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(54) **MACHINE FOR PROCESSING ROD-SHAPED ARTICLES OF THE TOBACCO INDUSTRY AND METHOD FOR THE OFF-LINE TRANSFER OF ROD-SHAPED ARTICLES OF THE TOBACCO INDUSTRY**

(57) Described are a machine for processing rod-shaped articles of the tobacco industry and a method for the off-line transfer of rod-shaped articles of the tobacco industry, implemented by the machine, wherein the machine comprises a succession of drums for transversely feeding an ordered succession of rod-shaped articles (100), at least one processing and/or inspection unit associated with at least one of the drums and a trans-

fer unit (1) defining a first and a second feed path (P1, P2), which are separate from each other, and comprising a transverse feed channel (11) for one or more rod-shaped articles (100) and selecting means (50), disposed at the exit of the feed channel (11) and configured to direct each article (100) individually and controlledly towards the first or the second feed path (P1, P2).

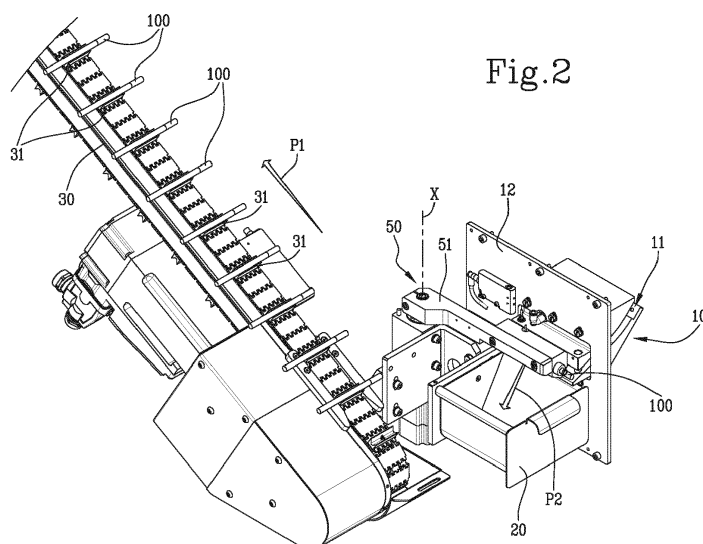


Fig.2

Description

[0001] This invention relates to a machine for processing rod-shaped articles of the tobacco industry, specifically cigarettes, filter or tobacco segments, tubular segments and the like, and to a method for the off-line transfer of rod-shaped articles of the tobacco industry, implemented by the machine. Transfer is performed in multi-functional mode and may be carried out, for example, for off-line inspection, sorting or rejection purposes.

[0002] In prior art automatic machines of the tobacco industry, in particular for the production of cigarettes, the off-line inspection of articles is typically carried out by taking individual articles from an ordered flow of articles and delivering these articles into a specific container which is subsequently transported to an inspection station by an operator. The same applies to defective articles, which are diverted from the normal flow of articles and directed to specific collection containers which are then forwarded manually to a disassembly device.

[0003] There is therefore a need to simplify rejection and/or inspection operations, automating them as much as possible.

[0004] The need specified is met by a machine for processing rod-shaped articles of the tobacco industry and by a method for the off-line transfer of rod-shaped articles of the tobacco industry, in accordance with claims 1 and 13, respectively, and with one or more of the claims dependent thereon. The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment of it and in which:

- Figure 1 shows a perspective view of a unit for transferring rod-shaped articles of the tobacco industry, the unit being usable in a machine according to the invention and being shown in a working configuration;
- Figure 2 shows a perspective view of a first portion of the unit of Figure 1 in a first working position and with the protective guards removed in order to illustrate the operating components located therein;
- Figure 3 shows a side view of the portion of Figure 2;
- Figure 3A is a scaled-up view of a detail from Figure 3;
- Figure 4 is a perspective view of the portion of Figure 2 in a second working position;
- Figure 5 shows a side view of the portion of Figure 4;
- Figure 5A shows a front view of a detail of the unit of Figure 1;
- Figure 6 shows a perspective view of a second portion of the unit of Figure 1 with the protective guards removed in order to illustrate the operating components located therein.

[0005] The numeral 1 in the accompanying drawings denotes in its entirety a unit for the off-line transfer of rod-shaped articles of the tobacco industry. The unit 1 is us-

able in a machine for processing rod-shaped articles for the tobacco industry in accordance with the invention.

