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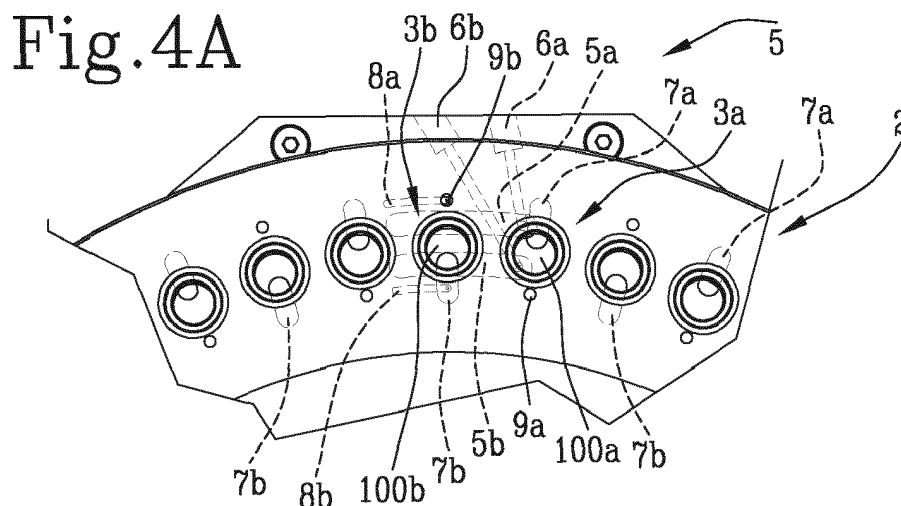
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(54) **UNIT AND METHOD FOR MEASURING THE PRESSURE DROP IN A SMOKING ARTICLE**

(57) This invention relates to a unit (1) for measuring the pressure drop in a smoking article (100), comprising:
- a conveyor (2) comprising a plurality of housing seats (3) configured to receive and transversely feed a plurality of rod-shaped smoking articles (100) along a feed path (P);
- a fixed measuring device (4) disposed on the feed path (P) and configured to measure a value of pressure drop

in each article (100), wherein the measuring device (4) comprises at least two air loading slots (5a, 5b) connected or connectable to respective, distinct compressed air sources (6a, 6b);
- connecting means (7) disposed on the conveyor (2) and configured to alternately connect consecutive housing seats (3a, 3b) to different air loading slots (5a, 5b) in order to feed an air flow to the articles (100).



Description

[0001] This invention relates to a unit and a method for measuring the pressure drop in a smoking article.

[0002] In particular, the term "smoking article" is used herein to denote any rod-shaped article for the tobacco industry, defining a finished product, such as a cigarette, for example, or a semi-product (for example: a filter segment, a tobacco segment, a composite segment or a piece of a multisegment product).

[0003] The cigarette may be a traditional cigarette which can be smoked by burning the end of the tobacco segment defining the active portion, or inhaled by heating but not burning an active portion.

[0004] Thus, the active portion may be a cigarette segment comprising traditional tobacco or it may be an aerosol-generating element, that is, a product containing heat-not-burn type tobacco.

[0005] In order to be correctly smokable, cigarettes must be easy to inhale and draw pressure must be such that inhalation is smooth and not excessively intense.

[0006] To ensure they provide optimum smoking pleasure, cigarettes are therefore subjected to specific tests to make certain that the pressure drop within the smoking articles falls within specified ranges of acceptability.

[0007] That way, it is possible to determine whether the properties of the smoking articles made are such that the smokability of the cigarette is acceptable - that is, that they allow the cigarette to be correctly inhaled - based on predetermined parameters.

[0008] For traditional cigarettes, it is established practice in the tobacco industry to test the smoking articles in line after they have been made and to measure the value of the pressure drop, also known as "resistance to draw" (RTD) by making air flow through the smoking articles at a predetermined rate and recording the resulting overpressure on the side on which the air stream is applied.

[0009] Measurement is performed typically in the machine while the articles move transversely along their feed path on conveyors.

[0010] For example, the smoking articles disposed inside suction housing seats round the periphery of a transfer drum are made to pass by a detection device located at a fixed position on the drum itself.

[0011] As the drum rotates, each article moves past the detection device in such a way that the end of the article is aligned with an angular loading slot of the detection device which extends along a circular arc and through which a predetermined amount of air is injected. This solution is described, for example, in DE3341686 (slots 24 and 31) or US3418844 (slots 96-112). More specifically, the angular extent of the loading slot is smaller than the angular distance between two consecutive smoking articles to allow only one smoking article at a time to be loaded and hence tested.

[0012] Once air has been loaded into the article, a pres-

sure sensor of the detection device measures the RTD value.

[0013] The article is thus loaded with air for a loading time corresponding to the time taken by the article to travel in front of the angular loading slot. Thus, under equal conditions of air flow injectable into the article and of drum rotation speed, the greater the angular length of the slot, the greater the quantity of air that can be injected into the article.

[0014] More specifically, the higher the RTD, the longer the time needed for the pressure to be stabilized and thus, for smoking articles with high RTD, air must be injected for a longer length of time. Conversely, the higher the article production speed (that is, the higher the drum rotation speed) the less the time available for supplying the air, since the articles are tested while in motion.

[0015] In practice, this translates as a limitation on the maximum RTD value measurable by the detection device. In effect, at the end of the test, the higher the real RTD value is, the more it will differ from the RTD reading of the sensor.

[0016] The Applicant has thus found that to obtain an acceptable measurement for smoking articles with a high RTD value in prior art machines, it is necessary to provide longer loading slots or to reduce the production speed; both solutions have considerable disadvantages, however.

[0017] In effect, if the slots were to be made longer, the quantity of air loaded by each would be divided between two or more consecutive articles, thus losing control over how much air is actually injected into each article and altering the measurement performed by the pressure sensor.

[0018] If rotation speed is lowered, on the other hand, production efficiency is reduced, with evident disadvantages in terms of productivity.

[0019] The purpose of this invention is to provide a unit and a method for measuring the pressure drop in a smoking article to allow increasing the maximum measurable RTD value.

[0020] More specifically, this invention has for an aim to increase the length of time available for injecting air through the smoking articles without reducing the production speed. The maximum measurable RTD value is thus increased, making it possible to measure a wide range of smoking articles.

[0021] The technical purpose indicated and the aims specified are substantially achieved by a unit and a method for measuring the pressure drop in a smoking article, comprising the technical features described in one or more of the appended claims.

[0022] More specifically, this invention provides a unit for measuring the pressure drop in a smoking article, comprising:

- a conveyor comprising a plurality of housing seats configured to receive and transversely feed a plurality of rod-shaped smoking articles along a feed path,

- a fixed measuring device disposed on the feed path and configured to measure a value of pressure drop in each article, wherein the measuring device comprises at least one air loading slot connected or connectable to a compressed air source,
- connecting means disposed on the conveyor and configured to connect the air loading slot sequentially to one of the housing seats in order to feed an air flow to the articles.

[0023] Advantageously, the measuring device comprises at least two air loading slots connected or connectable to respective, distinct compressed air sources and the connecting means are configured to alternately connect consecutive housing seats to different air loading slots.

