



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.12.2004 Bulletin 2004/52

(51) Int Cl.7: **A24C 5/00**

(21) Application number: **04425442.3**

(22) Date of filing: **15.06.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR
 Designated Extension States:
AL HR LT LV MK

- **Mengoli, Fausto**
40037 Sasso Marconi (Bologna) (IT)
- **Sartoni, Massimo**
40139 Bologna (IT)
- **Zanetti, Umberto**
41100 Modena (IT)

(30) Priority: **19.06.2003 IT BO20030378**

(71) Applicant: **G.D S.p.A.**
40133 Bologna (IT)

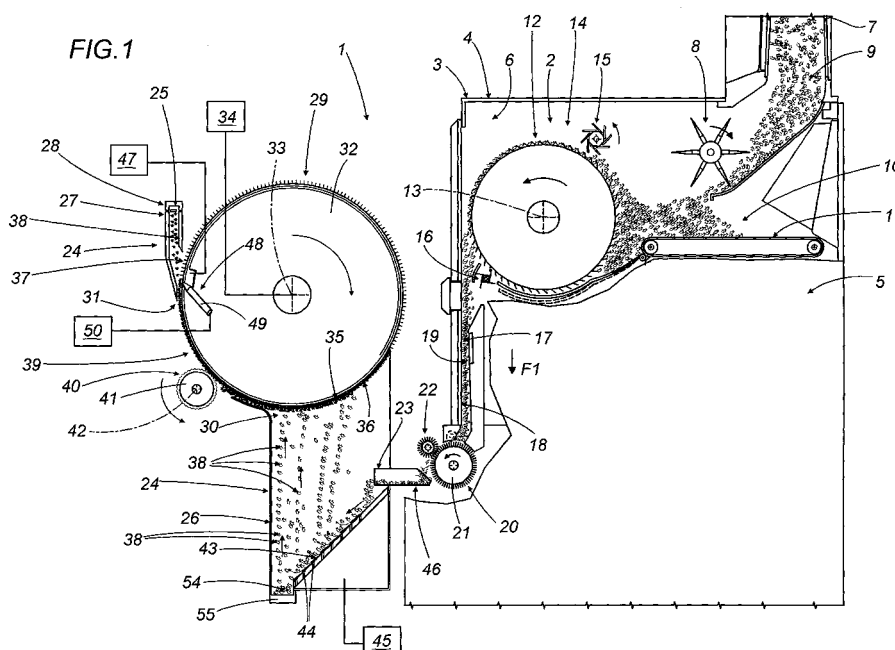
(74) Representative: **Lanzoni, Luciano**
c/o BUGNION S.p.A.
Via Goito, 18
40126 Bologna (IT)

(72) Inventors:
 • **Draghetti, Fiorenzo**
40059 Medicina (Bologna) (IT)

(54) **A cigarette maker**

(57) In a cigarette maker, shredded tobacco (9) is directed by a conveyor (23) into a riser (24) and ascends as a flow of distinct particles (38) toward an aspirating belt (25), placed at the top outlet end of the riser (24), by which the particles are attracted and gathered progressively to form a stream of tobacco filler. The riser (24) is made up of a lower first portion (26) in receipt of

the tobacco (9) from the conveyor (23), and an upper second portion (27) enclosed by the aspirating belt (25); the first portion (26) is embodied separately from the second portion (27), and the two portions are interconnected by the revolving surface of a toothed suction roller (32) designed to transfer a uniform layer of tobacco (9) from the first portion to the second.



Description

[0001] The present invention relates to a cigarette maker.

[0002] The prior art embraces cigarette making machines, with single or multiple processing lines, typically comprising an infeed chamber from which shredded tobacco is taken up by a carding unit and directed into a descent channel or chute.

[0003] At the bottom end of the chute, the tobacco is transferred by a toothed outfeed unit onto a feed conveyor and then carried by this same conveyor toward the bottom inlet end of an ascending channel or riser. As the tobacco enters the inlet of the riser, stems and heavier particles, or scraps, are separated from the lighter particles, whereupon the stems and scraps drop by gravity into a collection vessel and will be rejected, whilst the lighter particles, used in the manufacturing process, are carried up the riser on an ascending air current.

[0004] The top end of the riser is enclosed by a single conveyor, in the case of a machine with just the one processing line, or two conveyors side by side in the case of a machine with two lines. Reference will be made explicitly during the course of the following specification to a cigarette maker with two lines, albeit implying no limitation in scope.