[0006] The expression "off-line" is used to denote a process performed outside of the production line, in particular following the diversion (extraction) of a reduced number of articles from the production line. These articles are subjected to specific inspections or tests, in particular of the kind not practicable in process on account of the very high production speeds involved, and subsequently returned to the production line or discarded. Alternatively, the extracted articles may be sent directly to a disassembly device to recover the materials (in the case of non-conforming articles). According to the invention, the unit 1 forms part of a machine (not illustrated in its entirety since it is of known type) for processing rod-shaped articles of the tobacco industry, such as, for example, for making cigarettes (filter tip attachment machine), which comprises a succession of drums for transversely feeding an ordered succession of rod-shaped articles, and at least one processing and/or inspection unit associated with at least one drum. In this solution, the unit 1 is coupled with one of the drums to receive a succession of articles from the drum following the expulsion of the articles from the drum. Expulsion, which may be carried out by mechanical, pneumatic or other means, is intended to remove only some of the articles from the production line, for example, individual articles or a short succession of them or, more generally speaking, a subset of the articles forming the succession of articles. The articles selected, diverted transversely, are fed directly to the unit 1 by the same transverse movement. For this purpose, the unit 1 is preferably disposed adjacent or almost tangent to the respective drum of the machine. Furthermore, operatively, the articles not transferred to the unit 1 remain on the drum and proceed in the direction of other drum and/or of the processing unit in line.

[0007] In different embodiments, the unit 1 could be used in machines of a different kind, for example, in machines where the articles advance longitudinally (maker machines for forming filter or cigarette segments) or where the articles are fed to the unit 1 by means of containers of predetermined capacity.

[0008] Figure 1 shows the unit 1 in a working configuration, covered by protective guards which hide its working components. The unit 1 comprises a receiving portion 10, a collecting container 20, a conveyor 30, a movement device 40 and an inspection unit (not illustrated) downstream of the movement device 40.

[0009] The receiving portion 10 is shaped to define a straight and/or curved, transverse feed channel 11, preferably extending downwards, for one or more rod-shaped articles 100 extracted from the drum (in the solution illustrated, the articles 100 are filter cigarettes). As may be seen in Figure 2, the receiving portion 10 is preferably integral with a mounting flange 12 for coupling to a wall of the machine, specifically a vertical wall, in such a way that the receiving portion 10, in use, is positioned adjacent or tangent to the drum, within the internal space of

the machine. Preferably, the flange 12 defines a separating plane, where only the receiving portion 10 is positioned on one side of the separating plane and the rest of the unit 1 is positioned on the other side of the separating plane. Thus, the receiving portion 10 is the only part of the unit 1 that is, in use, positioned inside the protective casing or frame of the machine.

[0010] As shown in the view of Figures 3 and 3A, the feed channel 11 extends from a first end 11a, which is positioned on one side of the flange 12 (inside the machine), to a second end 11b, which is positioned on the opposite side of the flange 12 (outside the machine). In other words, the receiving portion 10 and the feed channel 11 extend across the flange 12 so that the articles 100 coming from the drum move out of the internal space of the machine to reach the second end 11b.

[0011] The feed channel 11 is configured to allow only one article 100 to pass through at a time, in an ordered succession and keeping the articles 100 at the exit in the same order as they have at the entrance. For this purpose, the feed channel 11 has a thickness that is less than double the diameter of the rod-shaped articles 100, and preferably between 1 and 1.5 times this diameter.

[0012] Downstream of the feed channel 11, the unit 1 defines a first and a second, separate feed path P1 and P2 suitable for transporting the articles 100 individually to different destinations.

[0013] In the embodiment illustrated, the first feed path P1 is defined by the conveyor 30, whilst the second feed path P2 is defined by the articles 100 falling by gravity into the container 20 located under the exit of the feed channel 11.

[0014] The first feed path P1 extends transversely, specifically perpendicularly, to the feed movement of the articles 100 in the end stretch of the feed channel 11. More specifically, the first feed path P1 extends laterally and partly upwards with respect to the feed movement of the articles 100 in the end stretch of the feed channel 11.

[0015] According to the invention, the unit 1 also comprises selecting means (50), disposed at the exit of the feed channel 11 and configured to direct each article 100 individually and controlledly towards the first or the second feed path P1, P2, thus selecting, for each article 100, the path which that article 100 is intended for.

[0016] The selection means 50 may be embodied in any suitable manner, provided they are able to individually direct each article 100 to the respective feed path P1, P2 and, in particular, where required, to keep the articles 100 moving in succession in the same order as the order defined in the feed channel 11.

[0017] In the embodiment illustrated, the selecting means 50 comprise a gripping and transferring member 51 which is movable between a gripping position (Figures 2, 3 and 3A), where it is positioned at the exit of the feed channel 11 to receive and retain a single rod-shaped article 100, and a releasing position (Figures 4 and 5), where it transfers the rod-shaped article 100 to the con-

veyor 30.

[0018] Looking in more detail, the gripping and transferring member 51 is embodied in the form of a gripping arm or finger and has an arcuate retaining portion 52 adapted to define a seat that is substantially shaped to match an outer cylindrical portion of an article 100. The retaining portion 52, at the gripping position, is disposed at a position such as to intercept a portion of an article 100 positioned at the exit of the feed channel 11, specifically an upper front portion of the article 100. That way, the gripping and transferring member 51 is positioned to obstruct the exit of the feed channel 11 so that the article 100 advancing along the feed channel comes to a stop against the retaining portion 52 of the gripping and transferring member 51.

