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(54) **Device for forming a tobacco rod**

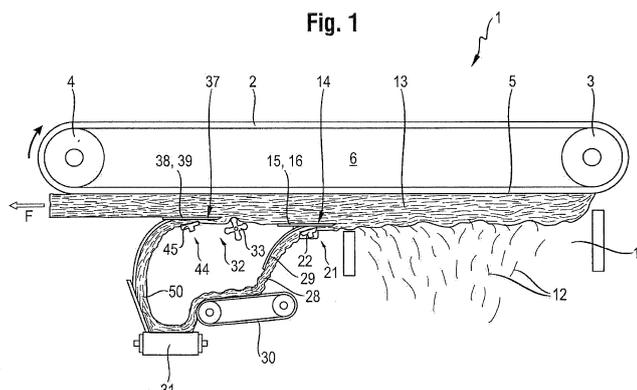
(57) A device for forming a tobacco rod with

- a discharging apparatus (1) for discharging loose tobacco out of a tobacco container (11) in the form of an endless tobacco rod (13) along a conveying section (10),
- an apparatus for forming tobacco accumulations (32), which forms local tobacco accumulations (36) in the endless tobacco rod (13) on the conveying section (10) at regular intervals and
- a trimming apparatus (37) for trimming the height of the tobacco rod (13) at least between the local tobacco accumulations (36),
- wherein the trimming apparatus (37) has a pair of rotating trimming disks (38, 39), the rotational axes (40, 41) of which are arranged on different sides of the conveying section (10), the peripheries (42, 43) of which approach

each other within the conveying section (10) and between which the discharging apparatus (1) conveys the tobacco rod (13) and

- which has a removal means (44) for excess tobacco with at least one rotating blade (48), which is arranged on the side of the trimming disks (38, 39) facing away from the discharging apparatus (1), sweeps over the insertion area (49.1) between the peripheries (42, 43) of the trimming disks (38, 39) in front of the point (49) of the greatest convergence of their peripheries (42, 43) with the at least one rotating blade (48) in order to thereby separate the sections of the tobacco rod (13) protruding from the trimming disks (38, 39) at least between the tobacco accumulations (36).

Fig. 1



Description

[0001] The invention relates to a device for forming a tobacco rod. Furthermore, the invention relates to a machine of the tobacco-processing industry, in particular a cigarette rod machine, with the device for forming a tobacco rod. Finally, the invention relates to a method for forming a tobacco rod.

[0002] In cigarette rod machines, an endless tobacco rod is formed from loose tobacco. It is continuously wrapped with an endless strip of cigarette paper. The thus formed endless cigarette rod is cut in individual cigarettes. On the front end and if applicable on the rear end, cigarettes have a somewhat higher tobacco density so that tobacco fibres do not fall out. The compacted areas are also called end-densifying. Outside of the end-densifying, the most even possible tobacco density is striven for. For this, local tobacco accumulations are designed in the endless tobacco rod at regular intervals and the height of the endless tobacco rod is trimmed. The endless tobacco rod is cut in the areas of the local tobacco accumulations wherein cigarettes with a head fortification only on the front end are cut from the cigarette rod at the border of the local tobacco accumulation and cigarettes with end-densifying on the front and back are cut off the cigarette rod between the two borders of the local tobacco accumulations.

[0003] According to EP 0 846 424 B1, a device for forming a tobacco rod for cigarette manufacture with a suction-type rod conveyor is known, which is equipped with a revolving, continuous, porous belt, to which vacuum is applied from the top and on whose underside tobacco shreds are conveyed along a tobacco channel. The device has a pre-equalizer for equalizing the height of the tobacco rod being conveyed in that part of the tobacco rod is removed. Furthermore, the device according to the invention has an apparatus for compacting the tobacco rod at periodic intervals and an equalizer that, in order to equalize the height of the tobacco rod that is compacted at regular intervals, removes additional tobacco from the tobacco rod. For the clean separation of tobacco fibres from the tobacco rod, the pre-equalizer has a revolving blade, which is positioned directly below the tobacco channel. According to one embodiment, the pre-equalizer has two circular blades overlapping within the tobacco channel, which shear off the protruding tobacco fibres.

[0004] Furthermore, devices for forming a tobacco rod are known, which, below a suction rod conveyor, have a pre-equalizer with two trimming disks and a bevelled wheel arranged below it for cutting off the tobacco. Behind it in the conveying direction, a rotating cam is arranged for compacting the tobacco rod at regular intervals. This is followed in the conveying direction by another equalizer with a pair of trimming disks and a bevelled wheel arranged below it for cutting off tobacco, so that it has overall the height of the compacted areas.

[0005] EP 0 645 098 B1 discloses an apparatus in a

cigarette rod making machine for removing surplus tobacco from a tobacco rod moving in a tobacco channel in a suction rod conveyor. The apparatus comprises two holding discs which rotate in opposite directions and are at least approximately in mutual contact by way of their periphery, roughly in the middle of the tobacco channel, at a distance from the suction rod conveyor corresponding to the intended rod height. A removal means is associated with the holding discs on the side facing away from the rod. Further, a compacting means for compacting sections of the tobacco rod before the removal of the surplus is provided. The holding discs are designed as plain circular discs. The removal means is designed as a circular knife which rotates about a knife axis and the cutting edge of which passes through the contact region of the holding discs on the side of the latter facing away from the rod. A deflector element in the form of a rotational body, which rotates about the knife axis and has an axially running peripheral surface provided as the deflector surface and intended for moving in preferred directions the tobacco particles removed from the rod, is associated with the circular knife. A second removal means which removes a portion of the original surplus from the tobacco rod in order to even out the surplus of tobacco particles, is provided upstream of the holding discs. The second removal means is a paddle wheel which removes the tobacco with the outer ends of its paddles.

[0006] EP 1 405 573 B1 describes a device for trimming a tobacco rod, in which the rod formation means is designed with a pair of trimming disks, which have recesses or flattened portions. The areas of the tobacco rod that engage with the recesses or flattened portions of the trimming disks during passage through the trimming disks are not trimmed and not condensed. The other areas of the tobacco rod are trimmed. The non-trimmed areas form the compacted areas on the head ends of the cigarettes. According to one embodiment, a revolving paddle wheel arranged below the trimming disks and tilted towards the conveying direction of the tobacco stream, substantially perpendicular to the surface of the suction-type conveyor, and provided with paddles on the periphery separates the excess tobacco with the exterior paddle ends from the tobacco rod. The paddle wheel has on its periphery recesses that meet the areas of the tobacco rod engaging in the recesses of the trimming disks so that they are not trimmed. According to one embodiment, another trimming disk pair without recesses and another paddle wheel without recesses are placed in front of the trimming disks in the conveying direction of the tobacco rod for the pre-equalization of the tobacco rod.

[0007] Cigarette paper for cigarettes produced with the known cigarette rod machines frequently has spots. In many cases, the spots only appear after a few days of storage or respectively intensify during the course of the storage of the cigarettes.

[0008] Against this background, the object of the invention is to improve the production of cigarettes so that the spot formation on the cigarette paper is reduced or

prevented entirely.

[0009] The object is achieved by a device with the features of claim 1. Advantageous embodiments of the device are specified in the dependent claims.