[0005] Each conveyor takes the form of a substantially horizontal air-permeable, aspirating belt capable of attracting the tobacco directed up through the riser as a continuous flow of divided particles, and causing it to form gradually into a continuous stream of filler. The flow of air ascending through the riser, which carries the tobacco up toward the aspirating belts, is generated by negative pressure created internally of an elongated vacuum chamber enclosed on the underside by the two belts. The streams of tobacco forming thus beyond the outlet of the riser are directed by the aspirating belts through a trimming station of which the function is to reduce the stream to a predetermined and uniform thickness, or depth. The trimmed streams of tobacco are then released by the aspirating belts to the entry point of a station where they are formed into two respective continuous cigarette rods.

[0006] As production tempo increases, cigarette makers of the conventional type in question betray certain drawbacks with regard in particular to the correct formation of the tobacco stream on the aspirating belts. More exactly, a higher operating speed must be accompanied necessarily, on the one hand, by a higher linear velocity of the aspirating belts, and on the other by a faster ascending movement of the tobacco particles within the riser.

[0007] For the tobacco particles to ascend more quickly through the riser as required, air must be drawn by the vacuum chamber through the aspirating belts at a higher rate of flow. A first consequence of such an increase is that the aspirating belts are soon saturated

transversely, as the tobacco will tend to accumulate non-uniformly in the vertical direction, perpendicular to the belts, with the density of the particles at its greatest near the surface of the belts and decreasing substantially in hyperbolic mode as the distance from the belts increases. A second consequence is that of a more violent impact between the tobacco particles and the surfaces of the aspirating belts, which causes the particles to slip, roll and bounce against the belts and results ultimately in an uneven and incorrect distribution of the particles along the direction followed by the belts.

[0008] Another drawback tending to accompany the higher operating speeds of conventional cigarette makers described above is reflected in an unsatisfactory separation of the stems and the heavier scraps of tobacco from the lighter particles. In practice, the faster the tobacco is directed into the riser, the shorter the duration of the separation process becomes, and with the area of the machine where the process in question takes place tending typically to be somewhat restricted, the stems and heavier scraps of tobacco are liable to be entrained in the upward current when air is drawn through the riser at high speed.

[0009] The object of the present invention is to provide a cigarette maker unaffected by the aforementioned drawbacks.

[0010] The stated object is realized according to the present invention in a cigarette maker of which the characterizing features are as recited in claim 1.

[0011] The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figure 1 illustrates a first embodiment of the cigarette maker according to the present invention, viewed schematically in a vertical section;
- figure 2 shows a first portion of the cigarette maker according to the present invention, viewed schematically in a vertical section and illustrated in a second embodiment;
- figure 3 is a variation on a detail of figure 2;
- figure 4 shows a second portion of the cigarette maker according to the present invention, viewed schematically in a vertical section and illustrated in the aforementioned second embodiment;
- figure 5 shows the portion of figure 4 in a plan view, illustrated schematically and with certain parts cut away.

[0012] With reference to figure 1, which illustrates a first embodiment of the cigarette maker according to the invention, and in particular a machine with a single processing line, 1 denotes an infeed portion, in its entirety, of such a machine.

[0013] The infeed portion 1 comprises a feed unit 2 by which a mass of shredded tobacco is formed into a continuous flow of tobacco particles. The various components making up the feed unit 2 are housed within a

vertically extending enclosure 3 delimited uppermost by a horizontal wall 4 and on either side by two vertical walls 5 and 6.

[0014] The infeed portion 1 presents an inlet duct 7 extending upward from the horizontal wall 4, and below the duct, internally of the enclosure 3, a power driven toothed roller 8 by which the shredded tobacco 9 is directed down into a lower chamber 10 delimited at the bottom by a conveyor belt 11.

[0015] The chamber 10 accommodates a carding roller 12 rotatable about an axis 13 transverse to the side walls 5 and 6, forming part of a carding unit 14 and positioned adjacent to the downstream end of the belt 11.

[0016] In addition to the carding roller 12, the unit 14 comprises a proportioning roller 15 rotatable substantially tangential to the carding roller 12 and in the same direction.

[0017] With this arrangement, the shredded tobacco 9 is directed by the toothed roller 8 onto the belt 11 and thence toward the carding roller 12, whereupon a layer of the tobacco 9 substantially equal in thickness to the radial dimension of the carding teeth is transferred by the roller 12 away from the chamber 10 and beyond its position of tangential proximity to the proportioning roller 15.

[0018] The infeed portion further comprises an impeller roller 16 rotatable about an axis parallel to the axis 13 aforementioned, of which the function is to pick up the layer of tobacco 9 from the carding roller 12 and project the constituent particles, in the direction denoted F1, down into a substantially vertical descent channel or chute 17 delimited by two side walls 18 and 19 extending parallel one with another and with the axis 13 of the carding roller 12.

[0019] The bottom end of the chute 17 is positioned facing the periphery of a toothed take-up unit 20 that comprises a take-up roller 21 and an impeller roller 22 combining one with another to transfer the shredded tobacco 9 away from the chute 17.