[0019] At the releasing position, on the other hand, the gripping and transferring member 51 is disposed above the conveyor 30 so it can release the respective article 100 downwards onto the conveyor 30.

[0020] Preferably, the retaining portion 52 of the gripping and transferring member 51 is provided with one or more openings (not illustrated) connected to a source of pneumatic suction in order to hold the article 100 securely in the retaining portion 52.

[0021] Preferably, the unit 1 also comprises pneumatic suction shutoff means (not illustrated) operating at least when the gripping and transferring member 51 is positioned at the releasing position, thereby making it easier for the article 100 to be released onto the conveyor 30. In addition or alternatively, the openings of the retaining portion 52 are each connectable to a source of pressurized air at least when the gripping and transferring member 51 is positioned at the releasing position so as to expel the article 100 from the retaining portion 52. Preferably, shutting off the suction and/or switching between suction and blowing are performed by specific switching valves mounted on a pneumatic supply duct (not illustrated) communicating with the gripping and transferring member 51.

[0022] In the embodiment illustrated, the gripping and transferring member 51 also comprises an arm rotatable about an axis of rotation X. The axis of rotation X is preferably vertical so as to keep the article 100 in a horizontal positioning plane as it passes from the feed channel 11 to the conveyor 30.

[0023] The gripping and releasing positions are also preferably spaced from each other by a rotation of 90° of the gripping and transferring member 51 about the axis of rotation X.

[0024] The rotation about the axis X is obtained via a suitable, automatically controlled drive member, not illustrated.

[0025] Preferably, the gripping and transferring member 51, when it is at the releasing position (Figures 4 and 5), clears the exit of the feed channel 11 to allow feeding a rod-shaped article 100 from the feed channel 11 to the second feed path P2 so the article 100 can fall freely into the container 20 below.

[0026] The container 20 may be a tray-like container, closed at the bottom, suitable for being extracted manually by an operator and transported to a predetermined destination.

[0027] Alternatively, the container 20 may be provided, at the bottom of it, with a conveyor (not illustrated) configured to periodically or continuously remove the articles 100 from the bottom of the container 20 and to transport them to a processing station such as, for example, a disassembly device. The bottom conveyor, a conveyor belt, for example, may remove the articles 100 without keeping them in any particular order or orientation, that is to say, freely. Alternatively, the bottom conveyor, a conveyor belt, for example, may remove the articles 100 while keeping them in a predetermined order or orientation, that is to say, in ordered fashion.

[0028] In a preferred embodiment, the selecting means 50 also comprise at least one retaining member (not illustrated) that is configured to hold a rod-shaped article 100 or a succession of rod-shaped articles 100 temporarily within the feed channel 11, in particular at the exit of the feed channel 11 or in an intermediate section of the feed channel 11. That way, while the article 100 further downstream is being allowed to move towards the first or the second path P1 or P2, any other articles 100 queuing up behind it are held back in the feed channel. Preferably, the selecting means 50 comprise one or more retaining means in the form of one or more stop teeth.

[0029] Alternatively, the gripping and transferring member 51 may itself define the retaining member configured to stop an article 100 and to pick it up or allow it to fall into the container 20.

[0030] The aforementioned configuration of the receiving portion 10 and selecting means 50 allows directing each article 100 individually and controlledly to the first or the second path P1, P2 while keeping the articles 100 in the same order as in the feed channel 11.

[0031] Figures 2-6 show the embodiment of the conveyor 30 in detail, without the protective guards (shown in Figure 1) which fully enclose the conveyor 30. The conveyor 30 is, in particular, an endless linear conveyor provided with transverse seats 31 for accommodating individual rod-shaped articles 100. The seats 31 are preferably defined by support blocks fixed to a hinged mesh belt; the conveyor 30 might, however, be embodied in accordance with different solutions.

[0032] Preferably, the length of each seat 31 is shorter than the length of each article 100 so that the ends of the article 100 accommodated in the seat 31 jut outward from the seat 31.

[0033] Preferably, the conveyor 30 moves intermittently in steps equal to the spacing between the seats 31. That way, after receiving an article 100, the conveyor 30 is made to advance by a length sufficient to bring the next seat 31 to a position suitable for receiving the next article 100 from the gripping and transferring member 51, specifically a position where the seat 31 and the retaining portion 52 of the gripping and transferring member 51

are aligned.

[0034] The seats 31 may be configured as suction seats for securely holding the articles 100.