[0010] The device according to the invention for forming a tobacco rod has

- a discharging apparatus for discharging loose tobacco out of a tobacco container in the form of an endless tobacco rod along a conveying section,
- an apparatus for forming tobacco accumulations, which forms local tobacco accumulations in the endless tobacco rod on the conveying section at regular intervals and
- a trimming apparatus for trimming the height of the tobacco rod at least between the local tobacco accumulations,
- wherein the trimming apparatus has a pair of rotating trimming disks, the rotational axes of which are arranged on different sides of the conveying section, the peripheries of which approach each other within the conveying section and between which the discharging apparatus conveys the tobacco rod through and
- which has a removal means for excess tobacco with at least one rotating blade, which is arranged on the side of the trimming disks facing away from the discharging apparatus and sweeps over the insertion area between the peripheries of the trimming disks in front of the point of the greatest convergence of their peripheries with the at least one rotating blade in order to thereby separate the sections of the tobacco rod protruding from the trimming disks at least between the tobacco accumulations.

[0011] The invention is based on the knowledge that the spot formation (also referred to as "stain formation") on the cigarette paper is due to moisture contained in the tobacco, which is released due to unfavourable separation of tobacco fibres in the trimming apparatuses. According to the current state of knowledge, the known trimming apparatuses generate smooth cut surfaces with sharp cut edges, which favour the release and the transfer of moisture from the tobacco fibres to the cigarette paper. Cigarettes produced using the device according to the invention, however, have a considerably reduced or no spot formation. This is due to the fact that the trimming apparatus does not cut the tobacco fibres in a sharp-edged manner but rather tears them off in an irregular manner. This is attributed to the fact that the tobacco fibres can be pulled slightly out of the tobacco rod when being hidden by the removal means since the insertion areas between the peripheries of the trimming disks are not yet held tightly like at the point of the greatest convergence of the trimming disks. In contrast, tobacco fibres are sharply cut by a rotating circular blade or other removal means, the cutting edge of which sweeps over the point of the greatest convergence of the trimming

disks and not the insertion area in front of it. This leads to smooth and sharp-edged separation surfaces. The irregular tearing of the tobacco fibres apparently reduces the transfer of the moisture to the cigarette paper so that the formation of spots is greatly reduced or stopped entirely. The cause is apparently a greatly reduced release of moisture at the irregular separation surfaces or respectively only a punctiform contact of small parts of the separation surfaces with the cigarette paper, which restricts at least greatly the transfer of moisture, in contrast to the surface contact of the smooth cut surfaces in the state of the art.

[0012] According to one embodiment, the device has a trimming apparatus arranged upstream in the conveying direction of the conveying section before the apparatus for forming the tobacco accumulations, wherein the upstream trimming apparatus has a pair of upstream, rotating trimming disks, the rotational axes of which are arranged on different sides of the conveying section, the peripheries of which approach each other within the conveying section and between which the discharging apparatus transports the endless tobacco rod and which has an removal means for excess tobacco with at least one upstream, rotating blade, which is arranged on the side of the upstream trimming disks facing away from the discharging apparatus, with the at least one upstream rotating blade sweeps over the upstream insertion area between the peripheries of the upstream trimming disks in front of the point of the greatest convergence of the upstream trimming disks in order to thereby separate the sections of the tobacco rod protruding from the trimming disks. A pre-equalizer is hereby realized, which trims the tobacco rod to an even height before the formation of the local tobacco accumulations. The pre-equalizer is also designed such that it separates the tobacco fibres in an advantageous manner, which at least greatly reduces the formation of spots.

[0013] According to a further embodiment, the rotating blade is aligned radially to its rotational axis and rotates in a rotational surface facing the insertion area and/or the upstream rotating blade is aligned radially to its rotational axis and rotates in a rotational surface facing the upstream insertion area. Preferably, the rotating blade rotates in a circular-disk-shaped rotational surface and/or rotates the upstream rotating blade in a circular-disk-shaped rotational surface. The radially aligned blades act on the tobacco fibres for a relatively long time so that they tear off gradually. This facilitates the advantageous separation of the tobacco fibres for reduced formation of spots.

[0014] According to a further embodiment, the rotational axis of the rotating blade is displaced laterally with respect to the conveying section and/or the rotational axis of the upstream rotating blade is displaced laterally with respect to the conveying section and the rotating blade and/or the upstream rotating blade has everywhere within the conveying section a speed component in the conveying direction of the tobacco rod. This embodiment in-

creases the engagement time, while the rotating blade and/or the upstream rotating blade acts on the tobacco fibres and thereby improves a separation of the tobacco fibres advantageous in terms of reduced spot formation. The engagement area of the rotating blade and/or the upstream rotating blade preferably wanders radially inward with the tobacco fibres as the insertion area is swept over so that the rotating blade and/or the upstream rotating blade acts on the tobacco fibres in the conveying direction during the engagement with approximately constant speed components. A separation of tobacco fibres advantageous with respect to the formation of spots is hereby further improved.

[0015] According to a further embodiment, the rotational axes of the rotating blade and the upstream rotating blade are arranged on different sides of the conveying section and rotate the rotating blade and the upstream rotating blade in different directions. This arrangement is particularly advantageous for the structural design. This relates in particular to the drive of the rotating blade and/or the upstream rotating blade and/or the trimming disks by at least one common drive motor and a gearbox.

[0016] According to a further embodiment, the rotating blade sweeps over at least one tenth, preferably at least one fourth and/or at most three quarters, preferably at most half of the surface of the insertion area between the trimming disks and/or the upstream rotating blade sweeps over at least one tenth, preferably at least one fourth and/or at most three quarters, preferably at most half of the surface of the insertion area between the two upstream trimming disks. It is hereby achieved that the rotating blade and/or the upstream rotating blade is in contact with the tobacco fibres for a sufficiently long period of time in order to separate them gradually without pulling tobacco fibres out of the tobacco rod completely.

[0017] According to a further embodiment, the rotational surface of the rotating blade is aligned at an acute angle to the trimming disks and/or the rotational surface of the upstream rotating blade is aligned at an acute angle to the upstream trimming disks. A separation of tobacco fibres advantageous with respect to spot formation is further improved by this arrangement of the paddle wheel.

[0018] According to a further embodiment, the rotating blade approaches the trimming disks except for a gap and/or the upstream rotating blade approaches the upstream trimming disks except for a gap. The height of the gap is preferably a maximum of 5/10 mm, preferably a maximum of 3/10 mm. The height of the gap is preferably 1/10 mm. A separation of tobacco fibres advantageous with respect to the formation of spots is hereby further improved.

[0019] According to a further embodiment, the rotating blade and/or the upstream rotating blade is designed on a hard metal insert of the removal means and/or of the upstream removal means. The hard metal inserts enable a long tool life for the removal means and/or the upstream removal means.

[0020] According to a further embodiment, the removal

means is a paddle wheel with the rotating blade on a paddle arm and/or the upstream removal means is an upstream paddle wheel with the upstream rotating blade on an upstream paddle arm. According to a further embodiment, the rotating blade is arranged on a radial flank of the paddle wheel located upstream in the direction of rotation and/or the upstream rotating blade is present on a radial flank of the upstream paddle wheel located upstream in the direction of rotation. According to a preferred embodiment, the paddle wheel has several rotating blades on several paddle arms and/or the upstream paddle wheel has several upstream rotating blades on several paddle arms.