[0020] More exactly, the tobacco 9 is received by the take-up unit 20 in the form of distinct particles and projected onto conveyor means 23 of which the function is to direct the shredded material toward an ascent channel or riser 24 enclosed at the top end by the moving surface of an aspirating belt 25 fashioned from air-permeable material.

[0021] In accordance with the present invention, the riser 24 is divided into a lower first portion 26 and an upper second portion 27, of which the top end 28 is enclosed by the aforementioned aspirating belt 25. The two portions 26 and 27 are separated and interconnected by conveyor means denoted 29 in their entirety, interposed between the outlet 30 of the first portion 26 and the inlet 31 of the second portion 27.

[0022] The length of the first portion 26, as measured along the direction of movement of the belt 25, is identical to the corresponding length of the second portion 27, whereas it will be seen from figure 1 that the width

of the first portion 26, measured transversely to this same direction, is appreciably greater than that of the second portion 27.

[0023] The aforementioned conveyor means 29 could be of any given type, and will be capable of transferring a predetermined quantity of tobacco 9 between the outlet 30 of the first portion 26 and the inlet 31 of the second portion 27 of the riser 24.

[0024] In particular, the conveyor means 29 will consist in any suitable conveying device capable of motion along a path that describes an endless loop. In the example illustrated, such means take the form of a toothed roller 32 rotatable clockwise, as viewed in figure 1, about an axis 33 parallel to the axis 13 of the carding roller 12, also to the direction of movement of the aspirating belt 25, and connected to a source 34 of negatively pressurized fluid in such a way that suction can be generated through the outer surface of the roller 32. Instead of a roller 32, alternatively, use could be made of a belt looped around a plurality of pulleys with axes parallel to the axis 13 of the carding roller 12 and to the direction of movement of the belt 25.

[0025] In the case of the roller 32, the looped path appears as a circular circumference and includes a first sector 35, on which a layer 36 of tobacco 9 is formed, and a second sector 37 from which the particles 38 making up the layer 36 of tobacco 9 are released.

[0026] More exactly, the first sector 35 coincides with the part of the roller 32 extending upward from and along the outlet 30 of the first portion 26 of the riser 24, whilst the second sector 37 coincides with the part of the roller 32 extending along the inlet 31 of the second portion 27 of the riser 24.

[0027] The path described by the toothed roller 32 also presents a third sector 39 interposed between the first and second sectors 35 and 37, occupied by metering and levelling means 40 which take the form of an equalizing roller 41 offered tangentially to the toothed roller 32. The roller 41 in question is rotatable anticlockwise, as viewed in figure 1, about an axis 42 extending parallel to the axis of the toothed roller 32, and at a speed marginally different to that of the latter roller 32. In this way, the equalizing roller 41 is able to ensure a uniform thickness of the aforementioned layer 36 of tobacco by redistributing particles from areas of greater density to areas of lesser density that may have formed in the layer.

[0028] As discernible in figure 1, the aforementioned lower first portion 26 of the riser 24 terminates at the bottom end in a downwardly inclined wall 43 of which the higher part is directed toward the conveyor means 23 bringing the tobacco 9 from the toothed take-up unit 20.

[0029] The inclined wall 43 presents a plurality of holes 44 through which to direct a pressurized fluid from a relative source denoted 45, of which the purpose will be described in due course.

[0030] The conveyor means 23 take the form of a first

vibrating tray 46 such as will slow the rate at which the tobacco advances toward the inlet of the first portion 26 of the riser 24.

[0031] Also associated with the toothed roller 32 at a point near the inlet of the upper second portion 27 of the riser 24, coinciding substantially with the second or release sector 37 of the looped path, are means denoted 47 by which to shut off the suction generated by the source 34 of negative pressure, and/or means denoted 48 by which to generate a flow of positively pressurized fluid. Such means 48 might consist, by way of example, in a nozzle 49 connected to a source 50 of pressure and angled convergently with the direction of movement of the aspirating belt 25. The aspirating action of the belt 25 combines with the dislodging flow blown by the nozzle 49, which includes a component oriented along the feed direction of the belt 25, to bring about an efficient transfer of the particles 38 of tobacco 9 from the surface of the roller 32 to the belt 25.

[0032] Thus, the particles 38 cling to the aspirating belt 25 and form progressively into a continuous stream (not illustrated), which on emerging from the second portion 27 of the riser 24 will advance on the belt 25 toward successive stations (not illustrated) where it is trimmed, shaped and formed ultimately into a continuous cigarette rod.