[0035] In order to make it easier for the articles in the seats 31 of the conveyor 30 to be released by the gripping and transferring member 51, there may be a guiding member 33 (Figure 5A) positioned in the releasing zone under the gripping and transferring member 51 when the latter is at the releasing position. The guiding member 33 may have one or more guide surfaces 34, specifically a pair of surfaces 34 converging to form a V shape at the opposite ends of the articles 100, hence on opposite sides of the seat 31 of the conveyor 30 intended to receive the article 100. Thus, the guide surfaces 34 direct each article 100 into the respective seat 31, thus optimizing the precision of its release. The guiding member 33 is fixed relative to the releasing zone. Alternatively, the guiding member 33 might be movable towards and away from the releasing zone to perform the aforesaid guiding function and then allow the article 100 to be moved away by the conveyor 30.

[0036] The guiding member 33 may comprise one or more openings (preferably at the one or more guide surfaces 34) connectable to a source of pressurized air to expel (by blowing) the article 100 from the retaining portion 52 of the gripping and transferring member 51.

[0037] The conveyor 30 has an active section, specifically the upper section, which extends from the selecting means 50 to the movement device 40. At the movement device 40, the articles 100 are removed from the seats 31, for example, by fixed diverters 32 which act on the protruding ends of the articles 100, thereby dislodging the articles from the seats 31.

[0038] To receive the articles 100 thus dislodged, the movement device 40 has a receiving channel 41, positioned to face the exit section of the conveyor 30, specifically under it and oriented transversely to the feed direction of the conveyor 30. The receiving channel 41 may be defined by a bottom portion of a receiving wall 42 having a convergent shape such as to make the articles 100 converge by gravity towards the receiving channel 41. The movement device 40 also comprises pushing means 43 operating along the channel to push the article 100 axially from a first portion of the receiving channel 41, facing the conveyor 30, to a second portion of the receiving channel 41, corresponding to an inlet opening A of the inspection unit (not illustrated). The pushing means 43 preferably comprise a linear actuator 44 provided with a front pushing wall 45 transverse to the receiving channel 41. The linear actuator 44 may be an actuator with linear or rotary drive and is associated with an encoder for checking the axial position adopted along the channel 41.

[0039] Preferably, the movement device 40 comprises an article presence sensor (for example, a photocell) operating on the receiving channel 41 to provide a signal representing the presence and/or absence of an article 100 inside the receiving channel 41 so as to stop the

pushing means if the presence of an article 100 in the receiving channel 41 has already been detected, thereby preventing articles 100 from colliding during the automatic operation of the unit 1.

[0040] Preferably, the movement device 40 comprises a cover 46 movable between a covering position, suitable for automatic loading of the articles 100 into the inspection unit through the opening A, and an open position (Figure 6), suitable for manual loading of the articles 100 into the inspection unit, through the opening A in this case, too. The open position is configured in such a way as to uncover the opening A of the inspection unit. According to an aspect of the invention, the pushing means 43 are controlled in such a way as to stop automatically when the cover 46 moves to the open position. Preferably, the cover 46 is hinged about a preferably horizontal tilt axis.

[0041] The invention achieves the preset aims, overcoming the disadvantages of the prior art.

[0042] The unit is fully automated and capable of directing each article along the chosen path, specifically a path leading to its storage/disassembly or a path leading to an inspection zone.

Claims

1. A machine for processing rod-shaped articles for the tobacco industry, comprising:

- a succession of drums for transversely feeding an ordered succession of rod-shaped articles (100),
- at least one processing and/or inspection unit associated with at least one of the drums, and
- a transfer unit (1) defining a first and a second feed path (P1, P2), which are separate from each other, and comprising a transverse feed channel (11) for one or more rod-shaped articles (100) and selecting means (50), disposed at the exit of the feed channel (11) and configured to direct each article (100) individually and controlled towards the first or the second feed path (P1, P2),