[0021] According to a further embodiment, the paddle wheel is cylindrical and/or conical on the side facing away from the trimming disks and/or the upstream paddle wheel is cylindrical and/or conical on the side facing away from the upstream trimming disks. This embodiment causes a discharge of the separated tobacco fibres from the tobacco rod, which avoids a material jam.

[0022] According to a further embodiment, the two trimming disks and/or the two upstream trimming disks approach each other except for a gap on the peripheries. The trimming disks preferably approach each other until they do not quite touch each other yet. The width of the gap is preferably a maximum of 5/10 mm, preferably a maximum of 3/10 mm, preferably 1/10 mm. The cutting off of the tobacco fibres by the trimming disks and/or the upstream trimming disks is hereby avoided. The two trimming disks and/or the two upstream trimming disks preferably rotate in opposite directions, wherein they rotate in the conveying direction of the tobacco rod at the point of their greatest convergence.

[0023] According to a further embodiment, the apparatus for forming tobacco accumulations is an apparatus for compacting the endless tobacco rod at regular intervals located upstream from the trimming apparatuses. In this embodiment, the trimming disks are circular with a constant wall thickness on the outer periphery. They are not provided with recesses or impressions as is the case for a pocket trimmer. According to a further embodiment, the apparatus for compacting has a rotating cam, preferably a rotating cross-cam. A cross-cam has four cams arranged cross-wise around a common axis of rotation.

[0024] Alternatively, the apparatus for forming tobacco accumulations is formed by a pair of trimming disks, which have recesses or depressions, into which the sections of the tobacco rod engage, in which the material accumulations are to be formed. The trimming disks with recesses or depressions are also the trimming disks of the trimming apparatus. They form a pocket trimmer. In this embodiment, the paddle wheel can have areas without paddle arms, into which tobacco fibres protruding out of the recesses towards the paddle wheel engage so that they are not separated. The paddle arms only separate those tobacco fibres that are fed between and through the trimming disks without engaging in the recesses. For this, the rotation of the trimming disks and the rotation of

the paddle wheel are synchronized with each other.

[0025] According to a preferred embodiment, the discharging apparatus is a suction-type rod conveyor.

[0026] Furthermore, the object of the invention is a machine of the tobacco-processing industry, in particular a cigarette rod machine, with a device for forming a tobacco rod according to one of claims 1 through 14.

[0027] Furthermore, the object of the invention is a method for forming a tobacco rod, in which

- a discharging apparatus discharges loose tobacco out of a tobacco container in the form of an endless tobacco rod along a conveying section,
- local tobacco accumulations are formed on the conveying section in the endless tobacco rod at regular intervals,
- the height of the tobacco rod is trimmed at least between the local tobacco accumulations,
- wherein the tobacco rod is conveyed on the conveying section between a pair of rotating trimming disks, which have their rotational axes on different sides of the conveying section and their peripheries approach each other within the conveying section and
- a removal means for excess tobacco with at least one rotating blade on the side facing away from the discharging apparatus sweeps over the insertion area between the peripheries of the trimming disks in front of the point of the greatest convergence of their peripheries in order to separate the sections of the tobacco rod protruding from the trimming disks at least between the tobacco accumulations.

[0028] According to a further embodiment of the method, this is performed using a device for forming a tobacco rod according to one of claims 1 to 14.

[0029] The above description of the corresponding characteristics of the device and its embodiments are referenced in terms of the advantages and advantageous embodiments of the method.

[0030] The invention is explained in greater detail below based on included drawings of an exemplary embodiment. In the drawings:

- Fig. 1 shows a device for forming a tobacco rod in a roughly schematic side view;
- Fig. 2 shows the trimming apparatuses of the device in a roughly schematic side view;
- Fig. 3 shows the same trimming apparatuses in a roughly schematic top view;
- Fig. 4 shows the same trimming apparatus in a roughly schematic top view;
- Fig. 5a-c shows an upstream paddle wheel of the same device in a top view (Fig. 5a), in a side view (Fig. 5b) and in a vertical cut (Fig. 5c);
- Fig. 6a-c shows a paddle wheel of the same device in a top view (Fig. 6a), in a side view (Fig. 6b) and in a vertical cut (Fig. 6c);
- Fig. 7 shows an enlarged detail VII from Fig. 3;

Fig. 8 shows a table with results from a comparative examination of the spot formation in a conventional device and in a device according to the invention for forming a tobacco rod.

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[0031] According to Fig. 1, a device according to the invention comprises a suction-type rod conveyor 1, which has an endless porous belt 2, which is fed over two deflection rollers 3, 4. One of the two deflection rollers 3, 4 is driven so that the lower run 5 of the belt 2 in Fig. 1 runs from left to right. This is the conveying direction F of the suction rod conveyor 1.

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[0032] A vacuum chamber 6, which is open towards the top side of the lower run 5, is located above the lower run 5. A vacuum pump is attached to the vacuum chamber 6.

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[0033] According to Fig. 4, the lower run 5 is delimited on both sides by side walls 7, 8, which extend along the entire length of the lower run 5 parallel to the plane of projection in Fig. 1. The side walls 7, 8 delimit together with the lower run 5 a downwardly open suction channel 9. The suction channel 9 delimits the upper part of a conveying section 10 for a tobacco rod.

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[0034] As shown in Fig. 1, the part of the suction channel 9 starting in conveying direction F is arranged above a duct-like tobacco container 11. Loose tobacco is located in the tobacco container 11. The loose tobacco is preferably centrifuged into the tobacco container 11 so that it hits the lower run 5. Due to the vacuum applied to the lower run 5, the tobacco fibres 12 are sucked from the bottom side of the lower run 5 and are held tight on it. The held tobacco fibres 12 form a tobacco rod 13 with an irregular bottom side. The tobacco rod 13 is surrounded on the top by the suction channel 9 and protrudes on the bottom out of the suction channel 9.

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[0035] The suction-type rod conveyor 1 first transports the tobacco rod 13 to an upstream trimming apparatus 14. According to Fig. 2 through 4, the upstream trimming apparatus 14 comprises a pair of rotating, upstream trimming disks 15, 16, the rotational axes 17, 18 of which are arranged on different sides of the lower run 5. The two upstream trimming disks 15, 16 are arranged symmetrically with respect to the lower run 5. The upstream trimming disks 15, 16 are aligned parallel to each other.

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[0036] The circular peripheries 19, 20 of the upstream trimming disks 15, 16 approach each other below the suction channel 9 within the conveying section 10 so that they do not quite touch each other yet.

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[0037] An upstream paddle wheel 21, which with its upper front side 22 faces the upstream trimming disks 15, 16, is arranged below the upstream trimming disks 15, 16.

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[0038] According to Fig. 5, the upstream paddle wheel 21 has a number of paddle arms 23 extending radially outwards, which are distributed at regular intervals evenly around its rotational axis 24. The upstream paddle wheel 21 has a conical bottom side 25. The rotational direction R1 of the upstream paddle wheel 21 is indicated

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by an arrow.