[0024] That way, supplying the air flow to one article does not interfere with the supplying of the air flow to the next adjacent article since the loading slots are connected to distinct compressed air sources and it is therefore possible to increase the air loading time.

[0025] In other words, thanks to this invention, under equal conditions (given a certain spacing between the articles, a certain feed speed and a given air supply flow rate), it is possible to create loading slots that are longer than in the prior art, using the alternate connection of consecutive articles to distinct loading slots.

[0026] This invention also provides a method for measuring the pressure drop in a smoking article, comprising the following steps:

- transversely feeding a plurality of rod-shaped smoking articles along a feed path through a fixed measuring device, where the measuring device comprising at least one air loading slot connected to a compressed air source,
- placing one end of each smoking article in fluid communication with the at least one air loading slot;
- measuring the value of pressure drop of each article connected to the air loading slot.

[0027] Advantageously, the measuring device comprises two air loading slots connected or connectable to distinct compressed air sources and the step of measuring the value of pressure drop of each article is performed by alternately connecting the ends of consecutive articles to different air loading slots.

[0028] The alternate connection of the ends of consecutive articles to different air loading slots makes it possible to increase the pressure drop measuring efficiency, with high RTD values, to obtain measurements that are as close as possible to the real values.

[0029] The dependent claims, which are incorporated herein by reference, correspond to different embodiments of the invention.

[0030] Further features of the invention and its advantages are more apparent in the non-limiting description below, with reference to a preferred but non-exclusive

embodiment of a unit for measuring the pressure drop in a smoking article, as illustrated in the accompanying drawings, in which:

- 5 - Figure 1 is a perspective view of a unit for measuring the pressure drop in a smoking article according to this invention;
- Figure 2 is a top view of the unit of Figure 1;
- 10 - Figure 3 is a front view of a part of a conveyor of a unit for measuring the pressure drop in a smoking article according to this invention;
- Figure 4 is a front view of a detail of a first embodiment of a measuring device of a unit for measuring the pressure drop in a smoking article according to this invention;
- 15 - Figures 4A-4D schematically illustrate a sequence of operating steps of a unit for measuring the pressure drop in a smoking article according to the first embodiment of the measuring device of Figure 4;
- 20 - Figure 5 is a front view of a detail of a second embodiment of a measuring device of a unit for measuring the pressure drop in a smoking article according to this invention; and
- 25 - Figures 5A-5D schematically illustrate a sequence of operating steps of a unit for measuring the pressure drop in a smoking article according to the first embodiment of the measuring device of Figure 5.

[0031] With reference to the accompanying drawings, the numeral 1 denotes in its entirety a unit for measuring the pressure drop in a smoking article, hereinafter referred to simply as unit 1.

[0032] The unit 1 comprises a conveyor 2 comprising a plurality of housing seats 3, preferably suction seats, configured to receive and transversely feed a plurality of rod-shaped smoking articles 100 along a feed path P.

[0033] For convenience of illustration, Figures 1 and 2 show only one article 100. The unit 1 then comprises a fixed measuring device 4 disposed on the feed path P and configured to measure a value of pressure drop in each article 100.

[0034] The articles 100 are thus movable relative to the measuring device 4. With reference to Figures 4 and 5, the measuring device 4 comprises at least one air loading slot 5a, 5b connected or connectable to a compressed air source 6a, 6b.

[0035] The unit also comprises connecting means 7 disposed on the conveyor 2 and configured to connect at least one air loading slot 5a, 5b sequentially to one of the housing seats 3 in order to feed an air flow to the articles 100. Advantageously, according to this invention, the measuring device 4 comprises at least two air loading slots 5a, 5b connected or connectable to respective, distinct compressed air sources 6a, 6b and the connecting means 7 are configured to alternately connect consecutive housing seats 3 to different air loading slots 5a, 5b.

[0036] For example, with reference to Figure 4A, a first article 100a is adapted to be loaded with a first air flow

from the compressed air source 6a through the air loading slot 5a, while a second article 100b is adapted to be loaded with a second air flow from the compressed air source 6b through the air loading slot 5b.

[0037] In other words, connecting the articles 100 selectively to alternately different air loading slots 5a, 5b allows making longer air loading slots 5a, 5b, preferably longer than the centre distance between one article 100 and the next without the loading slot 5a, 5b loading more than one article 100 at a time.

[0038] Thanks to the selective connection of the articles 100a, 100b to respective alternate loading slots 5a, 5b, it is thus possible to make loading slots 5a, 5b whose length is such as to allow obtaining a true measurement of the pressure drop of articles having high values of pressure drop (or resistance to draw, RTD): for example, higher than 200 mmH₂O.

[0039] Preferably, therefore, the loading slots 5a, 5b are at a fixed position on the measuring device 4, whilst the connecting means 7 formed on the conveyor are movable along the feed path P together with the articles 100.

[0040] It should be noted that in the embodiments illustrated, there are 2 loading slots 5a, 5b. However, solutions where the loading slots 5a, 5b are more than 2 in number are also imaginable without departing from the scope of the inventive concept of this invention.

[0041] The unit 1 is thus advantageously suitable for easy installation in any machine for making smoking articles 100 in order to efficiently measure the pressure drop values in the articles 100.

[0042] Moreover, with reference to the embodiments of this invention illustrated in the accompanying drawings, the conveyor 2 is preferably a drum which rotates about an axis of rotation X and has, for each housing seat 3, at least one supporting element 3' for an end portion of an article 100 housed in the housing seat 3.

[0043] The supporting elements 3' are advantageously configured to make a sealed compressed air connection with the compressed air sources 6 in order to obtain a correct measurement.

[0044] More specifically, the supporting element 3' is associated with the connecting means 7 and the feed path P is a circular path.

[0045] As shown in Figure 2, the supporting elements 3' engage the ends of the articles 100 only at a measuring zone M located at the measuring device 4 to allow measuring operations to be carried out. In the embodiment illustrated, the measuring zone M is engaged by means of supporting elements 3' which are fixed to the drum 2 at external inclined discs 2' that are configured to travel along a trajectory lying in a plane transverse to the axis of rotation X of the drum 2. Alternatively, for example in an embodiment not illustrated in the accompanying drawings, the supporting elements 3' might be movable towards and away from the articles 100 along the longitudinal axes thereof so as to selectively engage the articles 100 at the measuring zone M.

[0046] Preferably, the two loading slots 5a, 5b extend

along respective directions of extension parallel to the feed path P of the articles 100 and run alongside each other in a direction perpendicular to the feed path P. More specifically, as shown in the accompanying drawings, therefore, the two loading slots 5a, 5b extend along arcuate directions.

[0047] With reference to Figure 3, the connecting means 7 preferably comprise, for each housing seat 3, a respective connecting slot 7a, 7b configured to pneumatically connect each article 100a, 100b to a respective air loading slot 5a, 5b. In particular, the connecting slots 7a, 7b are disposed in at least two alternate sets in such a way that consecutive housing seats 3a, 3b correspond to connecting slots 7a, 7b of distinct sets configured to be connected to different air loading slots 5a, 5b.

