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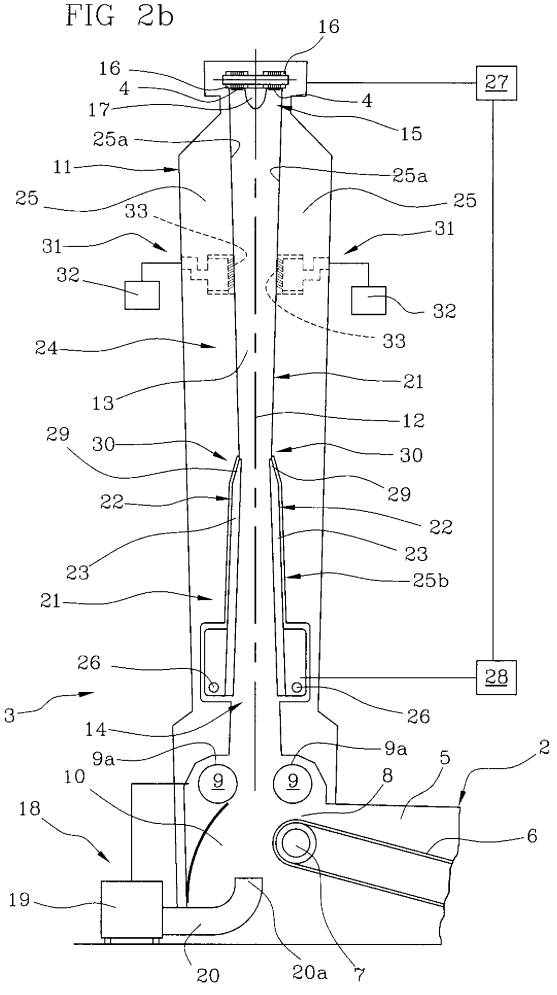
# (54) A cigarette making machine equipped to manufacture two continuous cigarette rods simultaneously

(57) In a twin-track cigarette maker (1) designed to manufacture two continuous cigarette rods at once, shredded tobacco particles entrained in an air current are directed up a channel (11) aligned on a substantially vertical axis (12). The channel (11) forms part of a chimney (13) enclosed at the top end (15) by two aspirating conveyor belts (16) and presenting a lower segment (21) equipped with a mechanism (22) intended to counter a loss of upward momentum tending to occur naturally in the flow of tobacco particles; the mechanism (22) comprises at least two flaps (23) hinged at the bottom and located internally of the channel (11), which are adjustable between a position parallel one with another, and a position converging toward an upper segment (24) of the chimney.

FIG 2b

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## Description

**[0001]** The present invention relates to a cigarette making machine of the type equipped to manufacture two continuous cigarette rods simultaneously.

**[0002]** Twin-track cigarette makers utilized in the tobacco industry are equipped with a carding unit designed to generate a flow of shredded tobacco particles, and operate by producing two continuous cigarette rods at one time. The flow of tobacco is fed typically into an ascending duct, or chimney, inside which the particles are carried forcibly upwards and into contact with two aspirating belts positioned to enclose the chimney at the top end.

**[0003]** Retained by the aspirating belts, which run at right angles to the direction followed by the rising flow of tobacco, the particles are gathered progressively into two continuous streams; the two streams are thereupon enveloped by strips of paper and formed into two continuous cigarette rods, each of which then advances along a relative path through downstream processing stations.

**[0004]** The flow of tobacco particles emerging from the chimney is not always perfectly uniform, due to an uneven distribution of the selfsame particles that derives from their dissimilar physical properties. Consequently, the two resulting streams of tobacco formed on the belts may present a different depth and/or weight per unit of length.

**[0005]** Given this irregularity, it becomes impossible to form two cigarette rods perfectly alike, presenting a predetermined and constant weight per unit of length, and therefore impossible ultimately to turn out cigarettes responding to the close tolerances required by manufacturers.

**[0006]** It has been noted that the uneven distribution of the tobacco is caused, not least, by a progressive reduction in velocity of the air flow through the chimney; this is occasioned by the cross-sectional geometry of the chimney itself, which appears wider at the outlet end offered to the aspirating belts, than at the inlet end.

**[0007]** Air is introduced at an initial velocity in such a manner as to "launch", then entrain and guide the particles of tobacco until the flow rates of the air and the tobacco are equalized. It is in the upper part of the chimney that the air flow rate becomes slower, due to the widening cross section of the chimney, and tends to attenuate the velocity of the tobacco particles, especially that of the smaller particles charged with less kinetic energy. Thus, not all of the tobacco particles are able to reach the aspirating belts, by reason of their dissimilar size, specific weight and aerodynamic behaviour.

