. The unit (1) according to one or more of the preceding claims, comprising a pair of conveyor drums (2a, 2b) disposed along a transverse conveying direction of the segments or groups of segments; and wherein the first series (E1) of pushing elements (3) is associated with the first of the drums (2a) to operate on a first ordered succession (S1) of segments or groups of segments conveyed by the first conveyor drum (2a), and wherein the second series (E2) of pushing elements (3) is associated with the second conveyor drum (2b) to operate on a second ordered succession (S2) of segments or groups of segments, different from the first succession (S1), conveyed by the second conveyor drum (2b).
5. The unit (1) according to claim 4, when dependent on claim 3, wherein each series (E1, E2) of pushing elements (3) is mounted on a respective conveying member (7a, 7b), a first conveying member (7a) being associated with and facing the first conveyor drum (2a) and a second conveying member (7b) being associated with and facing the second conveyor drum (2b).
6. The unit (1) according to one or more of claims 1 to 4, wherein the pushing elements (3) of both of the series (E1, E2) of pushing elements (3) are mounted on a single conveying member (7) facing the conveyor drum (2), the pushing elements (3) of the first series (E1) being alternated with the pushing elements (3) of the second series (E2).
7. The unit (1) according to one or more of claims 3 to 6, wherein the conveying member (7) or each conveying member (7a, 7b) rotates about a respective axis of rotation (Y; Ya, Yb), preferably inclined to the axis of rotation (X; Xa, Xb) of the conveyor drum (2) or of the respective conveyor drum (2a, 2b).
8. The unit (1) according to claim 7, wherein the pushing elements (3) of one same series (E1, E2) of pushing elements (3) are rigidly connected to each other, the conveying member (7) or each conveying member (7a, 7b) being preferably disc-shaped, with the pushing elements (3) or the respective pushing elements (3) being formed thereon, preferably as one therewith.
9. The unit (1) according to claim 8, wherein the pushing elements (3) of the first series (E1) have an axial dimension, measured in parallel with the axis of the at least one conveyor drum (2; 2a, 2b), different from the axial dimension of the pushing elements (3) of the second series (E2).
10. The unit (1) according to one or more of claims 1 to 7, wherein the pushing elements (3) are individually movable in parallel with the axis of the at least one conveyor drum (2; 2a, 2b) periodically between the

advanced and retracted positions through the action of respective cam or pneumatic actuating means.

11. The unit (1) according to one or more of the preceding claims, wherein the at least one conveyor drum (2; 2a, 2b) is associated, on each side, with a respective first and second series (E1, E2) of pushing elements (3), so that for each segment or group of segments, a pair of respective pushing elements (3) is provided at both ends of the segment or group of segments; during the rotation of the at least one conveyor drum (2; 2a, 2b), each pair of pushing elements (3) progressively engaging the respective segment or group of segments so as to compact and/or axially position and/or centre the segment or group of segments and then disengage themselves from the segment or group of segments.

12. A machine for making composite filters, each of the filters comprising a plurality of segments having different filtering properties and/or made of different materials, the machine comprising:

- a plurality of feed lines for feeding respective filter segments having different filtering properties and/or made of different materials;
- a combining apparatus, disposed downstream of the feed lines and configured to form, at the exit, at least two successions (S1, S2) of segments or groups of segments having different overall axial dimensions,
- a unit for axial positioning and/or centring according to one or more of the preceding claims, disposed downstream of the combining apparatus and configured to axially position and/or centre and/or compact the ordered successions (S1, S2) of segments or groups of segments.

13. A method for axially positioning, specifically centring and/or compacting segments or groups of rod-shaped segments of the tobacco industry, specifically filter segments or groups of filter segments, the method comprising the following steps:

- conveying segments or groups of segments in a predetermined feed order so as to create at least two periodic, alternate successions (S1, S2) of segments or groups of segments having different overall axial dimensions;
- engaging at least one end of each segment or group of segments with a respective pushing element (3) of a first or second series (E1, E2) of pushing elements (3) so that each segment or group of segments belonging to a first succession (S1) is engaged by a respective pushing element (3) belonging to the first series (E1) of pushing elements (3) and so that each segment or group of segments belonging to a second suc-

cession (S2) is engaged by a respective pushing element (3) belonging to the second series (E2) of pushing elements (3);

wherein the pushing elements (3) of the first series (E1) have a most advanced position that is different compared to the pushing elements (3) of the second series (E2).