[0048] For example, with reference to Figure 4A, a first article 100a, disposed in a first housing seat 3a with which a first connecting slot 7a is associated, is adapted to be loaded with a first air flow from the compressed air source 6a through a first air loading slot 5a, while a second article 100b, disposed in a second housing seat 3b (downstream of the first housing seat 3a) with which a second connecting slot 7b is associated, is adapted to be loaded with a second air flow from the compressed air source 6b through a second air loading slot 5b.

[0049] Preferably, the connecting slots 7a, 7b extend between the respective article 100a, 100b and the respective air loading slot 5a, 5b along respective directions of extension transverse, preferably perpendicular, to the feed path P.

[0050] Preferably, the measuring device 4 comprises, for each air loading slot 5a, 5b, a respective measuring slot 8a, 8b which is juxtaposed with the respective air loading slot 5a, 5b.

[0051] Advantageously, inside each measuring slot 8a, 8b there is a pressure sensor configured to measure a value of pressure drop associated with a respective article 100a, 100b. More specifically, each measuring slot 8a, 8b is placed in fluid communication with the respective air loading slot 5a, 5b by the connecting means 7.

[0052] Advantageously, therefore, the air is loaded into the articles 100 through the loading slots 5a, 5b and measurement is performed through the measuring slots 8a, 8b.

[0053] Preferably, the measuring slots 8a, 8b extend along respective directions of extension parallel to the feed path P of the articles 100.

[0054] Preferably, the measuring slots 8a, 8b are shorter in length, measured parallel to the feed path P, than the loading slots 5a, 5b.

[0055] As clearly shown in Figures 4 and 5, the air loading slots 5a, 5b are interposed between the measuring slots 8a, 8b relative to a direction transverse to the feed path P.

[0056] With reference in particular to Figures 4A-4D and 5A-5D, it may also be noted that, preferably, for an operating stretch of the feed path P (whose length or angular size is preferably approximately half the length

or angular size of the respective loading slot 5a, 5b), the measuring slot 8a, 8b, the respective air loading slot 5a, 5b and the respective article 100a, 100b to be measured are placed in mutual fluid communication simultaneously by the connecting means 7.

[0057] Preferably, also, as illustrated in the accompanying drawings, the operating stretch just mentioned coincides with the length of the measuring slot 8a, 8b.

[0058] As clearly shown in Figures 4 and 5, each measuring slot 8a, 8b preferably at least partly overlaps the respective air loading slot 5a, 5b along the feed path P and, still more preferably, overlaps only an end portion of the respective air loading slot 5a, 5b along the feed path P so that the pressure is measured only when the article 100 is in communication with that end portion of the of the air loading slot 5a, 5b.

[0059] Preferably, the end portion of the air loading slot 5a, 5b referred to above extends for a length that is approximately half the length of the air loading slot 5a, 5b itself.

[0060] According to this invention, the conveyor 2 preferably comprises, for each housing seat 3a, 3b, a respective vent 9a, 9b configured to intercept a respective measuring slot 8a, 8b and to relieve the pressure in the measuring slot 8a, 8b. In particular, the vents 9a, 9b are disposed on the conveyor 3 in at least two alternate sets in such a way that consecutive vents 9a, 9b intercept different measuring slots 8a, 8b.

[0061] The vents 9a, 9b and the connecting slots 7a, 7b are thus disposed alternately on the conveyor 3 at each housing seat 3a, 3b along the feed path P.

[0062] In particular, for each housing seat 3a, 3b, the respective vent 9a, 9b is disposed on the side opposite to the respective connecting slot 7a, 7b so that when the connecting slot 7a, 7b associated with the housing seat 3a, 3b is in communication with a respective measuring slot 8a, 8b, the respective vent 9a, 9b is in communication with the other measuring slot 8a, 8b.

[0063] In other terms, for each housing seat 3a, 3b, there is a connecting slot 7a, 7b on a first side and a vent 9a, 9b on a second side and for the next housing seat 3a, 3b, the first and second sides are reversed.

[0064] Preferably, each vent 9a, 9b is aligned with the respective connecting slot 7a, 7b transversely to the feed path P and, still more preferably, aligned along the direction of extension of the connecting slot 7a, 7b.

[0065] With reference to the embodiment illustrated in Figures 5A-5D, the measuring device 4 advantageously comprises, for each air loading slot 5a, 5b, a respective air pre-loading slot 10a, 10b disposed upstream of the air loading slot 5a, 5b relative to the feed path P and connected or connectable to a respective compressed air source 6c, 6d distinct from the compressed air source 6a, 6b of the respective air loading slot 5a, 5b.

[0066] More specifically, the connecting means 7 are configured to alternately connect at least one air pre-loading slot 10a, 10b to one of the housing seats 3 and, still more preferably, to connect consecutive housing

seats 3a, 3b to different air pre-loading slots 10a, 10b.

[0067] Advantageously, therefore, before being connected to the air loading slot 5a, 5b, each article 100 is first connected to an air pre-loading slot 10a, 10b. Thanks to the presence of the air pre-loading chambers 10a, 10b, it is possible to increase the length of time available to pressurize the article 100 and to allow high RTD values to be measured efficiently.

[0068] Preferably, each air pre-loading slot 10a, 10b is aligned with the respective air loading slot 5a, 5b in such a way that each article 100 is placed sequentially in fluid communication, by the connecting means 7, first with an air pre-loading slot 10a, 10b and then with the respective air loading slot 5a, 5b.

[0069] That way, the overall length of the stretch along which each article 100 is loaded with air is increased.

[0070] It should be noted that if the conveyor 2 is a drum, the air pre-loading slots 10a, 10b are preferably arcuate in extension along the feed path P. Preferably, each air pre-loading slot 10a, 10b is greater than or equal to the respective air loading slot 5a, 5b in length.

[0071] It should be noted that the lengths of the air loading slots 5a, 5b and of the air pre-loading slots 10a, 10b and their distances from each other are such that different connecting slots 7a, 7b are never placed in pneumatic communication with each other.

[0072] Also part of this invention is a method for measuring the pressure drop in a smoking article 100, comprising the following steps:

- transversely feeding a plurality of articles 100 along a feed path P through a fixed measuring device 4, where the measuring device 4 comprises two air loading slots 5a, 5b connected or connectable to distinct compressed air sources 6a, 6b;
- placing one end of each smoking article 100 in fluid communication with the at least one air loading slot 5a, 5b;
- measuring the value of pressure drop of each article 100 connected to the air loading slot 5a, 5b by alternately connecting the ends of consecutive articles 100 to different air loading slots 5a, 5b.

[0073] Preferably, the step of measuring the pressure drop of an article 100a, performed while the article 100 is connected to the respective air loading slot 5a, is performed simultaneously with a step of placing one end of the next consecutive article 100b in fluid communication with a different air loading slot 5b.

[0074] Advantageously, air can be loaded into each article 100 for a longer length of time.

[0075] Preferably, also, the step of measuring a first article 100a starts simultaneously with the starting of the step of placing one end of a second article 100b, following the first article 100a, in fluid communication with a respective air loading slot 5b.