**[0008]** This type of drawback cannot be overcome simply by increasing the initial velocity of the updraught through the chimney; in practice, there is a structural limit on any such increase, given that an excessive initial velocity will tend to stress the tobacco and degrade its physical properties, besides causing the particles to strike against the aspirating belts with unduly forceful impact.

**[0009]** The object of the present invention is to provide a cigarette maker equipped to manufacture two continuous cigarette rods simultaneously, in which all of the aforementioned drawbacks are overcome.

**[0010]** One object of the invention, in particular, is to provide a machine for manufacturing two continuous cigarette rods simultaneously, such as will allow a uniform distribution of the tobacco particles to be obtained on the two aspirating belts.

**[0011]** The stated objects are substantially realized according to the present invention in a twin-track machine designed to manufacture two continuous cigarette rods, of which the essential features are as recited in one or more of the claims appended.

**[0012]** The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figure 1 shows a cigarette maker according to the present invention, illustrated schematically and with parts cut away for clarity;
- figure 2a shows a portion of the cigarette maker in figure 1, illustrated schematically with parts cut away for clarity and in a first configuration;
- figure 2b shows a portion of the cigarette maker in figure 1, illustrated schematically with parts cut away for clarity and in a second configuration;
- figure 2c shows a portion of the cigarette maker in figure 1, illustrated schematically with parts cut away for clarity and in a third configuration.

**[0013]** With reference to figure 1, numeral 1 denotes a machine, in its entirety, equipped to manufacture two continuous cigarette rods simultaneously.

**[0014]** The machine 1 presents a first portion denoted 2, by which a continuous flow of shredded tobacco particles is fed to a second portion denoted 3; during their passage through the second portion 3, the particles are distributed in such a way as to form two continuous streams 4 of tobacco.

**[0015]** In particular, the first portion 2 comprises a substantially horizontal internal duct 5 housing a power driven conveyor belt 6, looped at opposite ends around two pulleys 7 of which one only can be seen in figure 2. The top branch of the belt 6 is positioned to take up shredded tobacco from a carding unit of familiar type (shown in figure 1) and transfer it beyond the downstream pulley 7 into a feed chamber 8 communicating uppermost, by way of a gap between two rollers 9 and 10 contrarotating about parallel horizontal axes, with a channel 11 aligned on a substantially vertical axis 12 and delimiting an ascending duct, or chimney 13.

**[0016]** The chimney 13 comprises a bottom inlet end 14, communicating with the chamber 8, and a top outlet end 15 enclosed by a pair of aspirating conveyor belts 16. The two aspirating belts 16 are driven in a predetermined conveying direction substantially normal to the viewing plane of figure 2, hence transverse to the axis 12 of the chimney 13, and made preferably of a perme-

able fabric.

**[0017]** The shredded tobacco particles are carried up through the chimney 13 on an ascending current of air and formed gradually into a continuous stream 4 on each of the aspirating belts 16.

**[0018]** Each stream 4 of tobacco, responding to selected physical specifications of depth, weight, moisture content and so forth, is formed into a continuous cigarette rod that will be divided subsequently into single cigarette sticks (not illustrated) by rotary cutter means (likewise not illustrated).

**[0019]** Located between the belts 16 is a separator 17 of familiar type, appearing as a bar of substantially ogival section, positioned facing the interior of the chimney 12 and extending parallel to the length dimension of the aspirating belts 16.

**[0020]** The machine 1 is equipped further with pneumatic means 18 by which the aforementioned ascending flow of air is generated internally of the chimney 13; such means comprise a source 19 of compressed air connected to a duct 20 of which an outlet end 20a is located inside the feed chamber 8, positioned below the pulley 7 and directed toward the inlet end 14 of the chimney 13.

**[0021]** The chimney 13 presents a lower first segment 21 equipped with means 22 by which to counter the deceleration in the flow of tobacco particles, consisting in at least two side walls, or flaps 23, located internally of the channel 11.

**[0022]** The lower first segment 21 extends into an upper second segment 24 delimited by the walls 25 of the channel 11, which extend divergently toward the top outlet end 15 of the chimney 13.

**[0023]** Figure 2a illustrates a first configuration in which the two flaps 23 are disposed parallel one with another, with the result that the lower first segment 21 of the chimney 13 presents a cross section of constant width.

**[0024]** Figure 2b shows a second configuration in which the flaps 23 are angled one relative to the other, and more exactly convergent, in such a way that the first segment 21 of the chimney 13 presents a cross section decreasing in width from the bottom inlet end 14 upwards.