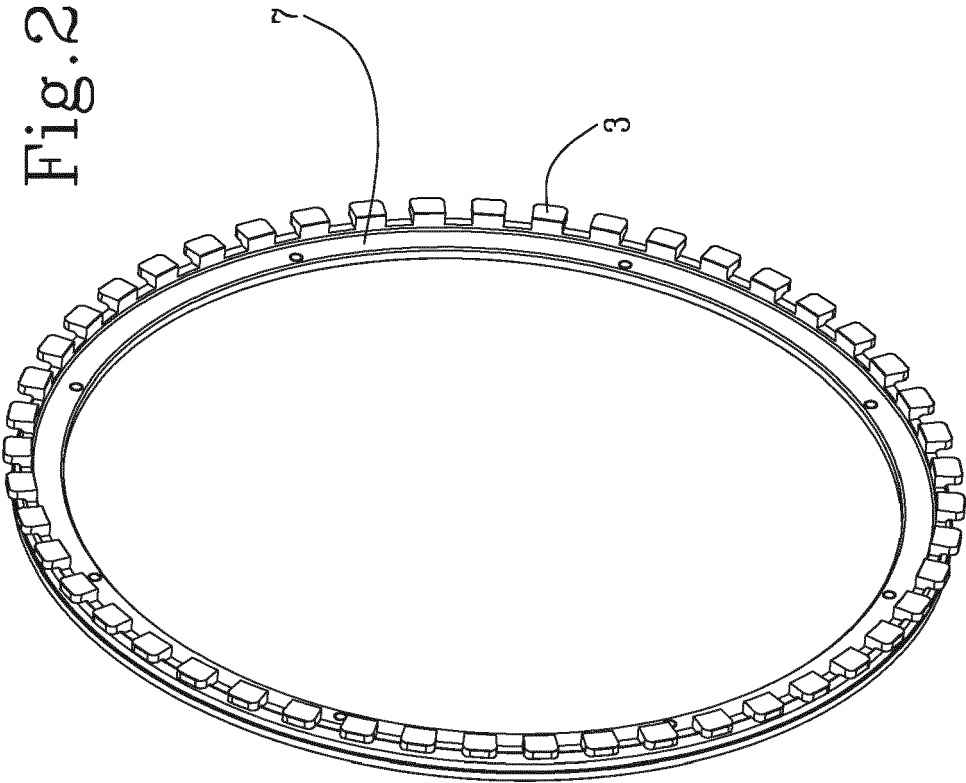
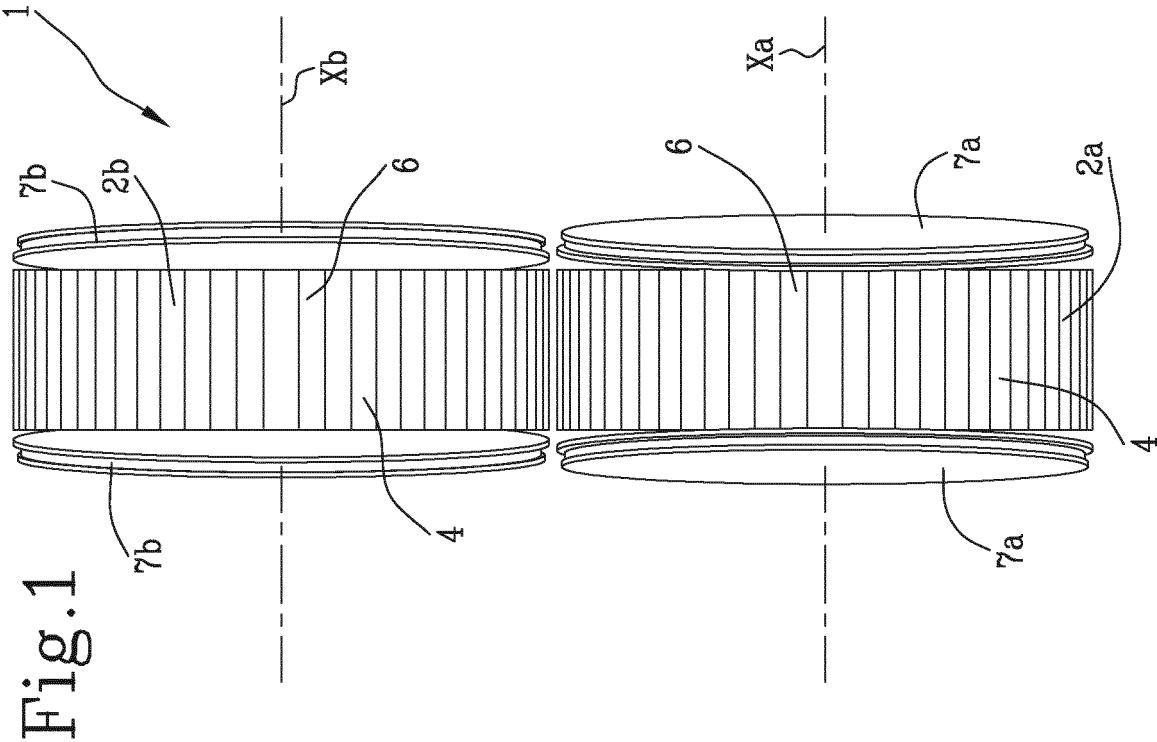