[0039] The paddle arms 23 each have a radial flank located upstream in direction of rotation R1, which has an upstream blade 26 on the upper front side 22. The even rotational surface of the upstream blade 26 falls into the front side 22.

[0040] According to Fig. 3, the rotational axis 24 of the upstream paddle wheel 21 is displaced laterally with respect to the lower run 5. The paddle arms 23 of the upstream paddle wheel 21 sweep over an upstream insertion area 27.1 between the peripheries 19, 20 of the two upstream trimming disks 15, 16 in front of point 27 of the greatest convergence of the peripheries 19, 20 (Fig. 3 and 8). According to Fig. 2, the upper front side 22 of the upstream paddle wheel 21 forms an acute angle with the lower run 5, wherein the upstream paddle wheel 21 is tilted in the conveying direction F away from the lower run 5. The gap S1 between the upstream paddle wheel 21 and the upstream trimming disks 15, 16 is preferably 1/10 mm high at the narrowest point.

[0041] The upstream trimming apparatus 14 separates a lower part 28 of the tobacco rod 13 so that it has an even height in the conveying direction F behind the upstream trimming apparatus 14. The lower part 28 of the tobacco rod 13 is hereby inserted into the upstream insertion area between the peripheries 19, 20 of the two upstream trimming disks 15, 16 and is increasingly clamped between them as it passes through until point 27 is reached. The upstream paddle wheel 21 hereby continuously separates the lower sections of the tobacco fibres 12 protruding down from the upstream trimming disks 15, 16 in the insertion area 27.1 in that it tears them off the upper sections arranged above the upstream trimming disks 15, 16 with the radial flanks 26. The upstream trimming disks 15, 16 hereby prevent the upper sections of the tobacco fibres 12 from being torn out of the tobacco rod 12.

[0042] The separated, lower part 28 of the tobacco rod 13 is redirected by a deflector plate 29 and is conveyed back into the tobacco container 11 over conveyor belts 30, 31 and if applicable further conveying apparatuses.

[0043] According to Fig. 1 and 2, an apparatus for forming tobacco accumulations 32 with a rotating cross-cam 33 is present in the conveying direction F behind the upstream trimming apparatus 14. The cross-cam 33 has four cams 35 distributed evenly around a horizontal rotational axis 34.

[0044] The cross-cam 33 compacts at regular intervals short sections of the tobacco rod 13 and thus generates local tobacco accumulations 36, which serve as end-densifying for cigarettes.

[0045] A trimming apparatus 37 with a pair of parallel, rotating trimming disks 38, 39 is arranged in the conveying direction F behind the cross-cam 33. The rotational axes 40, 41 of these trimming disks 38, 39 are also arranged on different sides of the lower run 5. The circular peripheries 42, 43 of the trimming disks 38, 39 approach each other below the suction channel 9 within the con-

veying section 10 so that they do not quite touch each other. The rotational axes 40, 41 of the two trimming disks 38, 39 are arranged symmetrically with respect to the conveying section 10.

[0046] A paddle wheel 44 is arranged below the two trimming disks 38, 39, wherein this paddle wheel 44 with its upper front side 45 faces the trimming disks 38, 39.

[0047] According to Fig. 6, the paddle wheel 44 has several paddle arms 47 extending radially outwards and distributed around its rotational axis 46. The rotational direction R2 of the paddle wheel 44 is indicated by an arrow. On the radial flank located upstream in the direction of rotation R2, the paddle arms 47 have a blade 48 on the front side 45. The even rotational surface of the blade 48 falls into the front side 45.

[0048] According to Fig. 2, the upper front side 45 of the paddle wheel 44 forms an acute angle with the lower run 5, wherein the distance between the front side 45 and the lower run 5 decreases in the conveying direction F.

[0049] According to Fig. 3, the paddle wheel 44 with its rotational axis 46 is displaced laterally with respect to the lower run 5 and namely to the other side of the upstream paddle wheel 21.

[0050] The paddle arms 47 of the paddle wheel 44 sweep over an insertion area 49.1 between the peripheries 42, 43 of the two trimming disks 38, 39 in front of point 49 of the greatest convergence of the peripheries 42, 43 (Fig. 3 and 8).

[0051] The gap S2 between the paddle wheel 44 and the two trimming disks 38, 39 is preferably 1/10mm high at the narrowest point.

[0052] The trimming apparatus 37 is arranged closer to the lower run 5 than the upstream trimming apparatus 14. The pre-trimmed and partially compacted tobacco rod 14 is conveyed from the lower run 5 between the peripheries 42, 43 of the two trimming disks 38, 39.

[0053] The trimming apparatus 37 separates the lower parts 50 of the tobacco rod 13 not compacted by the cross-cam 31.

[0054] The lower sections of tobacco fibres 12 protruding from the trimming disks 38, 39 in the insertion area 49.1 are torn off by the radial flanks 48 of the paddle wheel 44. The upper sections of the tobacco fibres 12 are thereby increasingly clamped by the trimming disks 38, 39 until point 49 is reached so that they are not torn out of the tobacco rod 13.

[0055] The separated lower parts 50 of the tobacco rod 13 are conveyed to the conveyor belt 31 along a deflector plate 51, which conveys the tobacco back to the tobacco container 11.

[0056] The paddle wheels 21, 44 have everywhere within the conveying section 10 a speed component in conveying direction F. This is comparatively small and constant since first the outer end of the respective paddle arm 23, 47 enters the conveying section 10 with a low speed component in conveying direction F and sections lying radially further inward of the paddle arms 23, 47

enter the conveying section 10 when passing through the conveying section 10.

[0057] The trimmed and partially compacted tobacco rod 13 is then enclosed in cigarette paper and cut into individual cigarettes.

[0058] Due to the special trimming, no or only very little moisture is transferred from the separation surfaces of the cut tobacco fibres 12 to the cigarette paper so that the formation of spots is avoided or greatly reduced.

[0059] Fig. 8 shows the results of a comparative examination, in which a conventional device and a device according to the invention were used to form a tobacco rod.

[0060] The device according to the invention for forming a tobacco rod was equipped with trimming apparatuses 34, 37 according to Fig. 3 with a tandem trimmer with a pair of trimming disks 38, 39 and a paddle wheel 44 working together with it and a pair of upstream trimming disks 15, 16 and an upstream paddle wheel 21 working together with it.

[0061] In the case of the conventional device, bevel wheels were present instead of the paddle wheel 44 and the upstream paddle wheel 21. The cutting edge formed by the periphery of the bevel wheels thereby passed through a vertical line through the narrowest point 29, 27 between the two neighbouring trimming disks 38, 39 or respectively 15, 16.

[0062] Furthermore, both paddle wheels with blunt cutting edges and paddle wheels with new, sharp-edged cutting edges were used.

[0063] According to the upper fourth of the table, the examinations were performed with two different tobacco mixtures (125th and 347th) on a specific machine (C85), which was equipped either with paddle wheels or with bevel wheels. The machine produced respectively 8,000 cigarettes per minute.

[0064] The second fourth of the table specifies the humidity values in tobacco in % by weight identified in 1,000 cigarettes right after production and a week after production.