[0033] It will be seen that, with the width of the first portion 26 significantly greater than the width of the second portion 27, which is substantially equal to that of the aspirating belt 25, and the width of the sector 35 on which the layer 36 of tobacco 9 is formed likewise much greater than the width of the aspirating belt 25, it becomes possible with only a relatively modest speed of rotation of the toothed roller 32 about its axis 33 and a relatively modest velocity of the particles 38 of tobacco 9 within the riser 24, for the belt 25 to be supplied with the correct quantity of tobacco 9 even when running at relatively high speed, and in such a manner as to guarantee a substantially uniform stratification of the tobacco 9 on the aspirating surface, both along the direction of movement of the belt 25 and in the vertical dimension, normal to the belt 25. Also, and to advantage, the process of separating the stems and larger scraps of tobacco 9 from the smaller particles occurs internally of a spacious enclosure afforded by the lower first portion 26, with the tobacco particles substantially detached one from another and progressing at a comparatively gentle rate of motion. The succession of selection jets delivered through the holes 44 also helps to increase the efficiency of the process whereby the stems and heavier scraps of tobacco are separated out. The stems and heavier scraps 54 drop into a collection trough 55.

[0034] Figures 2, 3 and 4 illustrate a second embodiment of the infeed portion 1 forming part of a cigarette maker according to the invention, and in particular a machine with two processing lines, that is to say equipped with two aspirating belts 25 on which two identical streams of tobacco are formed.

[0035] As regards the structure and operation of the risers 24 and the toothed rollers 32, it will be seen that there is no difference between this and the single line embodiment of figure 1.

[0036] In particular, as illustrated in figures 4 and 5, the infeed portion 1 of the machine comprises two risers 24 conveying two respective flows of tobacco particles 38, and two aspirating belts 25 located each above the top outlet end 28 of the relative second portion 27 of a corresponding riser 24, on which the two flows of particles 38 are formed into respective streams of tobacco 9.

[0037] More exactly, the risers 24 and the respective toothed rollers 32 are disposed symmetrically on either side of a vertical plane 51 lying between the two aspirating belts 25, as discernible in figures 4 and 5, and positioned transversely to the axes of rotation of the carding roller 12 and of the take-up roller 21, as illustrated in figure 5. In the solution of figures 2 to 5, more exactly, the toothed conveying rollers 32 are centred on respective axes 33 rotated through an angle of 90° (ninety degrees) relative to the viewing plane of the drawings, as compared to the position of the single roller 32 illustrated in figure 1, where the axis 33 of rotation extends parallel to the axis of the carding roller 12.

[0038] In the example of figure 5, the tobacco 9 is carried from the take-up roller 21 toward the two risers 24 by conveyor means 23 comprising a common first portion 52 and a pair of mutually independent second portions 53. The two independent portions 53 extend divergently from the common portion 52 and on either side of the vertical plane of symmetry, in such a way that the particles 38 of tobacco 9 are carried toward respective inclined walls 43 presented by the two lower first portions 26 of the corresponding risers 24.

[0039] In like manner to the example of figure 1, each of the two inclined walls 43 in this embodiment will present a plurality of holes 44 from which to generate a succession of air jets designed to aid the efficient separation of any stems and heavier scraps 54 of tobacco from the lighter particles. Here again, the stems and scraps 54 drop into a collection trough 55.

[0040] In particular, both the common first portion 52 and the independent second portions 53 consist in respective vibrating trays 56 and 57.

[0041] In the example of figure 2, the particles 38 of tobacco 9 leaving the take-up roller 21 drop onto a conveyor 58 moving from right to left as viewed in figure 2, and angled upward in such a manner that the forward-most edge will be positioned over the vibrating tray 56 constituting the common first portion 52.

[0042] Thus, the particles 38 of shredded tobacco 9 are advanced at a suitably measured rate of feed toward the two bottom walls 43 presented by the two first portions 26 of the risers 24. Here, the stems and scraps 54 are separated and the lighter particles are directed upward through the first portions 26 in a continuous flow, entrained in a current of air generated by pneumatic means of familiar embodiment (not illustrated). On