[0076] With reference to the accompanying drawings, the air loading slots 5a, 5b preferably have the same

extension, be it linear or angular, along the feed path P and wherein the step of measuring the pressure drop of the first article 100 starts while the end of the first article 100a is disposed at an end portion of the respective air loading slot 5a, further downstream, so that the step of measuring the first article 100a starts substantially simultaneously with the starting of the step of placing one end of a second article 100b in fluid communication with the respective air loading slot 5b.

[0077] Preferably, also, the step of measuring is accomplished by connecting to each other the end of the article 100 being measured, the air loading slot 5a, 5b and the measuring slot 8a, 8b by means of a single connecting slot 7a, 7b which is movable as one with the article 100.

[0078] In particular, the step of connecting each measuring slot 8a, 8b to the respective air loading slot 5a, 5b and the end of the respective article 100 occurs after the step of connecting the air loading slot 5a, 5b to the end of the article 100.

[0079] Preferably, each step of measuring performed in one measuring slot 8a, 8b is accompanied by a corresponding step, preferably simultaneous, of venting the pressure in the other measuring slot 8a, 8b.

[0080] The operation of the measuring method is described briefly below with reference to the example embodiment of Figures 4A-4D and with particular regard to the advancing motion of two consecutive articles 100a, 100b.

[0081] In Figure 4A:

- the first article 100a is starting to be loaded with air from the compressed air source 6a through the connecting slot 7a and the loading slot 5a; the respective vent 9a, on the other hand, is not in operation;
- the second article 100b is being loaded with air from the compressed air source 6b through the connecting slot 7b and the loading slot 5b and, simultaneously, the step of measuring the second article 100b through the measuring slot 8b is starting; the vent 9b starts moving across the measuring slot 8a to relieve the accumulated pressure.

[0082] In Figure 4B:

- the first article 100a is continuing to be loaded with air; the respective vent 9a is not in operation;
- the second article 100b is ending the step of loading with air and, simultaneously, the step of measuring is ending; the vent 9b is ending the step of relieving.

[0083] In Figure 4C:

- the first article 100a is continuing to be loaded with air and, simultaneously, the step of measuring through the measuring slot 8a is starting and the step of the vent 9a relieving pressure through the measuring slot 8b is starting;

- the second article 100b has been measured and is no longer in fluid communication with the measuring device 4;
- a further second article 100b, upstream of the first article 100a, is starting to be loaded with air from the compressed air source 6b through the connecting slot 7b and the loading slot 5b; the respective vent 9b, on the other hand, is not in operation;

[0084] In Figure 4D:

- the first article 100a is ending the step of loading with air and, simultaneously, the step of measuring; the vent 9a is also ending the step of relieving;
- the further second article 100b, on the other hand, is continuing to be loaded with air.

[0085] The cycle described with reference to Figures 4A to 4D is repeated cyclically along the entire feed path P to allow all the articles 100 to be measured. Compared to what is described above with reference to Figures 4A-4D, the embodiment illustrated in Figures 5A-5D comprises an additional step of preloading with air according to this invention.

[0086] In other words, before reaching the loading slots 5a, 5b, the articles 100 undergo a step of preloading in the respective preloading slots 10a, 10b.

[0087] This invention overcomes the disadvantages of the prior art by providing a unit and a method for measuring the pressure drop in a smoking article making it possible to increase the time available for supplying an air flow into the article so as to be able to measure real pressure drop values of a wide range of articles, in particular those whose RTD is higher than that of traditional cigarettes. Thanks to the air loading slots which are longer than those of the prior art and which are managed with alternate selective logic, it is possible, under otherwise equal conditions, to load the smoking articles with a larger quantity of air.

[0088] The invention is therefore able to enhance the versatility of machines for making smoking articles without modifying the overall dimensions of the measuring unit and without having to modify the speed at which the articles are fed.

Claims

1. A unit (1) for measuring the pressure drop in a smoking article (100), comprising:

- a conveyor (2) comprising a plurality of housing seats (3) configured to receive and transversely feed a plurality of rod-shaped smoking articles (100) along a feed path (P);
- a fixed measuring device (4) disposed on the feed path (P) and configured to measure a value of pressure drop in each article (100), wherein

- the measuring device (4) comprises at least one air loading slot (5a, 5b) connected or connectable to a compressed air source (6a, 6b); - connecting means (7) disposed on the conveyor (2) and configured to connect the at least one air loading slot (5a, 5b) sequentially to one of the housing seats (3) in order to feed an air flow to the articles (100); **characterized in that** the measuring device (4) comprises at least two air loading slots (5a, 5b) connected or connectable to respective, distinct compressed air sources (6a, 6b) and **in that** the connecting means (7) are configured to alternately connect consecutive housing seats (3a, 3b) to different air loading slots (5a, 5b).
2. The unit (1) according to claim 1, wherein the at least two air loading slots (5a, 5b) extend along respective directions of extension parallel to the feed path (P) of the articles (100) and are juxtaposed with each other along a direction perpendicular to the feed path (P), and wherein the connecting means (7) comprise, for each housing seat (3a, 3b), a respective connecting slot (7a, 7b) configured to pneumatically connect the respective article (100a, 100b) to a respective air loading slot (5a, 5b) and wherein the connecting slots (7a, 7b) are disposed in at least two alternate sets in such a way that consecutive housing seats (3a, 3b) correspond to connecting slots (7a, 7b) of distinct sets configured to be connected to different air loading slots (5a, 5b).
 3. The unit (1) according to claim 2, wherein the connecting slots (7a, 7b) extend between the respective article (100a, 100b) and the respective air loading slot (5a, 5b) along respective directions of extension transverse, preferably perpendicular, to the feed path (P).
 4. The unit (1) according to one or more of the preceding claims, wherein the measuring device (5) comprises, for each air loading slot (5a, 5b), a respective measuring slot (8a, 8b) which is juxtaposed with the respective air loading slot (5a, 5b) and inside which there is a pressure sensor configured to measure a value of pressure drop associated with a respective article (100a, 100b), each measuring slot (8a, 8b) being placed in fluid communication with the respective air loading slot (5a, 5b) by the connecting means (7).
 5. The unit (1) according to claim 4, wherein the measuring slot (8a, 8b), the respective air loading slot (5a, 5b) and the respective article (100a, 100b) to be measured are placed in mutual fluid communication simultaneously by the connecting means (7) for a certain operating stretch of the feed path (P).
 6. The unit (1) according to claim 5, wherein each measuring slot (8a, 8b) at least partly overlaps the respective air loading slot (5a, 5b) along the feed path (P), and wherein the measuring slot (8a, 8b) preferably overlaps only an end portion of the respective air loading slot (5a, 5b) along the feed path (P) so that the pressure is measured only when the article (100a, 100b) is in communication with that end portion of the of the air loading slot (5a, 5b).
 7. The unit (1) according to any one of claims 4 to 6, wherein the measuring slots (8a, 8b) extend along respective directions of extension parallel to the feed path (P) of the articles (100a, 100b).
 8. The unit (1) according to claim 7, when dependent on claim 3, wherein the air loading slots (5a, 5b) are interposed between the measuring slots (8a, 8b) relative to a direction transverse to the feed path (P).
 9. The unit (1) according to one or more of claims 4-6, wherein the conveyor (2) comprises, for each housing seat (3a, 3b), a respective vent (9a, 9b) configured to intercept a respective measuring slot (8a, 8b) and to relieve the pressure in the measuring slot (8a, 8b), and wherein the vents (9a, 9b) are disposed on the conveyor (3) in at least two alternate sets in such a way that consecutive vents (9a, 9b) intercept different measuring slots (8a, 8b).
 10. The unit (1) according to claim 9, wherein, for each housing seat (3a, 3b), the respective vent (9a, 9b) is disposed on the side opposite to the respective connecting slot (7a, 7b) so that when the connecting slot (7a, 7b) associated with the housing seat (3a, 3b) is in communication with a respective measuring slot (8a, 8b), the respective vent (9a, 9b) is in communication with the other measuring slot (8a, 8b).
 11. The unit (1) according to one or more of the preceding claims, wherein the conveyor (2) is a drum which rotates about an axis of rotation (X) and has, for each housing seat (3a, 3b), at least one supporting element (3') for an end portion of an article (100a, 100b) housed in the housing seat (3a, 3b), the supporting element (3') being associated with the connecting means (7); and wherein the feed path (P) defines a circular path, the at least two air loading slots (5a, 5b) extending along arcuate directions of extension.
 12. The unit (1) according to one or more of the preceding claims, wherein the measuring device (4) comprises, for each air loading slot (5a, 5b), a respective air pre-loading slot (10a, 10b) disposed upstream of the air loading slot (5a, 5b) relative to the feed path (P) and connected or connectable to a respective compressed air source (6c, 6d) distinct from the compressed air source (6a, 6b) of the respective air load-