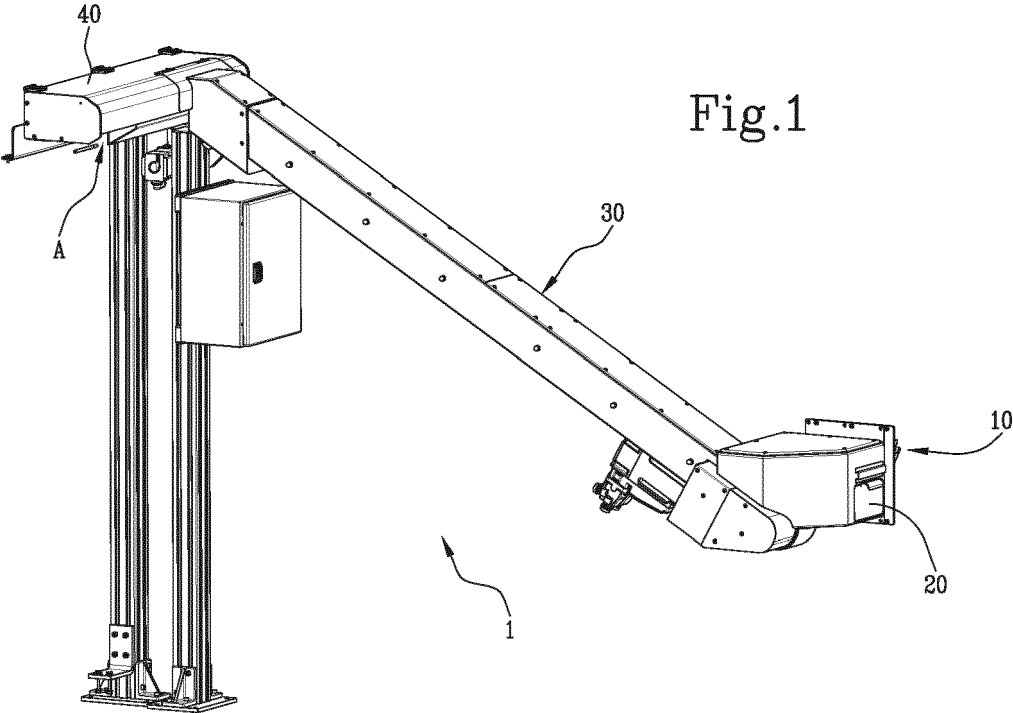
wherein the transfer unit (1) is coupled to one of the drums to receive one or more articles (100) from the drum after the one or more articles (100) are expelled from the drum to the feed channel (11) of the transfer unit (1), preferably by pneumatic or mechanical means.

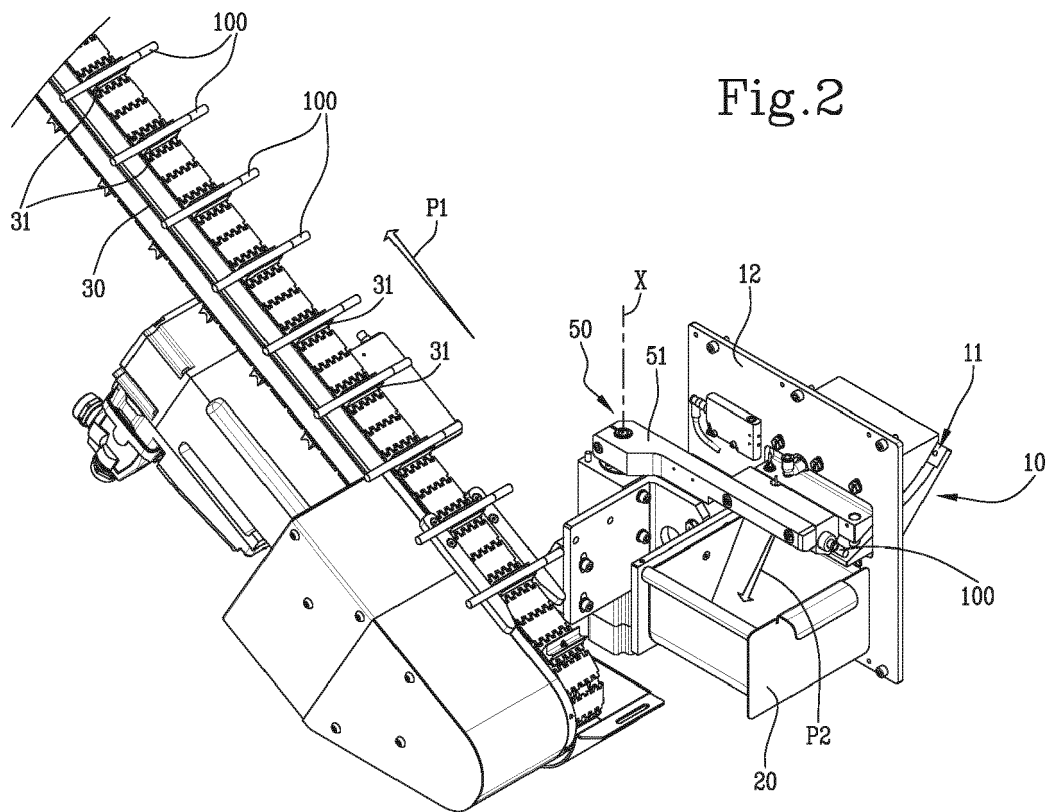
2. The machine according to claim 1, wherein the first feed path (P1) is defined at least partly by a conveyor (30) provided with transverse receiving seats (31) for accommodating single rod-shaped articles (100), the conveyor (30) being preferably a linear conveyor and, more preferably, a belt, chain or articulated