**[0025]** In both the two configurations mentioned above, the flaps 23 are flat.

**[0026]** Alternatively, the flaps 23 can be curved as in the example of figure 2c, with respective convex faces directed toward the inside of the chimney 13, and the first segment 21 again presenting a cross section that decreases in width from the bottom inlet end 14 upwards.

**[0027]** At all events, the lower first segment 21 of the chimney 13 and the relative means 22 of countering deceleration in the flow of ascending particles will extend from the bottom inlet end 14 of the chimney 13 to a height between 10% and 70% of the overall height of the chimney 13, and preferably between 15% and 40% of this same height.

**[0028]** On the basis of experimental tests, the optimum height of the first segment 21 is around 25% of the full height of the chimney 13.

**[0029]** To advantage, the flaps 23 are pivotable about axes 26 transverse to the axis 12 of the chimney 13 in such a way that their angle of inclination can be adjusted, and the cross section of the passage presented by the first segment 21 of the chimney 13 thus varied selectively.

**[0030]** More exactly, the flaps 23 can be moved between a position of parallel alignment one with another and a position of upward convergence one with another.

**[0031]** The height of the aforementioned upper second segment 24 is preferably at least 30% of the full height of the chimney 13. As mentioned previously, the second segment 24 is delimited by the walls 25 of the channel 11, which present a substantially Vee formation as viewed in the drawings.

**[0032]** The machine 1 also comprises control devices 27 of conventional type, such as will monitor selected parameters to which the streams 4 of tobacco retained by the belts 16 must respond. The control devices 27 operate in conjunction with actuator means 28 by which the flaps 23 in the first segment 21 of the chimney 13 can be positioned at a selected angle of inclination.

**[0033]** The channel 11 presents an area between the first segment 21 and the second segment 24, in particular between the free top ends 29 of the flaps 23 and the relative surfaces 25a of the channel walls 25, identifiable as a join zone 30.

**[0034]** The join zone 30 preferably establishes a smooth transition from the first segment 21 to the second segment 24, such as will to prevent any tobacco particles from penetrating between the flaps 23 and the surfaces 25a presented by the walls 25 of the channel 11.

**[0035]** The free ends 29 of the flaps 23 occupying the join zone 30 present bevels and localized breaks in continuity that can create vortices or turbulence.

**[0036]** A suitable join zone 30 can be created utilizing flexible membranes (not illustrated) to connect the free ends 29 of the flaps 23 with the surfaces 25a of the relative walls 25 of the channel 11.

**[0037]** Also forming part of the machine 1 disclosed are accelerators 31, each associated with a respective wall 25 in the second segment 24 of the chimney 13, near to the top outlet end 15, of which the function is to quicken and vary the flow rate of the updraught as required in order to obtain a uniform entrainment of the tobacco particles inside the chimney 13.

**[0038]** Each accelerator 31 comprises a vacuum unit 32 positioned externally of the channel 11 and communicating with the interior of the chimney 13 via a plurality of suction holes 33.

**[0039]** In an alternative configuration, not illustrated, each of the flaps 23 might consist in a plurality of portions, each adjustable for angular position in such a way that the geometry of the lower first segment 21 of the chimney 13 can be varied further, according to the required velocity of the air flow.

**[0040]** In a further possible configuration, the flaps 23 might be rigidly associated with the walls 25 of the channel 11, or embodied as relative lower portions 25b of

these same walls. Likewise in this instance, it remains possible to obtain the three configurations described above, namely with walls in the lower segment extending parallel, convergent and rectilinear or convergent and curvilinear when seen in section.

**[0041]** In operation, the shredded tobacco directed from the top branch of the conveyor belt 6 into the feed chamber 8 is launched toward the chimney 13 both by the force of the rollers 9 and 10 and by the flow of compressed air from the duct 20.

**[0042]** The flow of tobacco particles is admitted to the chimney 13 via the inlet end 14 delimited by the contra-rotating rollers 9 and 10, whereupon it rises through the first segment 21 and then through the second segment 24.

**[0043]** The two parts of the flow of tobacco particles split by the separator element 17 are attracted in a state of uniform distribution by the aspirating belts 16, and formed gradually into two continuous streams 4.

**[0044]** In the machine according to the invention, the parallel or tapered section presented by the lower first segment 21 has the effect of significantly reducing the tendency of the air flow to slow the progress of the tobacco particles in the upper segment 24 of the chimney, while maintaining a uniform flow of tobacco up to the point of impact against the aspirating belts 16.

**[0045]** More particularly, where the first segment 21 of the chimney 13 is equipped with flaps 23 extending parallel one with another, the initial velocity of the air and of the tobacco particles will remain substantially constant throughout the entire dwell internally of the first segment 21, whereupon the velocity decreases through the second segment 24 of divergent section.