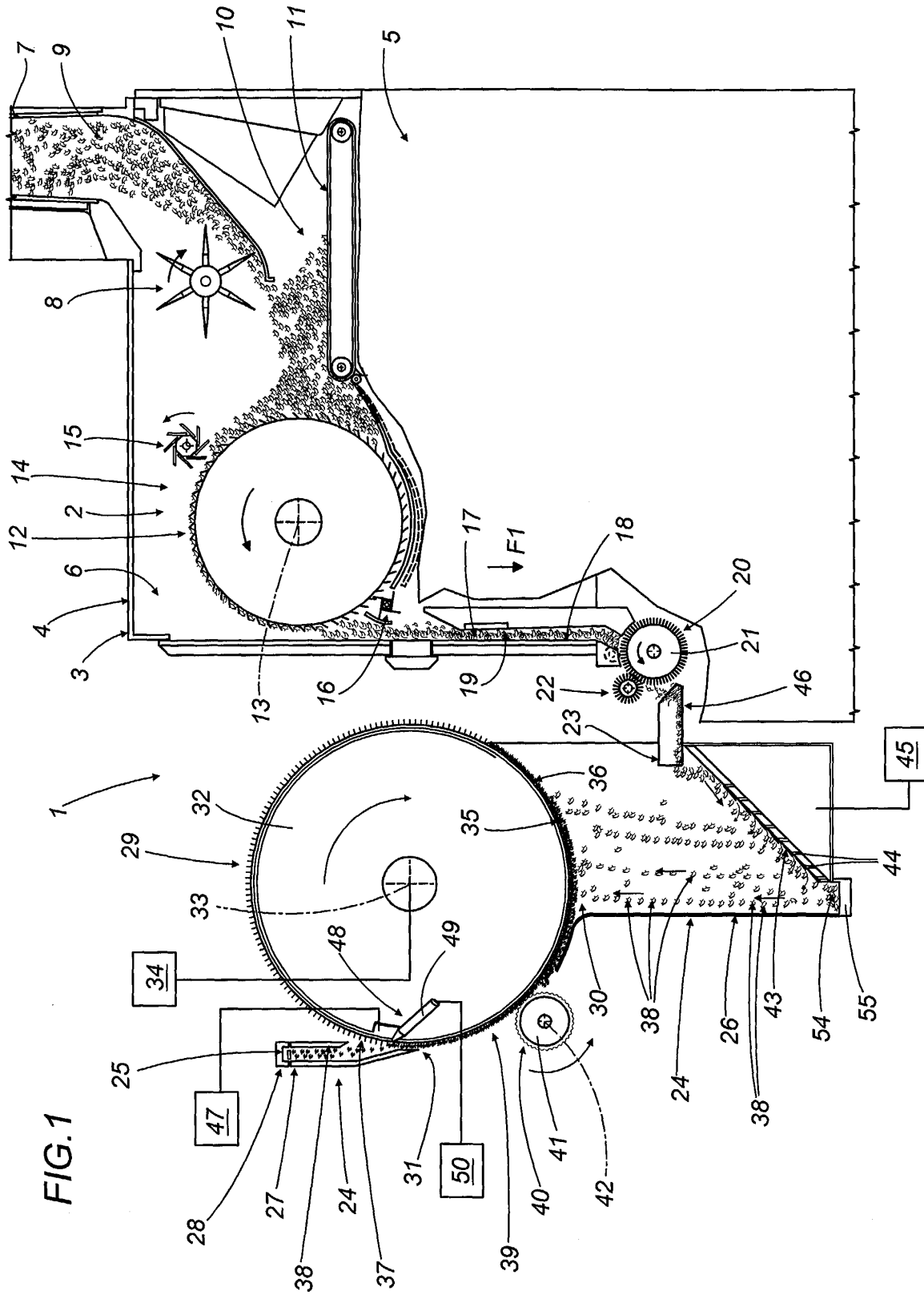
reaching the first sector 35 of each toothed roller 32 set in rotation about the relative axis 33, the flow of tobacco particles 38 will thicken progressively and at low speed on the surface of the roller 32 passing momentarily over the outlet 30 of the first portion 26, forming into a layer 36. Each layer 36 of tobacco is distributed and spread by the relative equalizing roller 41 and advances gradually toward the second sector 37 of the roller 32. At this point, the suction shut-off means 47 and/or the nozzles 49 are activated, so that the layer 36 of tobacco 9 is caused to detach from the surface of the roller 32 and gather into a new flow of particles 38. Exposed to the combined action of the aspirating belts 25 and of the jets delivered by the relative nozzles 49, the released particles will cling progressively to the belts 25 and form into a continuous stream of tobacco on each one.