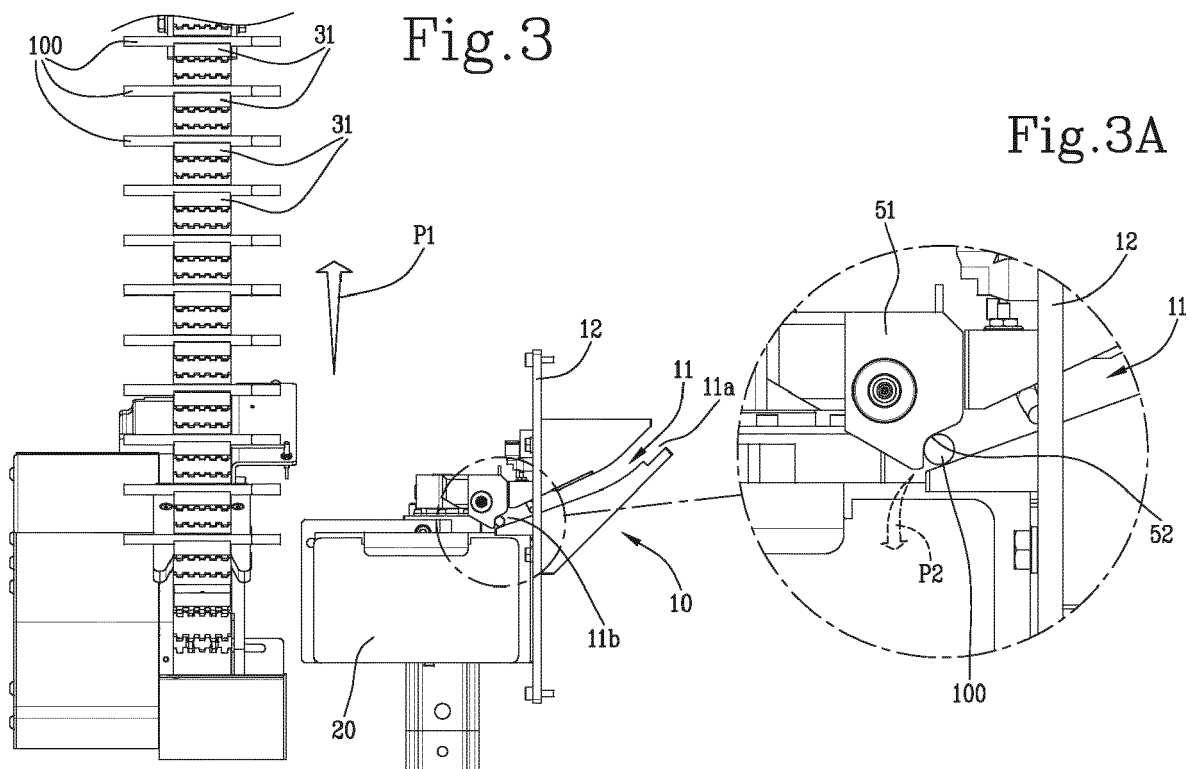
mesh conveyor.