ing slot (5a, 5b) and wherein the connecting means (7) are also configured to alternately connect consecutive housing seats (3a, 3b) to different air pre-loading slots (10a, 10b).

13. The unit (1) according to claim 11, wherein each air pre-loading slot (10a, 10b) is aligned with the respective air loading slot (5a, 5b) in such a way that each article (100a, 100b) is placed in fluid communication, by the connecting means (7), first with an air pre-loading slot (10a, 10b) and then with the respective air loading slot (5a, 5b).

14. The unit (1) according to claim 12 or 13, wherein each air pre-loading slot (10a, 10b) is greater than or equal to the respective air loading slot (5a, 5b) in length.

15. A method for measuring the pressure drop in a smoking article (100), comprising the following steps:

- transversely feeding a plurality of rod-shaped smoking articles (100) along a feed path (P) through a fixed measuring device (4), the measuring device (4) comprising at least one air loading slot (5a, 5b) connected or connectable to a compressed air source (6a, 6b);
- placing one end of each smoking article (100) in fluid communication with the at least one air loading slot (5a, 5b);
- measuring the value of pressure drop of each article connected to the air loading slot (5a, 5b);

characterized in that the measuring device (4) comprises two air loading slots (5a, 5b) connected or connectable to distinct compressed air sources (6a, 6b) and **in that** the step of measuring the value of pressure drop of each article (100) is performed by alternately connecting the ends of consecutive articles (100a, 100b) to different air loading slots (5a, 5b).

16. The method according to claim 15, wherein the step of measuring the value of pressure drop of an article (100a, 100b), performed while the article (100a, 100b) is connected to an air loading slot (5a, 5b), is performed simultaneously with a step of placing one end of the next consecutive article (100a, 100b) in fluid communication with a different air loading slot (5a, 5b).

17. The method according to claim 15 or 16, wherein the step of measuring a first article (100a) starts simultaneously with the starting of the step of placing one end of a second article (100b), following the first article (100a), in fluid communication with a respective air loading slot (5a, 5b).

18. The method according to claim 17, wherein the air loading slots (5a, 5b) have the same extension, be it linear or angular, along the feed path (P) and wherein the step of measuring the pressure drop of the first article (100) starts while the end of the first article (100a) is disposed at an end portion of the respective air loading slot (5a), further downstream, so that the step of measuring the first article (100a) starts substantially simultaneously with the starting of the step of placing one end of a second article (100b) in fluid communication with the respective air loading slot (5b).

19. The method according to one or more of claims 15 to 18, wherein the measuring device (4) comprises, for each air loading slot (5a, 5b), a respective measuring slot (8a, 8b) inside which there is a pressure sensor, and wherein the step of measuring is performed by connecting together the end of the article (100a, 100b) measured, the air loading slot (5a, 5b) and the measuring slot (8a, 8b) by means of a single connecting slot (7a, 7b) which is movable as one with the article (100a, 100b), there being two distinct sets of connecting slots (7a, 7b) disposed in alternate succession at consecutive articles (100, 100b) so that consecutive articles (100a, 100b) are connected to different air loading slots (5a, 5b) and different measuring slots (8a, 8b).

20. The method according to claim 19, wherein the step of connecting each measuring slot (8a, 8b) to the respective air loading slot (5a, 5b) and the end of the respective article (100a, 100b) occurs after the step of connecting air loading slot (5a, 5b) to the end of the article (100a, 100b).

21. The method according to claim 19 or 20, wherein each step of measuring performed in one measuring slot (8a, 8b) is accompanied by a corresponding step, preferably simultaneous, of venting the pressure in the other measuring slot (8a, 8b).

22. A unit (1) for measuring the pressure drop in a smoking article (100), comprising:

- a conveyor (2) comprising a plurality of housing seats (3) configured to receive and transversely feed a plurality of rod-shaped smoking articles (100) along a feed path (P);
- a fixed measuring device (4) disposed on the feed path (P) and configured to measure a value of pressure drop in each article (100), wherein the measuring device (4) comprises at least one air loading slot (5a, 5b) connected or connectable to a compressed air source (6a, 6b);
- connecting means (7) disposed on the conveyor (2) and configured to connect the at least one air loading slot (5a, 5b) sequentially to one of

the housing seats (3) in order to feed an air flow to the articles (100); **characterized in that** the measuring device (4) comprises, for each at least one air loading slot (5a, 5b), a respective air pre-loading slot (10a, 10b) disposed upstream of the air loading slot (5a, 5b) relative to the feed path (P) and connected or connectable to a respective compressed air source (6c, 6d) distinct from the compressed air source (6a, 6b) of the respective air loading slot (5a, 5b) and wherein the connecting means (7) are also configured to connect the at least one pre-loading slot (10a, 10b) to one of the housing seats (3).