[0065] The third fourth of the table specifies the number of spots of the respectively 1,000 examined cigarettes divided into heavy, medium and light spots.

[0066] The bottom fourth of the table specifies the corresponding percentages of cigarettes with heavy, medium and light spots.

[0067] According to the first table column, light spots were shown when the trimming apparatus was equipped with bevel wheels on 57 of 1,000 cigarettes, which corresponds to 5.7%. According to the second column, the use of the trimming apparatus with blunt paddle wheels led to only 24 light spots on 1,000 cigarettes, which corresponds to 2.4%. In the case of both the use of the bevel wheels and the paddle wheels, only one medium-sized spot was identified, which corresponds to 0.1%.

[0068] According to the third column, the use of new, sharp-edged paddle wheels resulted in only 8 light spots on 1,000 cigarettes, which corresponds to 0.8%.

[0069] According to the fourth column, three medium spots and 54 light spots were identified on 1,000 cigarettes during processing of the second tobacco mixture using bevel wheels, which corresponds to 0.3% or respectively 5.4%.

[0070] In the case of the use of a blunt paddle wheel according to the fifth column, no medium spots and only 37 light spots were identified on 1,000 cigarettes according to the right column, which corresponds to 3.7%.

[0071] In the case of the use of a new, sharp-edged paddle wheel, only one medium spot and 17 light spots were identified on 1,000 cigarettes, which corresponds to 0.1% or respectively 1.7%.

[0072] A significant reduction in the spot formation was thus identified in the use of paddle wheels over bevel wheels. The sharp-edged paddle wheel was thereby superior to the blunt paddle wheel.

List of References

[0073]

1	Suction-type rod conveyor
2	Belt
3, 4	Deflection rollers
5	Branch
6	Vacuum chamber
7, 8	Side walls
9	Suction channel
10	Conveying section
11	Tobacco container
12	Tobacco fibres
13	Tobacco rod
14	Upstream trimming apparatus
15, 16	Upstream trimming disks
17, 18	Rotational axes
19,20	Circular peripheries
21	Upstream paddle wheel
22	Upper front side
23	Paddle arm

24	Rotational axis		out of a tobacco container (11) in the form of an endless tobacco rod (13) along a conveying section (10),
25	Conical bottom side		
26	Upstream blade	5	• an apparatus for forming tobacco accumulations (32), which forms local tobacco accumulations (36) in the endless tobacco rod (13) on the conveying section (10) at regular intervals and
27	Point of greatest convergence		
27.1	Upstream insertion area	10	• a trimming apparatus (37) for trimming the height of the tobacco rod (13) at least between the local tobacco accumulations (36),
28	Bottom part of tobacco rod		• wherein the trimming apparatus (37) has a pair of rotating trimming disks (38, 39), the rotational axes (40, 41) of which are arranged on different sides of the conveying section (10), the peripheries (42, 43) of which approach each other within the conveying section (10) and between which the discharging apparatus (1) conveys the tobacco rod (13) through and
29	Deflector plate		
30, 31	Conveyor belts	15	• which has a removal means (44) for excess tobacco with at least one rotating blade (48), which is arranged on the side of the trimming apparatus (1) and sweeps over the insertion area (49.1) between the peripheries (42, 43) of the trimming disks (38, 39) in front of the point (49) of the greatest convergence of their peripheries (42, 43) with the at least one rotating blade (48) in order to thereby separate the sections of the tobacco rod (13) protruding from the trimming disks (38, 39) at least between the tobacco accumulations (36).
32	Apparatus for forming tobacco accumulations		
33	Cross-cam	20	
34	Horizontal rotational axis		
35	Cam		
36	Local tobacco accumulations	25	
37	Trimming apparatus		
38, 39	Trimming disks	30	
40, 41	Rotational axes		
42, 43	Peripheries		
44	Paddle wheel	35	2. The device according to claim 1 with a trimming apparatus (14) arranged upstream in the conveying direction (F) of the conveying section (10) of the apparatus for forming tobacco accumulations (32), wherein the upstream trimming apparatus (14) has a pair of rotating, upstream trimming disks (15, 16), the rotational axes (17, 18) of which are arranged on different sides of the conveying section (10), the peripheries (19, 20) of which approach each other within the conveying section (10) and between which the discharging apparatus (1) conveys the tobacco rod (13), and which has an upstream removal means (21) for excess tobacco with at least one upstream rotating blade (26), which is arranged on the side of the upstream trimming disks (15, 16) facing away from the discharging apparatus (1), sweeps over the upstream insertion area (27.1) between the peripheries of the upstream trimming disks (15, 16) with the at least one upstream rotating blade (26) in order to thereby separate the areas of the tobacco rod (13) protruding from the upstream trimming disks (15, 16).
45	Upper front side		
46	Rotational axis	40	
47	Paddle arms		
48	Blade		
49	Point of greatest convergence	45	
49.1	Insertion area		
50	Bottom parts of the tobacco rod	50	
51	Deflector plate		
Claims			
1.	A device for forming a tobacco rod with	55	
	• an apparatus for discharging (1) loose tobacco		
3.	The device according to one of claims 1 or 2, in which the rotating blade (48) is aligned radially to its rota-		