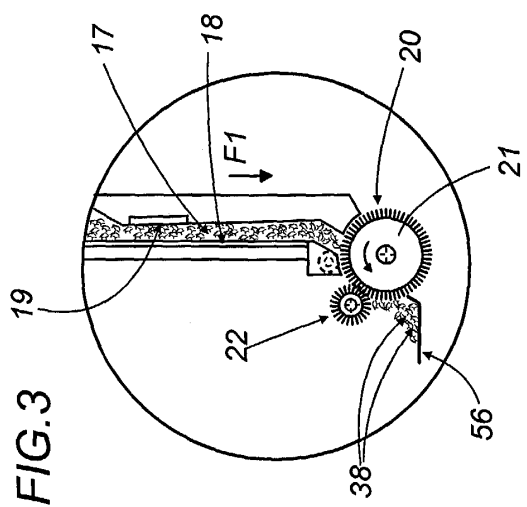
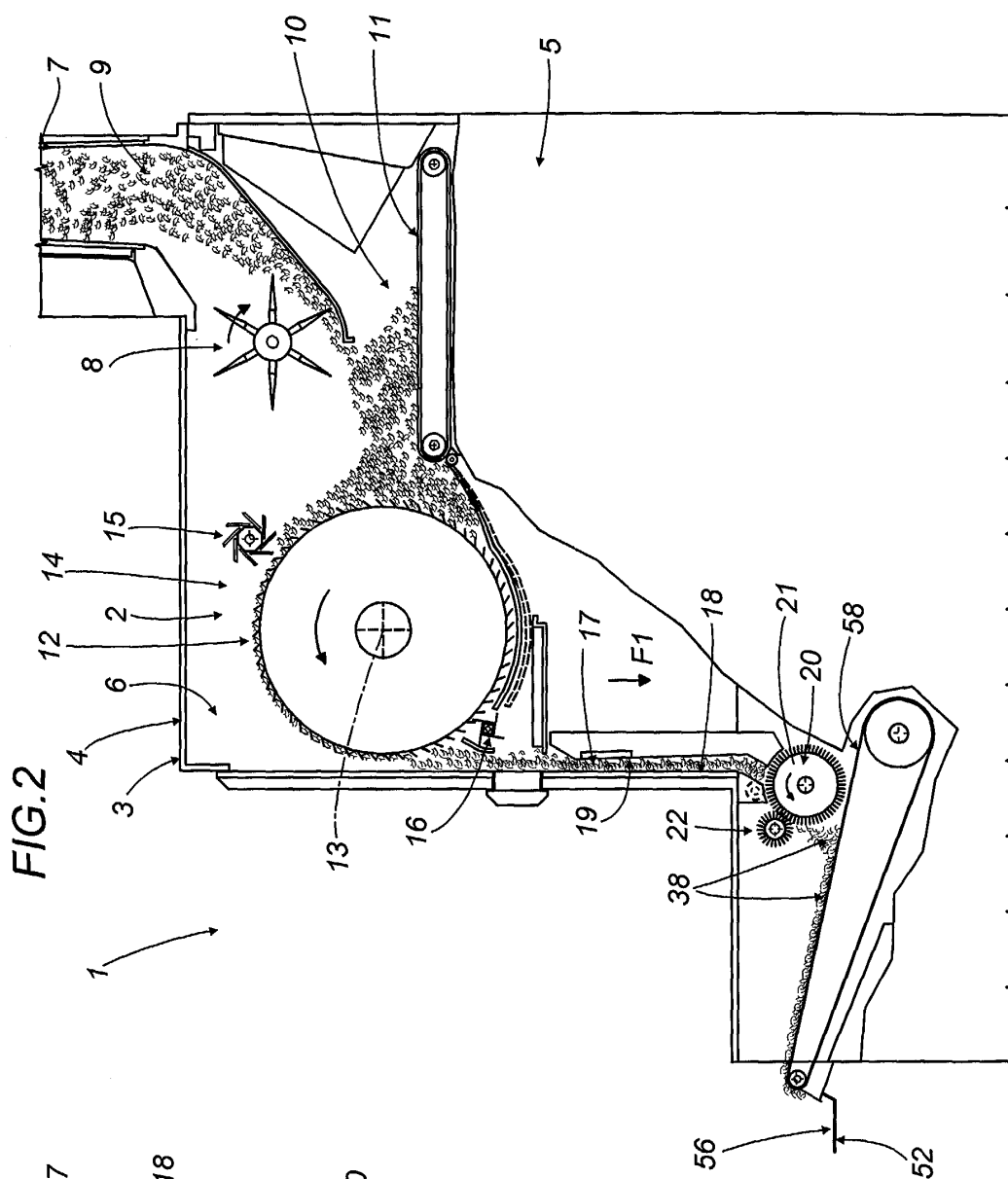
[0043] Finally, it will be seen in the illustration of figure 3 that the particles 38 of tobacco 9 are released by the rollers 21 and 22 directly onto the common vibrating tray 56.