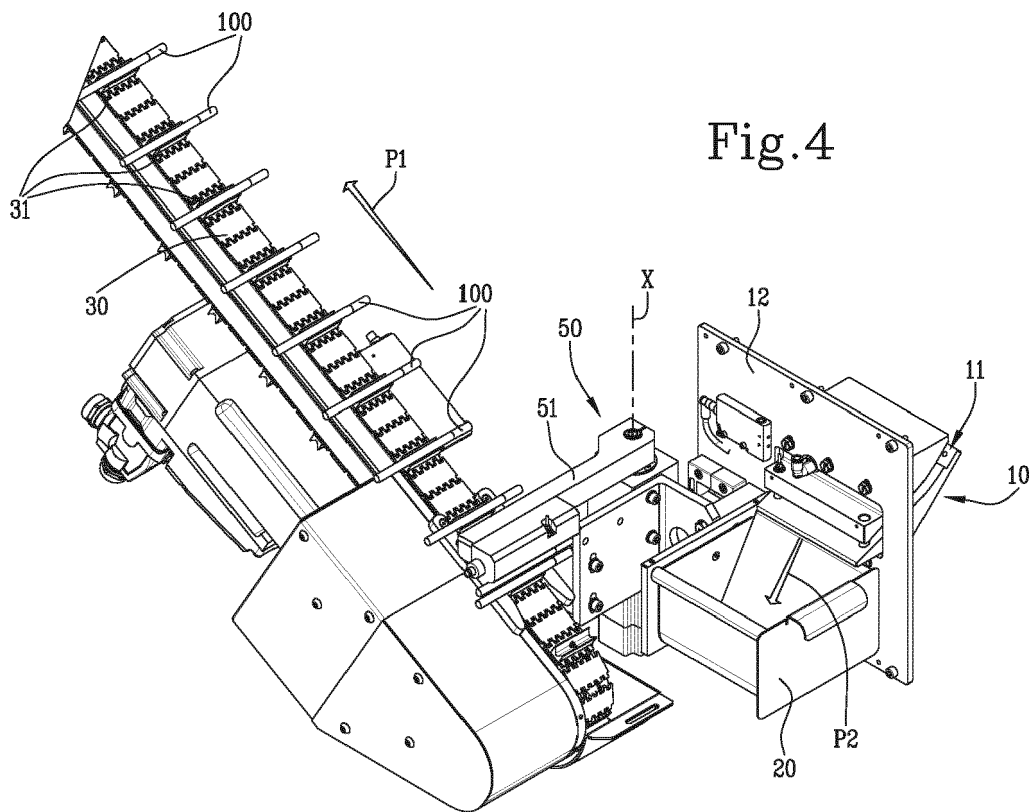
3. The machine according to claim 2, wherein the selecting means (50) comprise a gripping and transferring member (51) which is movable between a gripping position, where it is positioned at the exit of the feed channel (11) to receive and retain a single rod-shaped article (100), and a releasing position, where it releases the rod-shaped article (100) into a receiving seat (31) of the conveyor (30).
4. The machine according to claim 3, wherein the gripping and transferring member (51), when it is at the gripping position, is positioned to obstruct the exit of the feed channel (11) and/or wherein the gripping and transferring member (51), when it is at the releasing position, clears the exit of the feed channel (11) to allow feeding a rod-shaped article (100) from the feed channel (11) to the second feed path (P2).
5. The machine according to claim 3 or 4, wherein the gripping and transferring member (51) comprises an arm rotatable about a preferably vertical axis (X) and provided with at least one retaining portion (52) having at least one opening that is connected to a pneumatic suction source.
6. The machine according to claim 5, further comprising pneumatic suction shutoff means operating at least when the gripping and transferring member (51) is positioned at the releasing position, thereby making it easier for the article (100) to be released onto the conveyor (30), and/or wherein the opening is also connectable to a pressurized air source at least when the gripping and transferring member (51) is at the releasing position, thereby expelling the article (100) from the retaining portion (52).
7. The machine according to any one of claims 1 to 6, wherein the selecting means (50) comprise at least one retaining member that is configured to hold a rod-shaped article (100) temporarily within the feed channel (11), in particular at the exit of the feed channel (11) or in an intermediate section of the feed channel (11), the retaining member preferably comprising a movable stop tooth.
8. The machine according to any one of the preceding claims, wherein the second feed path (P2) is defined by a downwardly directed stretch which feeds the articles by gravity into a collecting container (20) below.
9. The machine according to claim 8, wherein the collecting container (20) is provided, at the bottom of it, with a conveyor for carrying the articles (100), in particular, disposed in orderly fashion, towards a further operating station, in particular a disassembly station.

10. The machine according to any one of the preceding claims, further comprising an inspection unit that is located along the first path (P1), in particular, downstream of the conveyor (30). 5
11. The machine according to claim 10, comprising a movement device (40), interposed between the conveyor (30) and the inspection unit and comprising a receiving channel (41), disposed transversely to the feed direction of the conveyor (30) to receive an article (100) from the conveyor (30), specifically by gravity, and pushing means (43) operating along the receiving channel (41) to push the article (100) axially from a first portion of the receiving channel (41), facing the conveyor (30), to a second portion of the receiving channel (41), corresponding to an inlet opening (A) of the inspection unit. 10 15
12. The machine according to claim 11, wherein the movement device (40) comprises a cover (46) that is movable between a covered position, suitable for automatically loading the articles (100) to the inspection unit, and an open position, suitable for manually loading the articles (100) to the inspection unit, the open position being configured in such a way as to uncover the inlet opening (A) of the inspection unit, and wherein the pushing means (43) are controlled in such a way as to stop automatically after the cover (46) is moved to the open position. 20 25 30
13. A method for the off-line transfer of rod-shaped articles of the tobacco industry, implemented by a machine according to any one of the preceding claims, comprising the steps of feeding a succession of articles along a feed line defined by the succession of drums and along which the articles are subjected to at least one step of processing and/or inspecting, the method further comprising a step of extracting one or more of the articles from the succession by expelling them, preferably mechanically or pneumatically, from one of the drums while other articles of the succession proceed along the feed line, followed by a step of transversely feeding the extracted articles (100) along the feed channel (11) and by a step of directing each article (100) individually and controlledly towards the first or the second feed path (P1, P2). 35 40 45
14. The method according to claim 13, wherein the step of directing each article (100) individually and controlledly towards the first or the second feed path (P1, P2) is carried out while temporarily stopping other articles (100) present in the feed channel (11). 50
15. The method according to claim 13 or 14, wherein the step of directing each article (100) individually and controlledly towards the first or the second feed path (P1, P2) is carried out while keeping the articles (100) in the same as in the feed channel (11), specifically the feed channel (11) having a thickness between 1 and 1.5 times the diameter of the rod-shaped articles (100). 55