Fig.3A

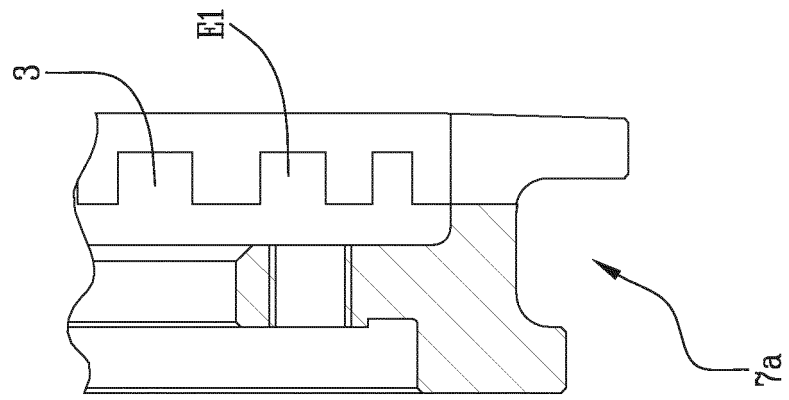


Fig.3B

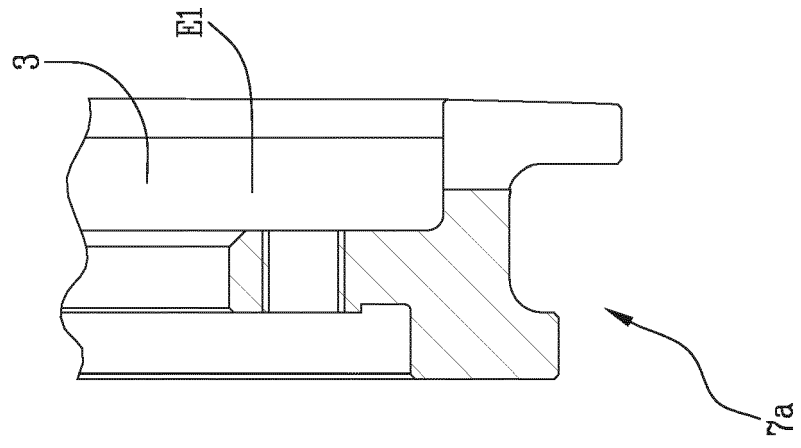


Fig.3C

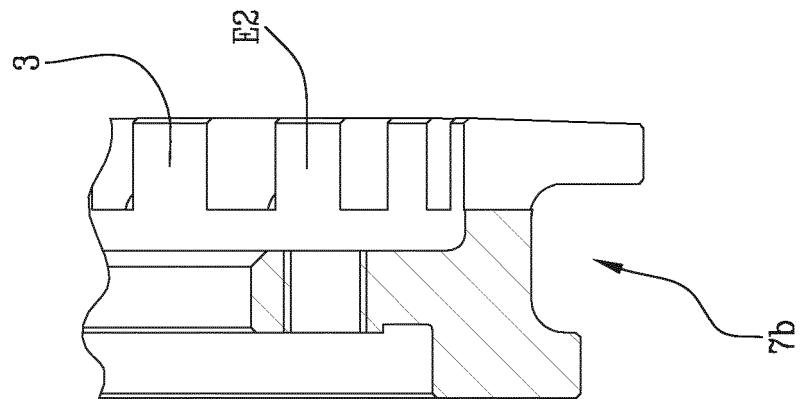


Fig.4B

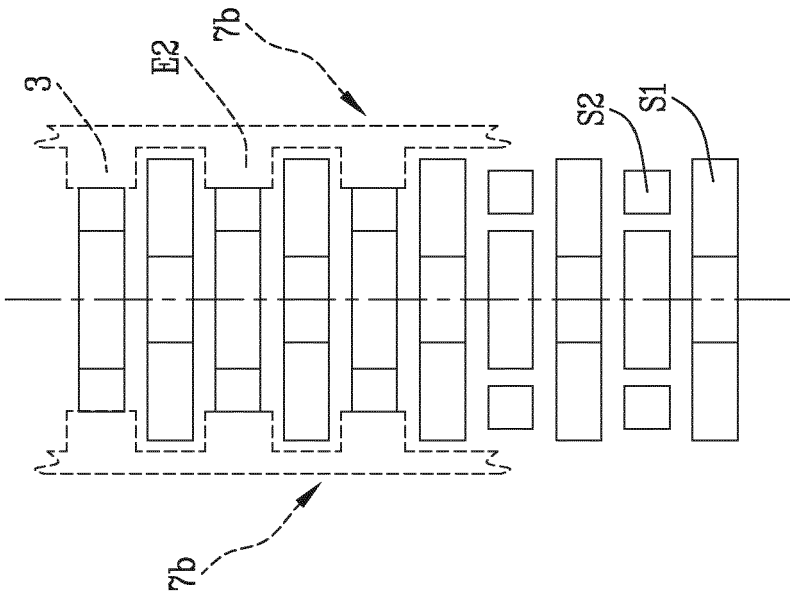