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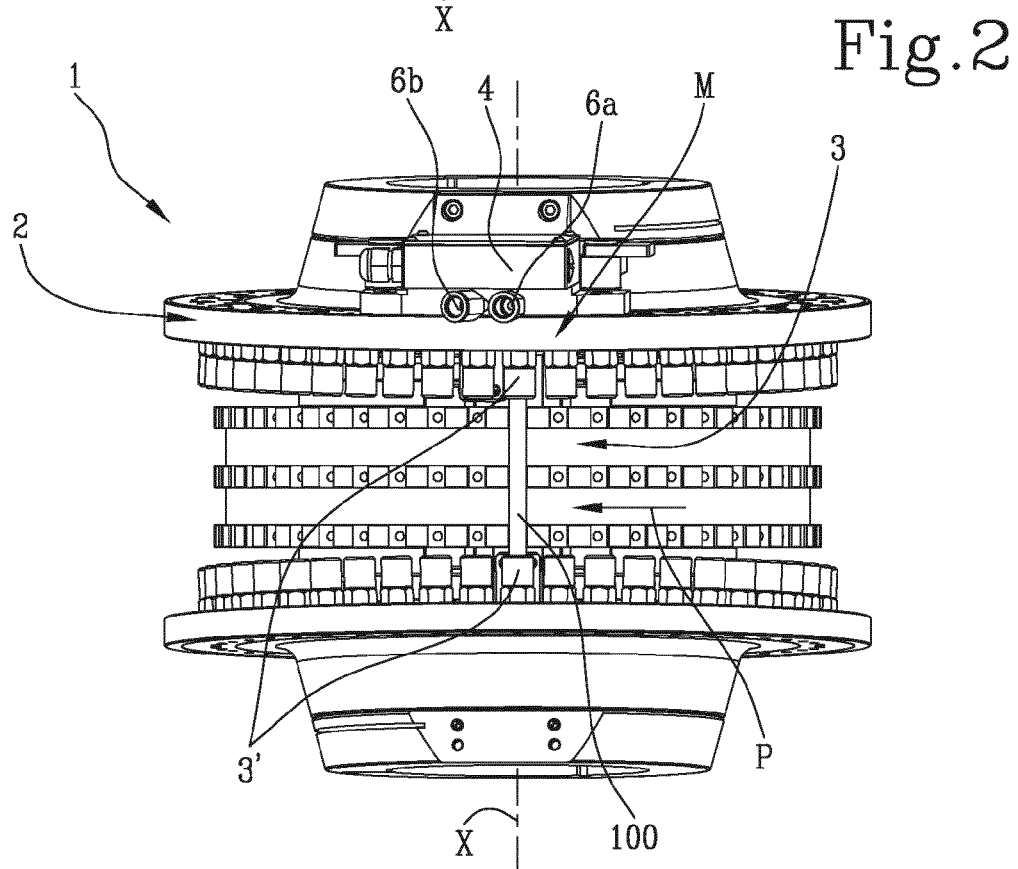
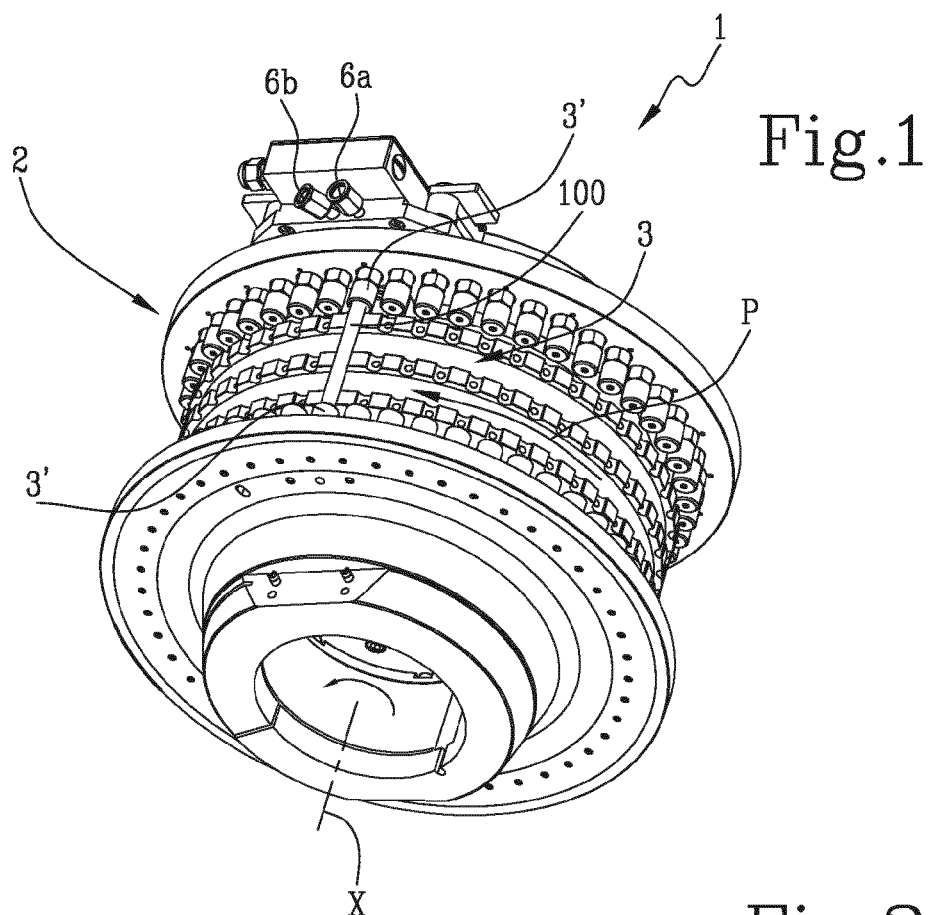