Claims

1. A cigarette making machine comprising at least one ascent channel (24) through which to direct at least one flow of tobacco particles (38), also conveyor means (23) by which the tobacco (9) is supplied to the ascent channel (24), and at least one aspirating belt (25) set in motion adjacent to the outlet of the ascent channel (24), on which the flow of particles is formed into a corresponding stream of tobacco (9), wherein the ascent channel (24) comprises a lower first portion (26) designed to receive the tobacco (9) from the conveyor means (23), and an upper second portion (27) enclosed by the belt (25), **characterized in that** it comprises means (29), interposed between the first portion (26) and the second portion (27) of the ascent channel (24), by which to convey a predetermined quantity of tobacco (9) from the first portion to the second portion.
2. A cigarette making machine comprising a descent channel (17), feed means (12) by which shredded tobacco (9) is supplied to the descent channel (17) a unit (20) by which the tobacco (9) is taken up from the descent channel (17), at least one ascent channel (24) through which to direct at least one flow of tobacco particles (38), conveyor means (23) by which the tobacco (9) is transferred from the take-up unit (20) to the ascent channel (24), and at least one aspirating belt (25) set in motion at the outlet of the ascent channel (24), on which the flow of particles is formed into a corresponding stream of tobacco (9) and the stream then directed to the entry point of a station where it is formed into a continuous cigarette rod, **characterized in that** the ascent channel (24) comprises a lower first portion (26) and an upper second portion (27) embodied separately one from the other, of which the upper second portion (27) is enclosed by the belt (25); and **in that** it comprises means (29), interposed between the first portion (26) and the second portion (27) of the ascent channel (24), by which to convey a predetermined quantity of tobacco (9).
3. A machine as in claim 1 or 2, wherein the length of the first portion (26), as measured along the direction of movement of the aspirating belt (25), is identical to the corresponding length of the second portion (27), whereas the width of the first portion (26), measured transversely to the selfsame direction, is greater than that of the second portion (27).
4. A machine as in claims 1 to 3, wherein the conveyor means (29) are capable of movement along an endless path including a first sector (35) adjacent to an outlet (30) presented by the first portion (26) of the ascent channel (24), on which a layer (36) of tobacco (9) is formed, and at least one second sector (37), adjacent to an inlet (31) presented by the second portion (27) of the ascent channel (24), from which the particles (38) constituting the layer (36) of tobacco (9) are released.
5. A machine as in claim 4, comprising means (40) by which to level the layer (36) of tobacco, operating in conjunction with a third sector (39) of the conveyor means (29) interposed between the first and second sectors (35, 37).
6. A machine as in claim 2, wherein feed means (12) comprise a carding roller (12) rotatable about a relative axis (13), and conveyor means (29) comprise a toothed roller (32) able to generate suction and rotatable about a respective axis (33) disposed substantially parallel to the axis (13) of the carding roller (12).
7. A machine as in claims 1 to 6, wherein conveyor means (29) comprise a toothed roller (32) able to generate suction and rotatable about a respective axis (33) disposed substantially parallel to the direction of movement of the aspirating belt (25).
8. A machine as in claims 5 and 6, wherein levelling means (40) consist in a roller (41) occupying a position substantially tangential to the toothed roller (32).
9. A machine as in claims 5 and 7, wherein levelling means (40) consist in a roller (41) occupying a position substantially tangential to the toothed roller (32).

10. A machine as in claim 1, wherein the conveyor means (23) comprise at least one vibrating tray (46).
11. A machine as in claim 2, wherein the conveyor means (29) used to transfer the tobacco (9) comprise at least one vibrating tray (46).
12. A machine as in claim 2, comprising feed means (12) equipped with a carding roller (12) rotatable about a respective axis (13), two ascent channels (24) through which to direct respective flows of tobacco particles (38), and two aspirating belts (25) placed at the outlets of the ascent channel (24), on which the flows are formed into corresponding streams of tobacco, wherein the two ascent channels (24) are arranged symmetrically on either side of a vertical plane (51) lying between the aspirating belts (25) and perpendicular to the axis (13) of rotation of the carding roller (12).
13. A machine as in claim 12, wherein the conveyor means (23) by which the tobacco (9) is transferred comprises a common first portion (52) and two mutually independent second portions (53) extending divergently from the common first portion (52) on either side of the vertical plane (51) of symmetry.
14. A machine as in claim 13, wherein the common first portion (52) and the two mutually independent second portions (53) consist in respective vibrating trays (56, 57).
15. A machine as in claims 12 to 14, wherein each ascent channel (24) is equipped with a respective toothed conveyor roller (32) able to generate suction and rotatable about a respective axis (33) disposed transversely to the axis (13) of the carding roller (12).
16. A machine as in claim 1, comprising two ascent channels (24) through which to direct two flows of tobacco particles (38), and two aspirating belts (25) positioned at the outlets of the ascent channels (24), on which the flows of particles are formed into corresponding streams of tobacco, wherein the ascent channels (24) are arranged symmetrically on either side of a vertical plane (51) lying between the aspirating belts (25), and equipped each with a respective toothed conveyor roller (32) able to generate suction and rotatable about a respective axis (33) disposed substantially parallel to the direction of movement of the aspirating belts (25).
17. A machine as in claim 4, and as in claim 15 or 16, wherein the conveyor roller (32) able to generate suction comprises means (47), associated with the second release sector (37), by which to shut off the suction.
18. A machine as in claim 17, comprising means (48), associated with the second release sector (37), by which to generate a flow of positively pressurized fluid.
19. A machine as in claims 1 to 18, wherein the first portion (26) of the ascent channel (24) terminates at bottom in an inclined wall (43) presenting holes (44) through which to direct a pressurized fluid.
20. A method of making cigarettes, comprising the steps of directing a flow of shredded and carded tobacco particles down a descent channel, taking up the shredded tobacco at the bottom of the descent channel by means of a toothed unit and transferring it by way of conveyor means to the inlet of at least one ascent channel, causing a flow of tobacco particles to rise through the ascent channel toward at least one aspirating belt placed at the outlet of the selfsame channel, and causing the particles to form into a continuous stream on the belt, **characterized in that** it comprises the steps of forming a layer of tobacco from the ascending flow of particles at the outlet of a first portion of the ascent channel, transferring the layer of tobacco to the inlet of a second portion of the ascent channel, establishing a second ascending flow of particles from the layer of tobacco and directing the second flow onto the aspirating belt.
21. A method as in claim 20, wherein the step of transferring the layer of tobacco comprises the subsidiary step of levelling the selfsame layer of tobacco.