**[0046]** Where the first segment 21 of the chimney 13 is equipped with upwardly convergent flaps 23, the velocity both of the air and of the tobacco particles will be accelerated. Likewise in this instance, the shredded tobacco particles undergo a deceleration along the divergent section, becoming uniformly distributed and dividing appropriately between the two aspirating belts 16.

**[0047]** In either case, the deceleration in the flow of tobacco typical of prior art solutions is delayed.

**[0048]** The second segment 24 of the ascending channel 11 necessarily presents a divergent profile when seen in section, given that the width of the chimney at the top outlet end is determined by the transverse dimension of the paired aspirating belts 16, which extend side by side and are separated one from another by the ogival bar 17.

**[0049]** The chimney 13, and in particular the lower first segment 21, is configured in such a way that the final velocity at which the tobacco particles hit the belts 16 can be increased, by varying the angle of the flaps 23, to between three and four times the initial velocity at which the tobacco particles are fed into the chimney 13.

**[0050]** In the machine according to the invention, the velocity at which the tobacco particles hit the belts 16 is higher by 50-60% than the corresponding impact velocity of the tobacco in other prior art machines.

**[0051]** In the event of the control devices 27 detecting that the streams 4 of tobacco on either or both of the aspirating belts 16 do not respond to certain properties and parameters, correction signals are sent to the actuator means 28 and the angle of the flaps 23 is adjusted accordingly. The adjustment in question can be independent and dissimilar for the two single flaps 23 so as to compensate and cancel out any non-symmetrical distribution of the tobacco on the two aspirating belts 16. The angle of the flaps 23 might also be adjusted manually.

**[0052]** The invention affords significant advantages.

**[0053]** By varying the geometry of the first segment 21, it becomes possible to select the height of the point at which the velocities of the air and the tobacco are equalized, that is to say the point beyond which the air begins to have a decelerating effect on the tobacco particles, causing them to separate one from another according to their size and weight.

**[0054]** Delaying the deceleration, as far as possible, the distance through which the tobacco particles are carried purely by the force of inertia can be advantageously reduced.

**[0055]** The distance travelled by the tobacco particles under acceleration or at constant velocity is thus extended, and with the tobacco entrained forcibly for longer before spreading at a later stage, there is insufficient time for a distinct separation of particles having dissimilar properties to occur inside the chimney.

## Claims

**1.** A cigarette making machine equipped to manufacture two continuous cigarette rods simultaneously, comprising a channel (11) aligned on a substantially vertical axis (12) and creating a chimney (13), through which to direct a flow of tobacco particles entrained by an ascending flow of air, enclosed at a top outlet end (15) by a pair of aspirating belts (16) set in motion along a direction transverse to the chimney (13), on which two continuous streams (4) of tobacco are formed,
**characterized**
**in that** the chimney (13) presents a lower first segment (21) furnished with means (22) by which to counter deceleration in the flow of tobacco particles, consisting in at least two flaps (23) located internally of the channel (11), and an upper second segment (24) delimited directly by walls (25) of the selfsame channel (11) extending divergently toward the top outlet end (15).

**2.** A machine as in claim 1, wherein the flaps (23) are disposed mutually parallel, in such a way that the cross sectional width presented by the first segment (21) of the chimney (13) remains constant.

**3.** A machine as in claim 1, wherein the flaps (23) are disposed mutually convergent, in such a way that the cross sectional width presented by the first segment (21) of the chimney (13) decreases from the bottom end (14) upwards.

**4.** A machine as in claim 3, wherein the flaps (23) present a curved profile, each with a convex face directed toward the interior of the chimney (13).

**5.** A machine as in claim 1 to claim 4, wherein the lower first segment (21) of the channel (11) extends from a bottom inlet end (14) of the chimney (13) to a height between 10% and 70% of the overall height of the selfsame chimney (13).

**6.** A machine as in claim 1 to claim 5, wherein the flaps (23) are pivotably adjustable about axes (26) transverse to the axis (12) of the chimney (13), in such a way that the cross sectional width of the chimney (13) can be varied at least along the first segment (21).

**7.** A machine as in claim 6, wherein the flaps (23) are capable of movement between a position of parallel alignment one with another and a position of convergence toward the top end (15) of the chimney.

**8.** A machine as in claim 1 to claim 7, comprising actuator means (28) serving to adjust the angle of inclination of the flaps (23), interlocked to control devices (27) monitoring predetermined properties of the continuous streams (4) of tobacco.