Fig.4A

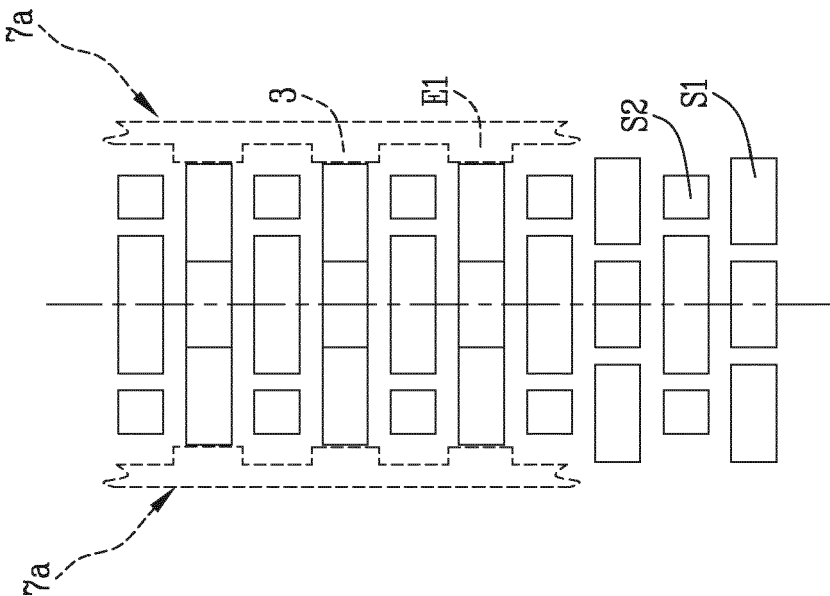


Fig.5

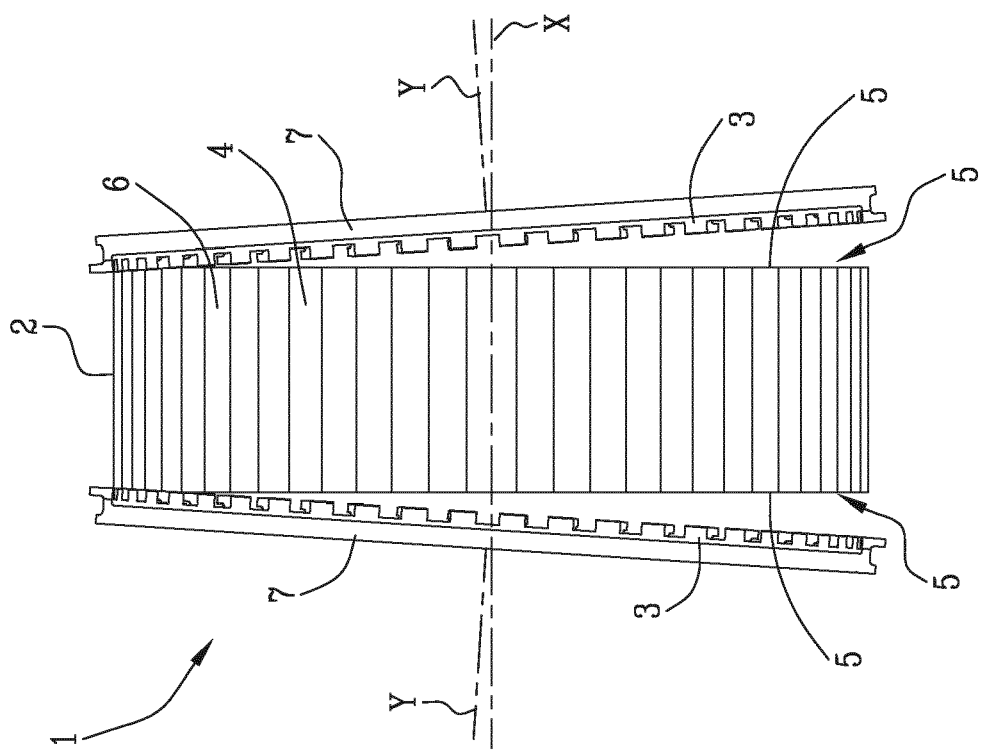
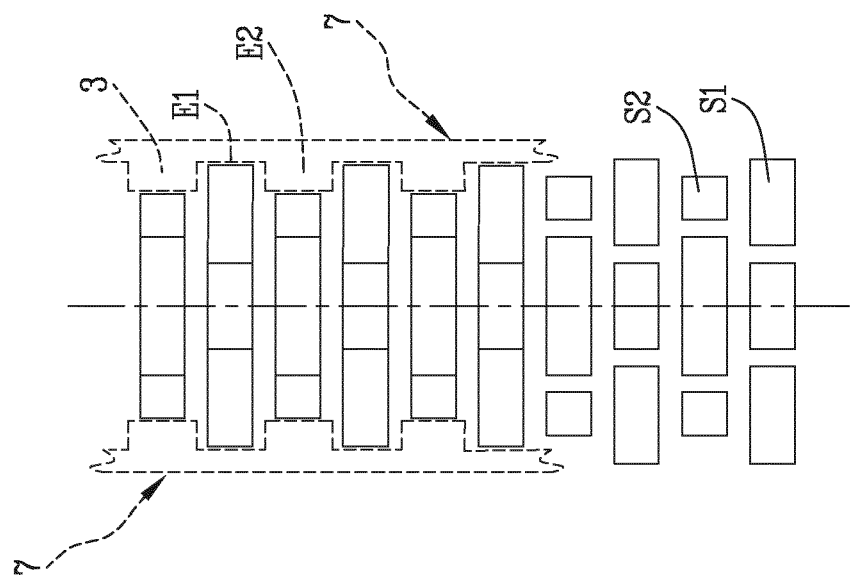


Fig.6





EUROPEAN SEARCH REPORT

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Place of search Munich		Date of completion of the search 29 June 2021	Examiner Marzano Monterosso
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