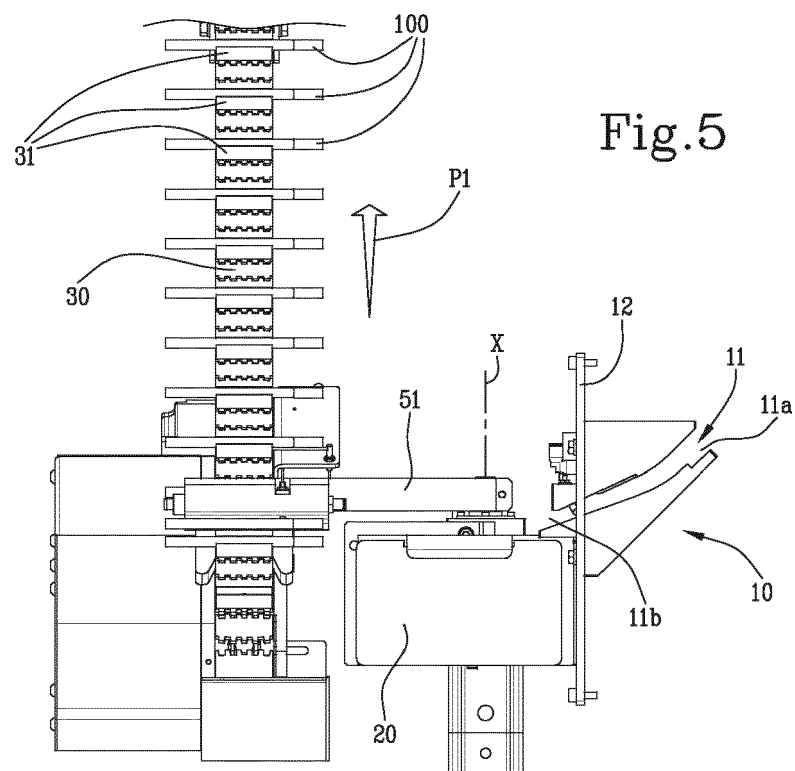
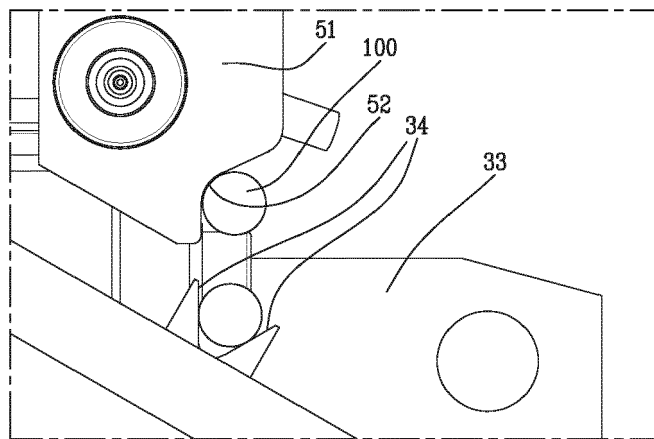
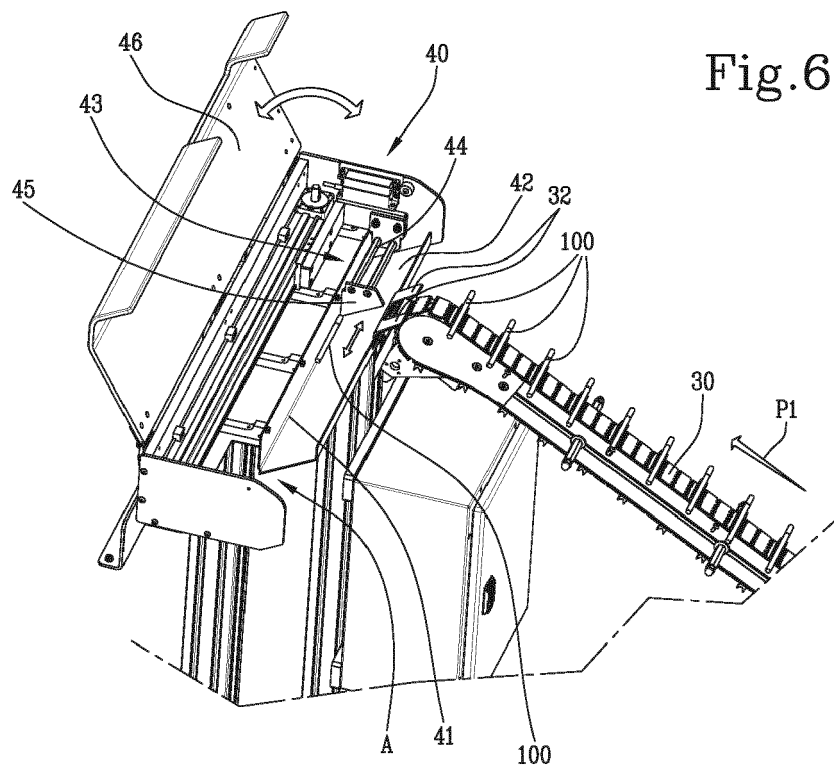


Fig.5A







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Application Number

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 May 2023	Examiner Cabrele, Silvio
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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