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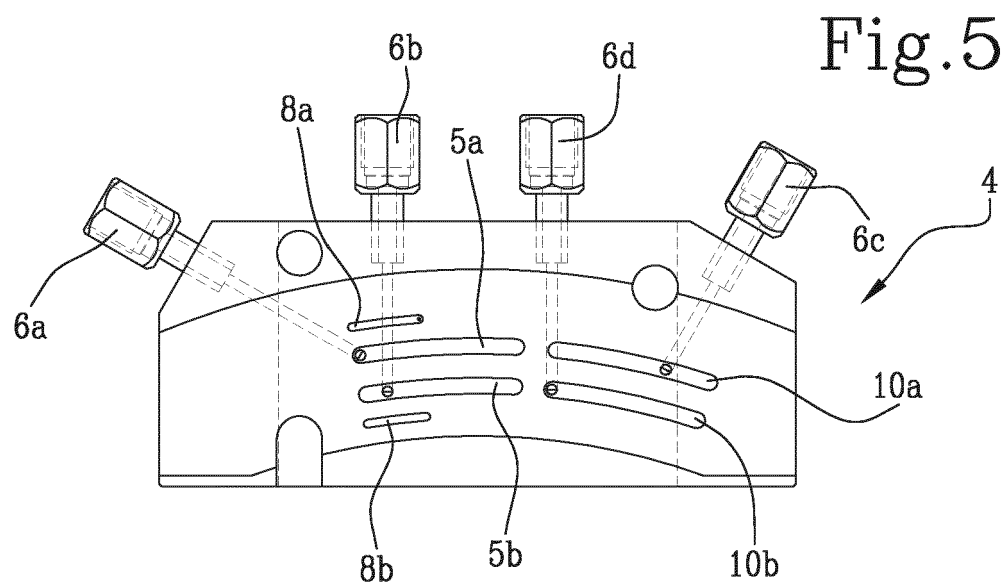
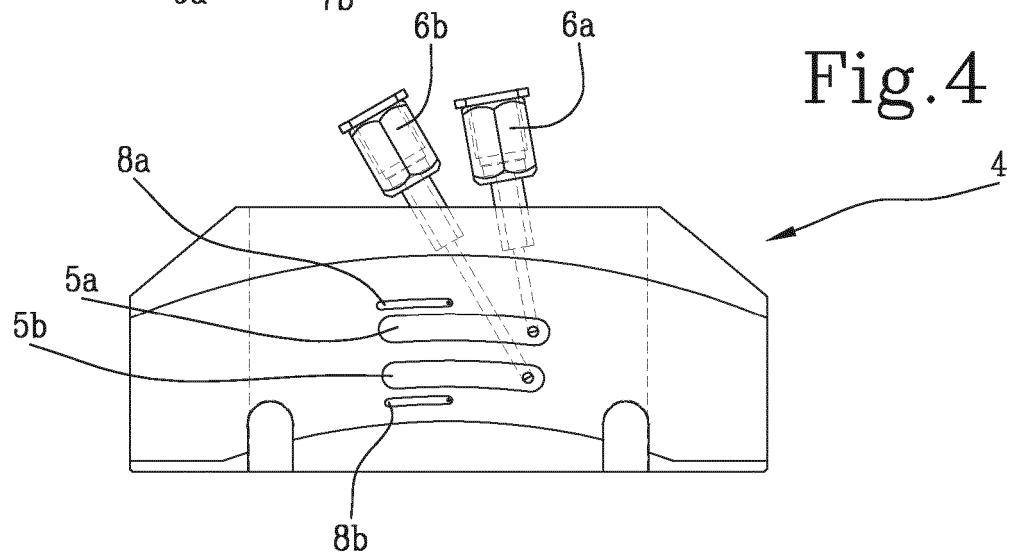
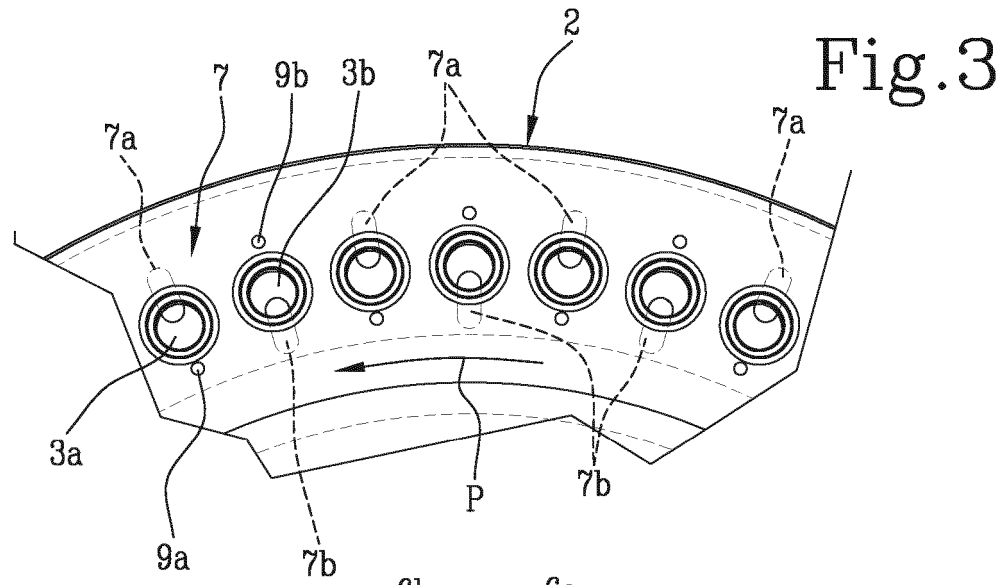