- tional axis (48) and rotates in a rotational surface facing the insertion area (49.1) and/or the upstream rotating blade (26) is aligned radially to its rotational axis (24) and rotates in a rotational surface facing the upstream insertion area (27.1).
4. The device according to one of claims 1 through 3, in which the rotational axis (46) of the rotating blade (48) is displaced laterally with respect to the conveying section (10) and/or in which the rotational axis (24) of the upstream rotating blade (26) is displaced laterally with respect to the conveying section (10) and the rotating blade (48) and/or the upstream rotating blade (26) has everywhere within the conveying section (10) a speed component in the conveying direction (F) of the tobacco rod (13).
 5. The device according to claim 4, in which the rotational axes (46, 24) of the rotating blade (48) and of the upstream rotating blade (26) are arranged on different sides of the conveying section (10) and the rotating blade (48) and the upstream rotating blade (26) rotate in different directions (R2, R1).
 6. The device according to one of claims 1 through 5, in which the rotating blade (48) sweeps over at least one tenth, preferably at least one fourth and/or at most three quarters, preferably at most half of the surface of the insertion area (49.1) between the trimming disks (38, 39) and/or the upstream rotating blade (26) sweeps over at least one tenth, preferably at least one fourth and/or at most three quarters, preferably at most half of the surface of the insertion area (27.1) between the two upstream trimming disks (15, 16).
 7. The device according to one of claims 1 to 6, in which the rotational surface (45) of the rotating blade (48) is aligned at an acute angle to the trimming disks (38, 39) and/or the rotational surface (22) of the upstream rotating blade (26) is aligned at an acute angle to the upstream trimming disks (15, 16).
 8. The device according to one of claims 1 to 7, in which the rotating blade (48) approaches the trimming disks (38, 39) except for a gap (S2) and/or in which the upstream rotating blade (26) approaches the upstream trimming disks (15, 16) except for a gap (S1).
 9. The device according to one of claims 1 through 8, in which the rotating blade (48) and/or the upstream rotating blade (26) is designed on a hard metal insert of the removal means (44) and/or of the upstream removal means (21).
 10. The device according to one of claims 1 through 9, in which the removal means (44) is a paddle wheel with the rotating blade (48) on a paddle arm (47) and/or the upstream removal means (21) is an upstream paddle wheel with the upstream rotating blade (26) on an upstream paddle arm (23).
 11. The device according to one of claims 1 through 9, in which the paddle wheel (44) is cylindrical and/or conical on the side facing away from the trimming disks (38, 39) and/or in which the upstream paddle wheel (21) is cylindrical and/or conical on the side facing away from the upstream trimming disks (15, 16).
 12. The device according to one of claims 1 through 11, in which the two trimming disks (38, 39) on the peripheries (42, 43) and/or the two upstream trimming disks (15, 16) on the peripheries (19, 20) approach each other except for a gap.
 13. The device according to one of claims 1 through 12, in which the apparatus for forming tobacco accumulations (32) is an apparatus for compacting the endless tobacco rod at regular intervals located upstream from the trimming apparatus (37).
 14. The device according to claim 13, in which the apparatus for compacting has a rotating cam (35), preferably a rotating cross-cam (33).
 15. A machine of the tobacco-processing industry, in particular in a cigarette rod machine, with a device for forming a tobacco rod according to one of claims 1 through 14.
 16. A method for forming a tobacco rod, in which
 - a discharging apparatus discharges loose tobacco out of a tobacco container in the form of an endless tobacco rod along a conveying section,
 - local tobacco accumulations are formed on the conveying section in the endless tobacco rod at regular intervals,
 - the height of the tobacco rod is trimmed at least between the local tobacco accumulations,
 - wherein the tobacco rod is conveyed on the conveying section between a pair of rotating trimming disks, which have their rotational axes on different sides of the conveying section and the peripheries of which approach each other within the conveying section and
 - a removal means for excess tobacco with at least one rotating blade on the side facing away from the discharging apparatus with the at least one rotating blade sweeps over the insertion area between the peripheries of the trimming disks of the point of the greatest convergence of their peripheries in order to separate the sections of the tobacco rod passed through and between

the trimming disks at least between the tobacco accumulations.

17. The method according to claim 16, performed using a device for forming a tobacco rod according to one of claims 1 through 14. 5

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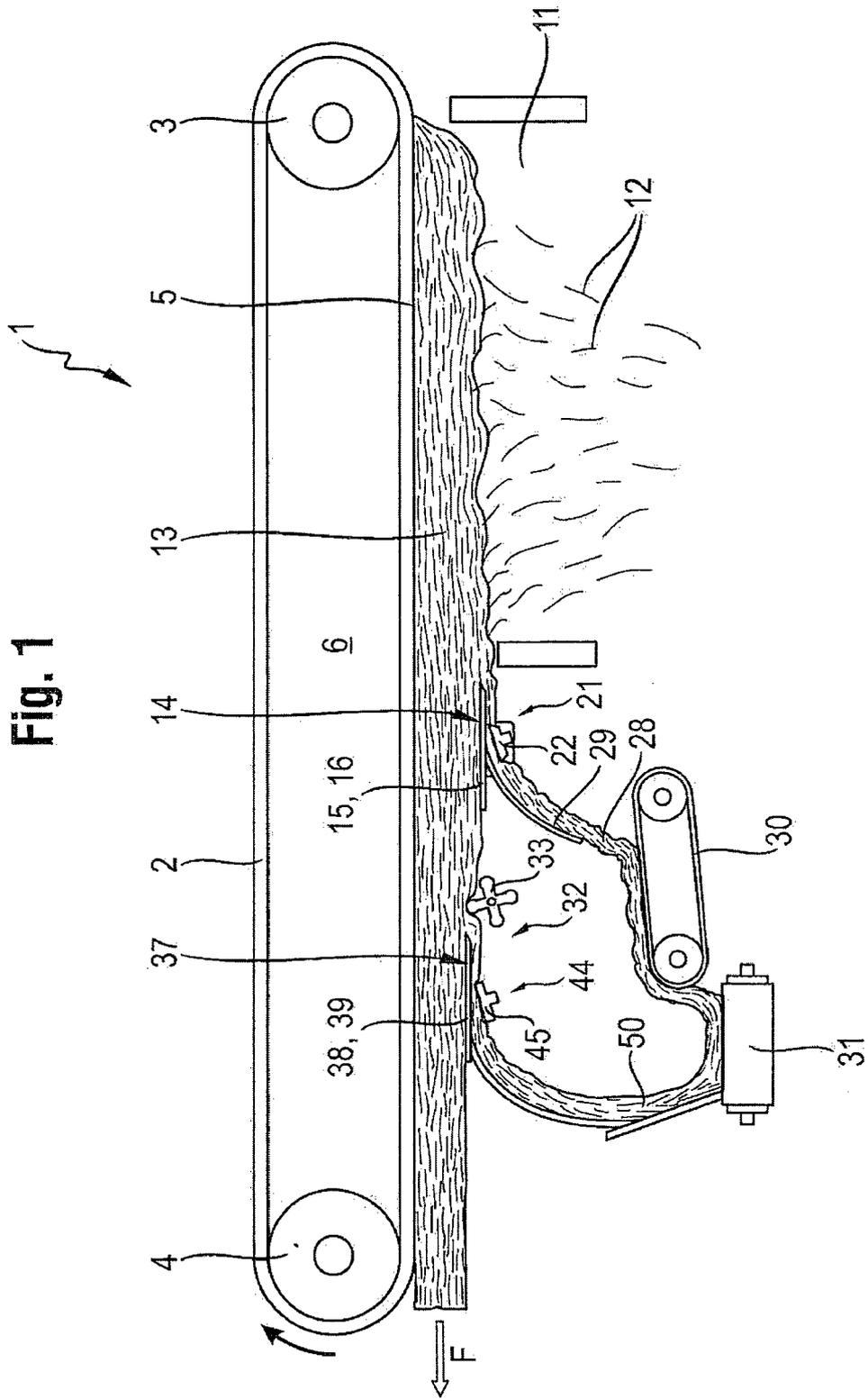