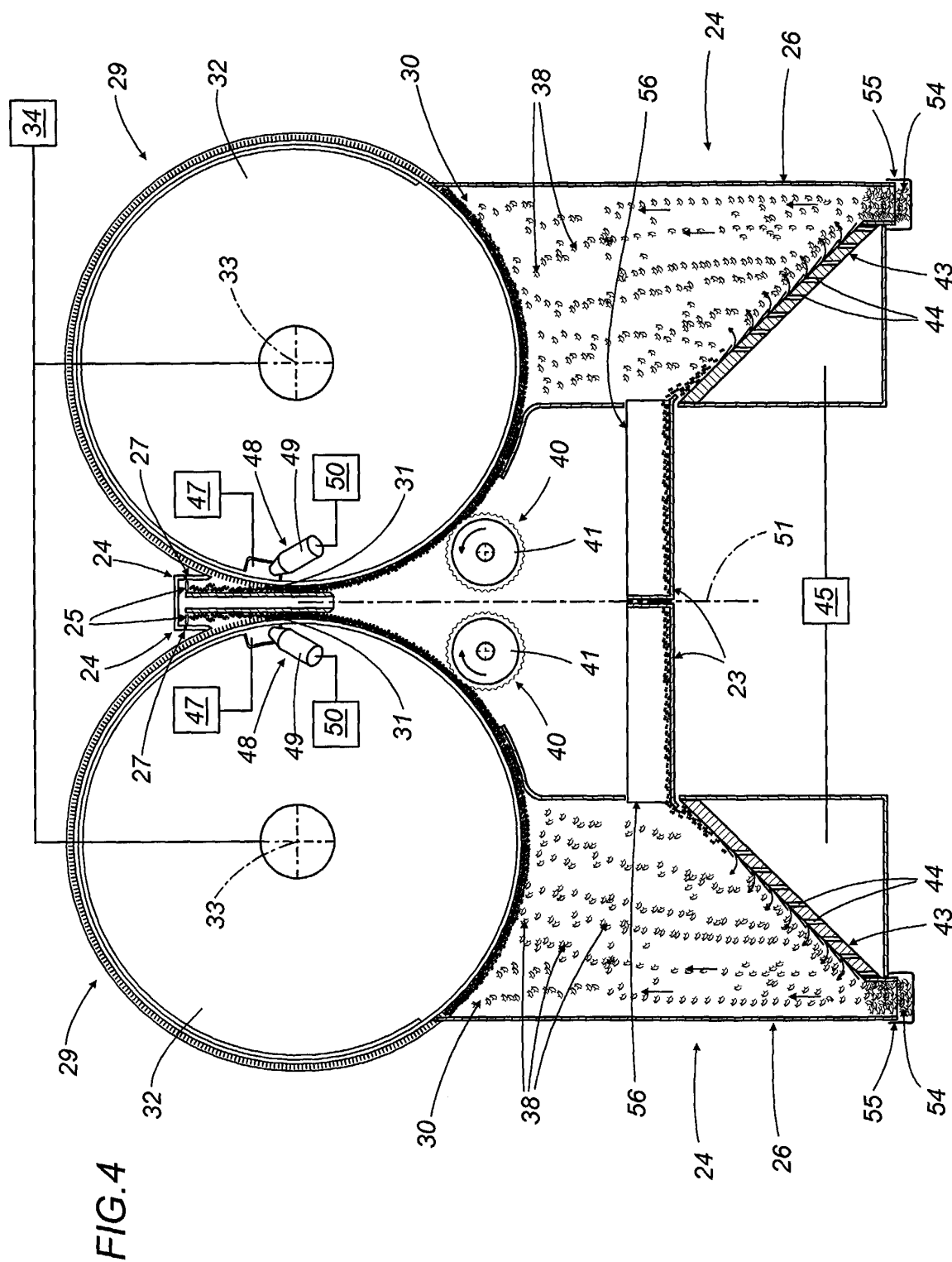


FIG.5