Fig.4A

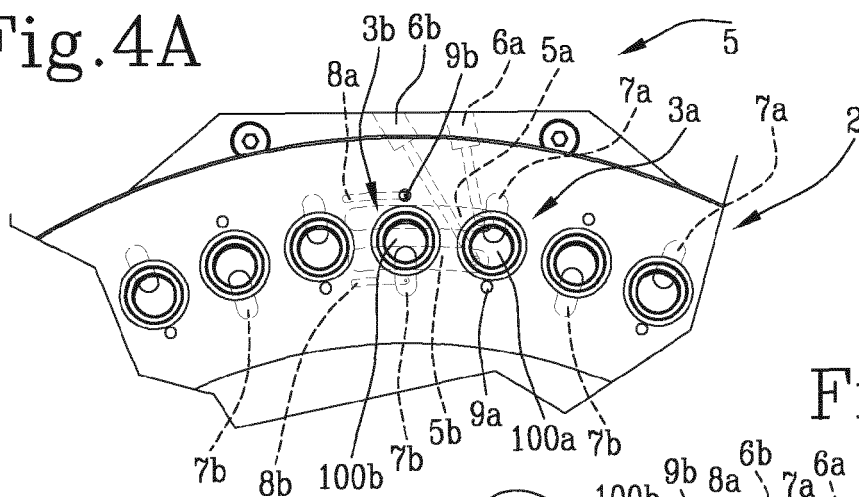


Fig.4B

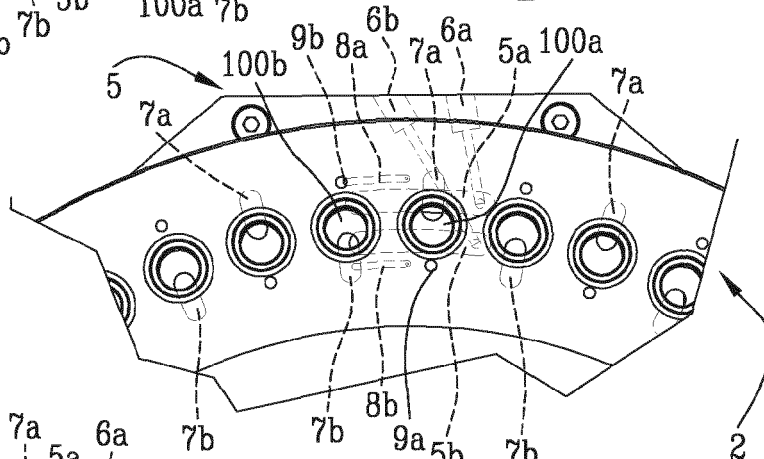


Fig.4C

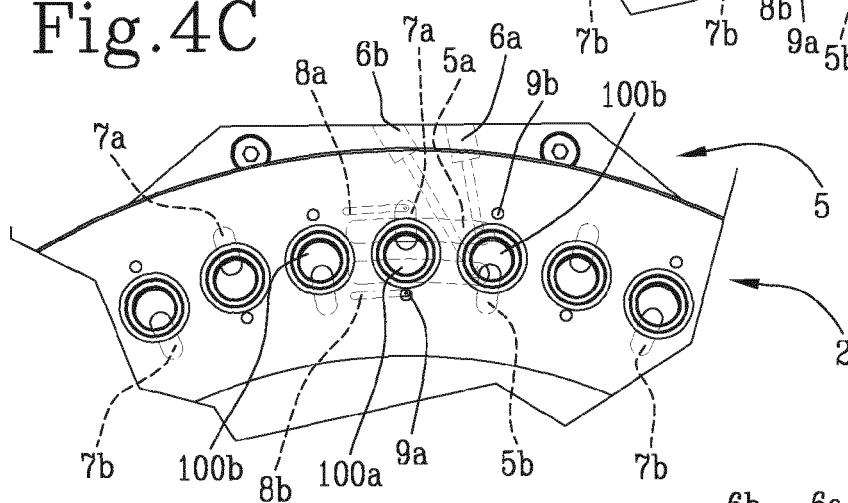


Fig.4D

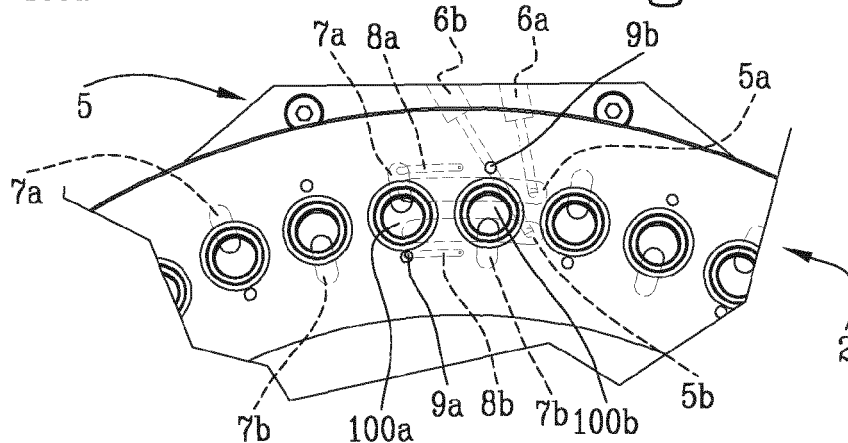


Fig.5A

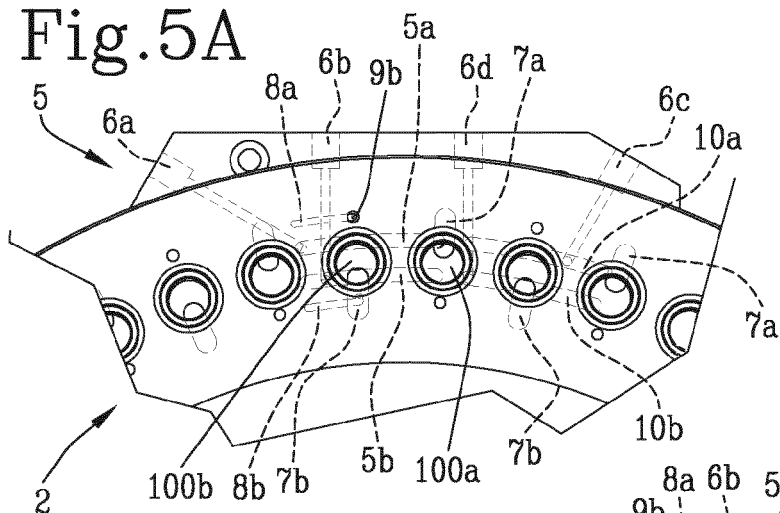


Fig.5B

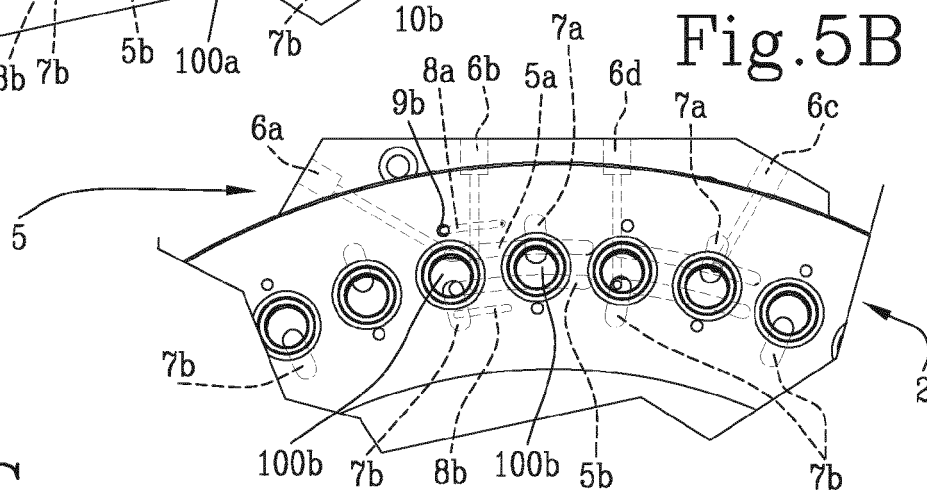


Fig.5C

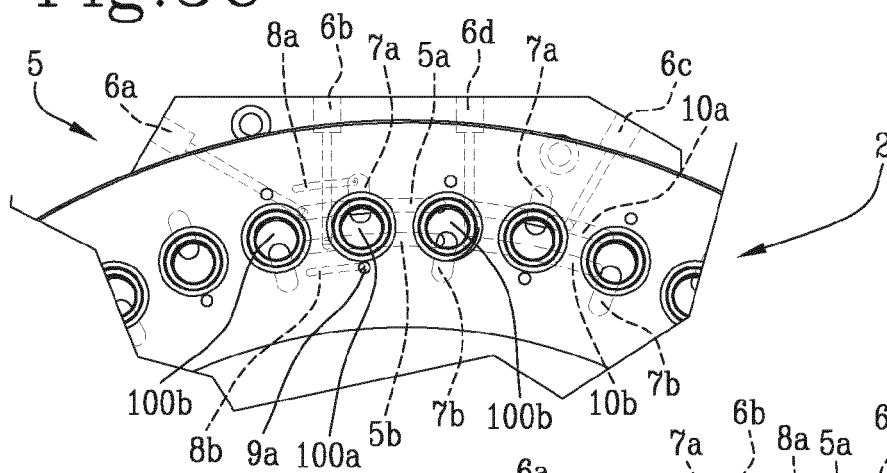
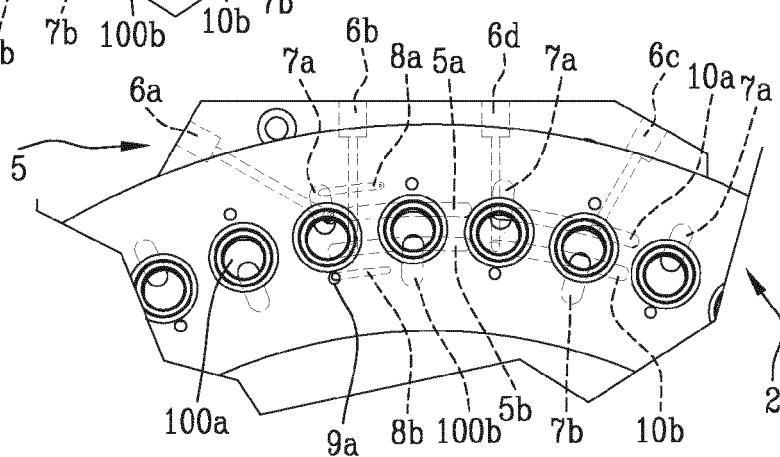


Fig.5D





EUROPEAN SEARCH REPORT

Application Number
EP 19 18 3769

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			TECHNICAL FIELDS SEARCHED (IPC)
			A24C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 December 2019	Examiner Marzano Monterosso
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-12-2019

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