Fig. 2

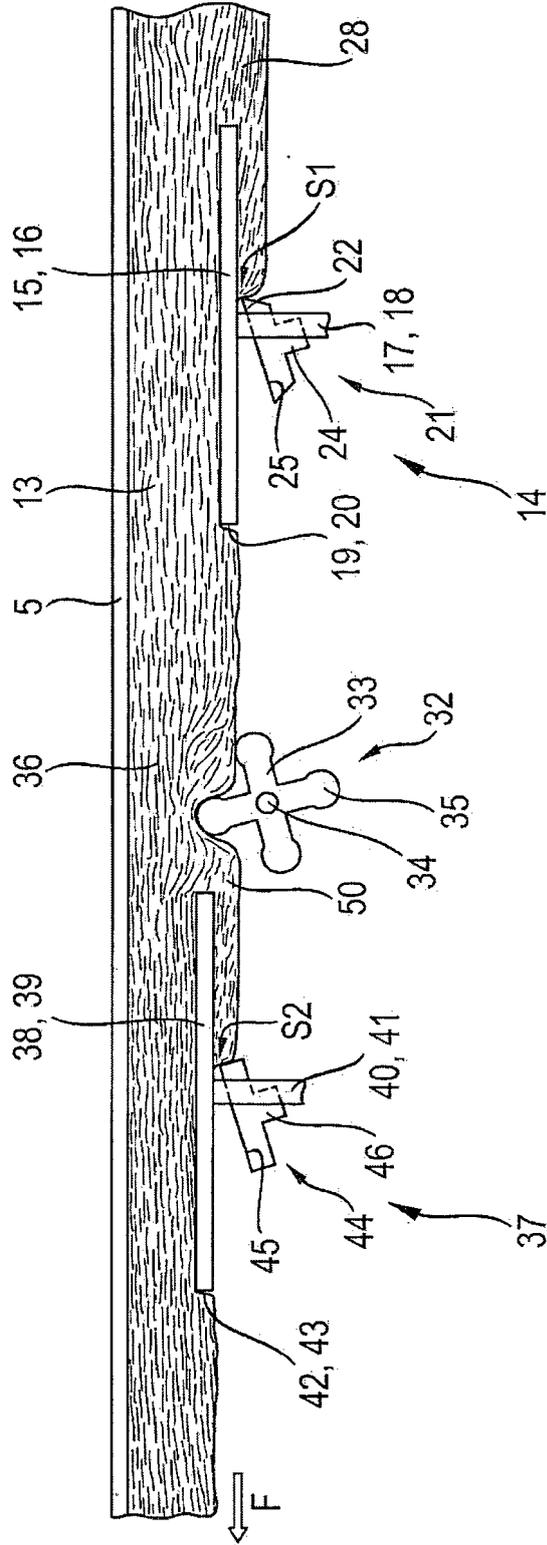


Fig. 3

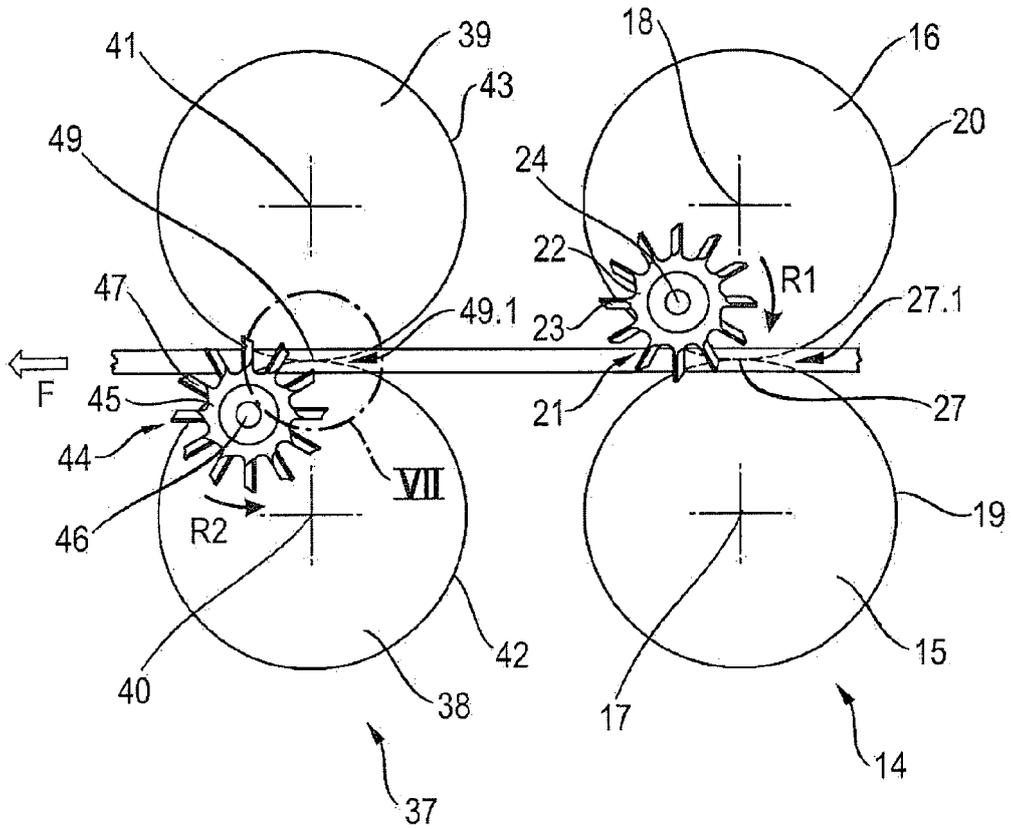


Fig. 4

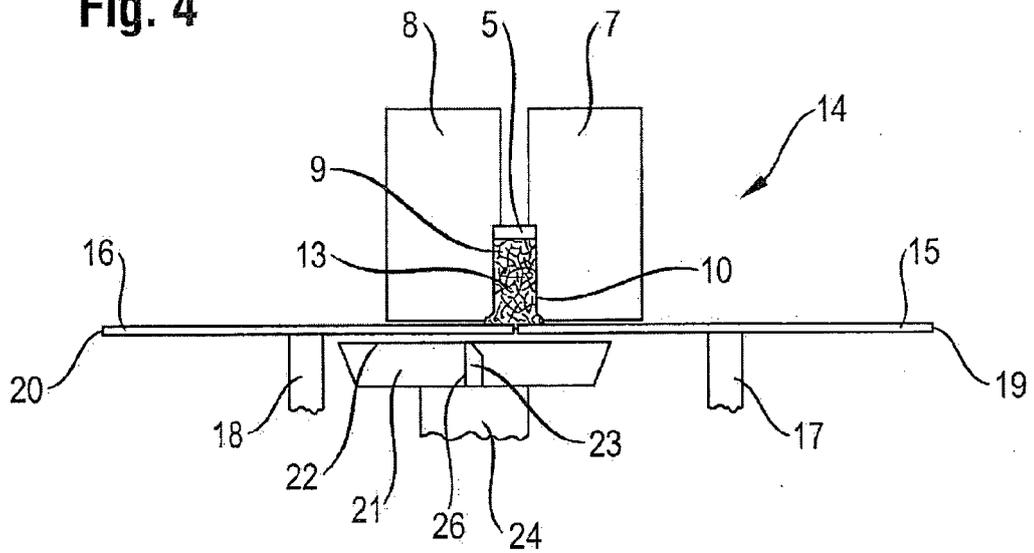


Fig. 6c

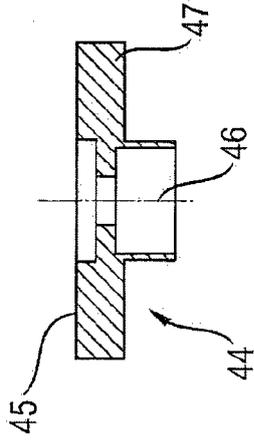


Fig. 5c

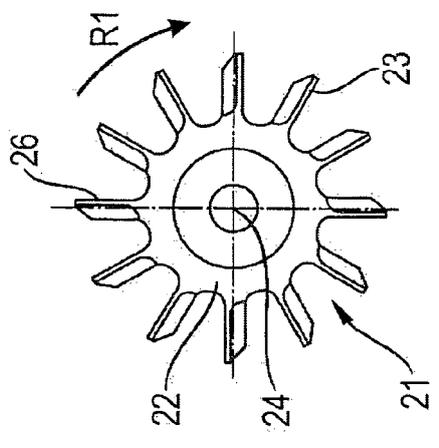
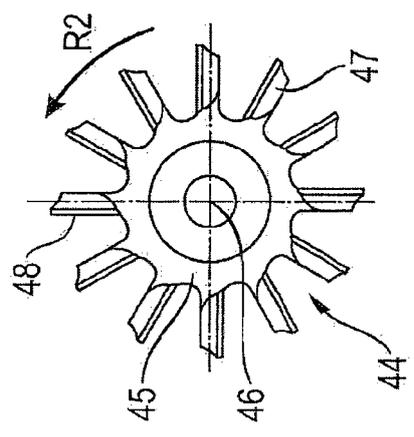
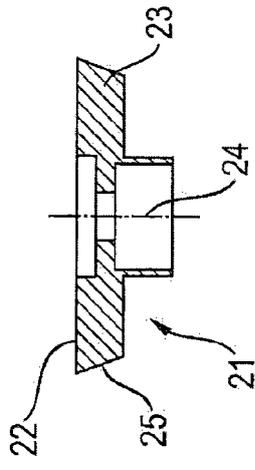


Fig. 6a

Fig. 5a

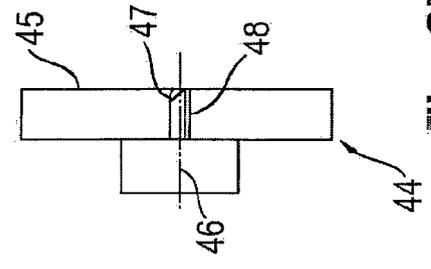


Fig. 6b

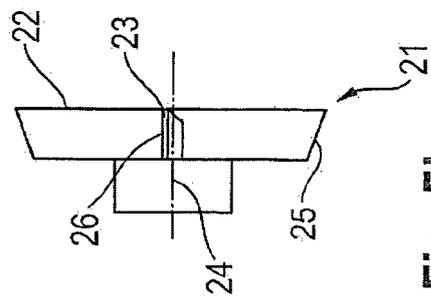


Fig. 7

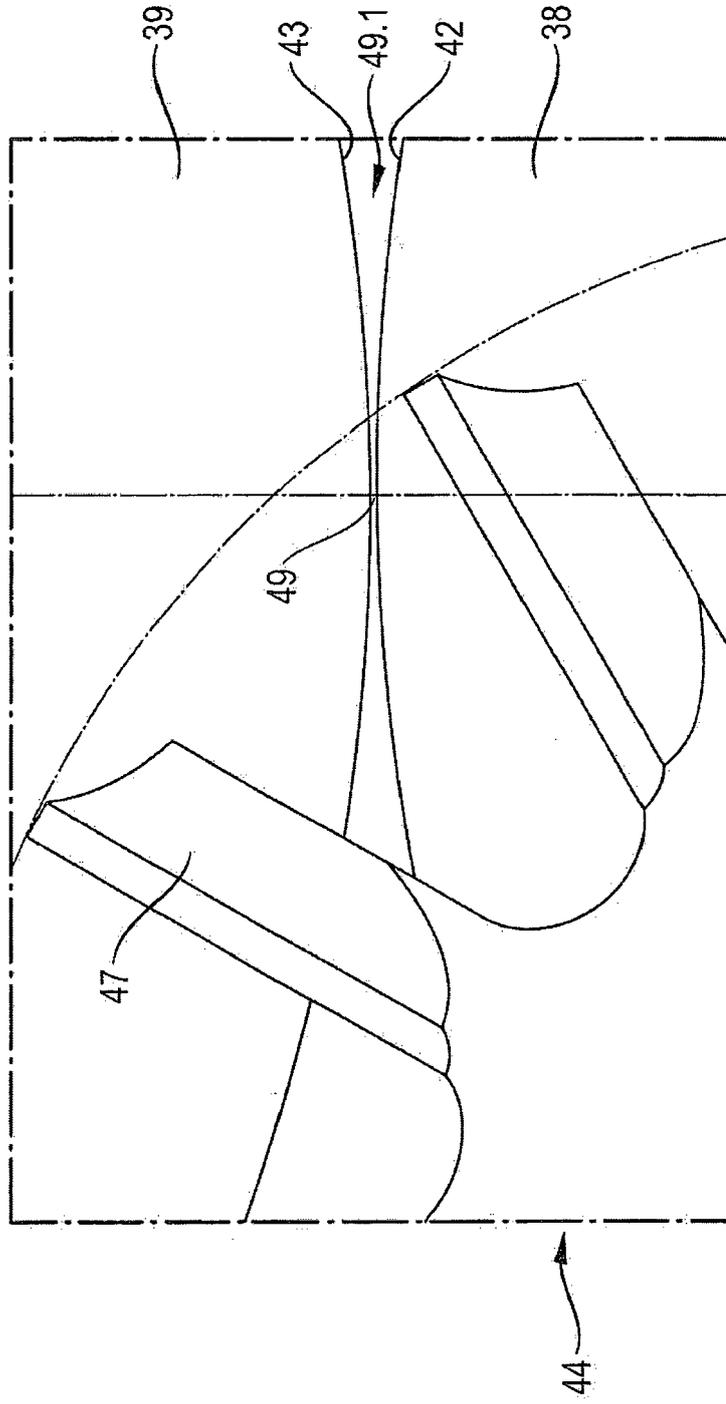


Fig. 8

	Brand	tray	tray	tray	tray	tray	tray	tray
	Tobacco	Normal Cig.in tray. Kegelrad	Normal Cig.in tray. Paddelrad (stumpf)	Normal Cig.in tray. Paddelrad (new)	Normal Cig.in tray. Kegelrad	Normal Cig.in tray. Paddelrad (stumpf)	Normal Cig.in tray. Paddelrad (new)	Normal Cig.in tray. Paddelrad (new)
	Machine	127er	127er	127er	347er	347er	347er	347er
	cig/min	C85	C85	C85	C85	C85	C85	C85
	%	8000	8000	8000	8000	8000	8000	8000
	Tob. moisture							
	%	11,4	11,2	11,3	11,4	11,3	11,3	11,5
	Cig. moisture (target 11,4%)							
	%	11,3	11,3	11,3	11,4	11,3	11,3	11,3
	Cig. moisture after 1 Week							
	checked Cig	1000	1000	1000	1000	1000	1000	1000
A2	C02.2.3 Stains on cigarette paper (heavy)							
B2	C02.4.4 Stains on cigarette paper (medium)	1	1		3			1
C2	C02.6.4 Stains on cigarette paper (light)	57	24	8	54	37		17
A2	C02.2.3 Stains on cigarette paper (heavy)							
B2	C02.4.4 Stains on cigarette paper (medium)	0,10	0,10		0,30			0,10
C2	C02.6.4 Stains on cigarette paper (light)	5,70	2,40	0,80	5,40	3,70		1,70



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Application Number
EP 13 00 4709

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Place of search Munich		Date of completion of the search 11 March 2014	Examiner Marzano Monterosso
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