**9.** A machine as in claim 1 to claim 8, further comprising a join zone (30) at which the free top ends (29) of the flaps (23) are offered to relative surfaces (25a) presented by the walls (25) of the channel (11).

**10.** A machine as in claim 9, wherein the join zone (30) is occupied by bevels formed on the top ends (29) of the flaps (23).

**11.** A machine as in claim 9, wherein the join zone (30) is occupied by flexible membranes connecting the free top end (29) of each flap (23) to the surface (25a) presented by the relative wall (25) of the channel (11).

**12.** A machine as in claim 1 to claim 5, wherein the flaps (23) form an integral part of respective lower portions (25b) presented by the walls (25) of the channel (11).

FIG 1

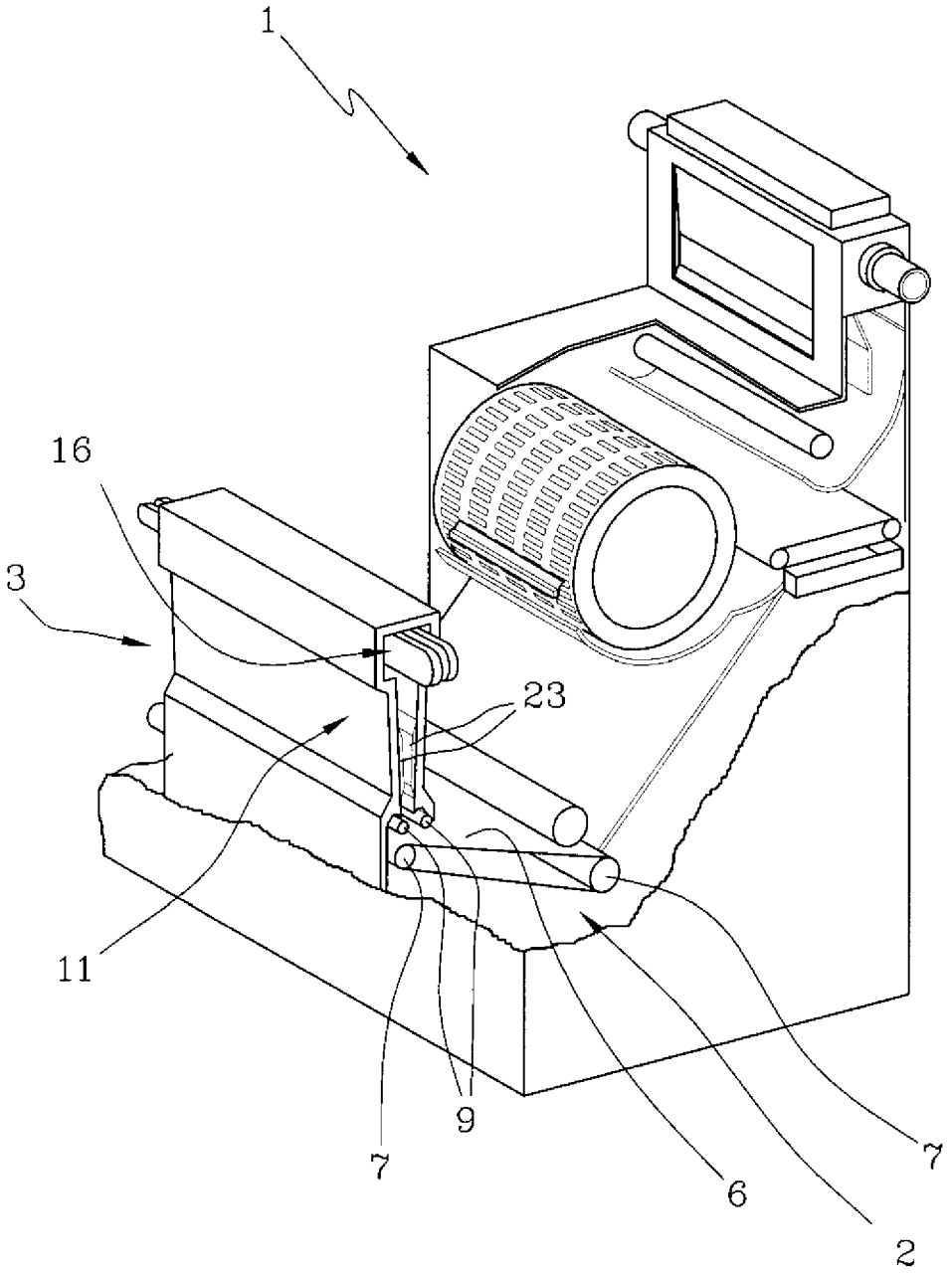

FIG 2a

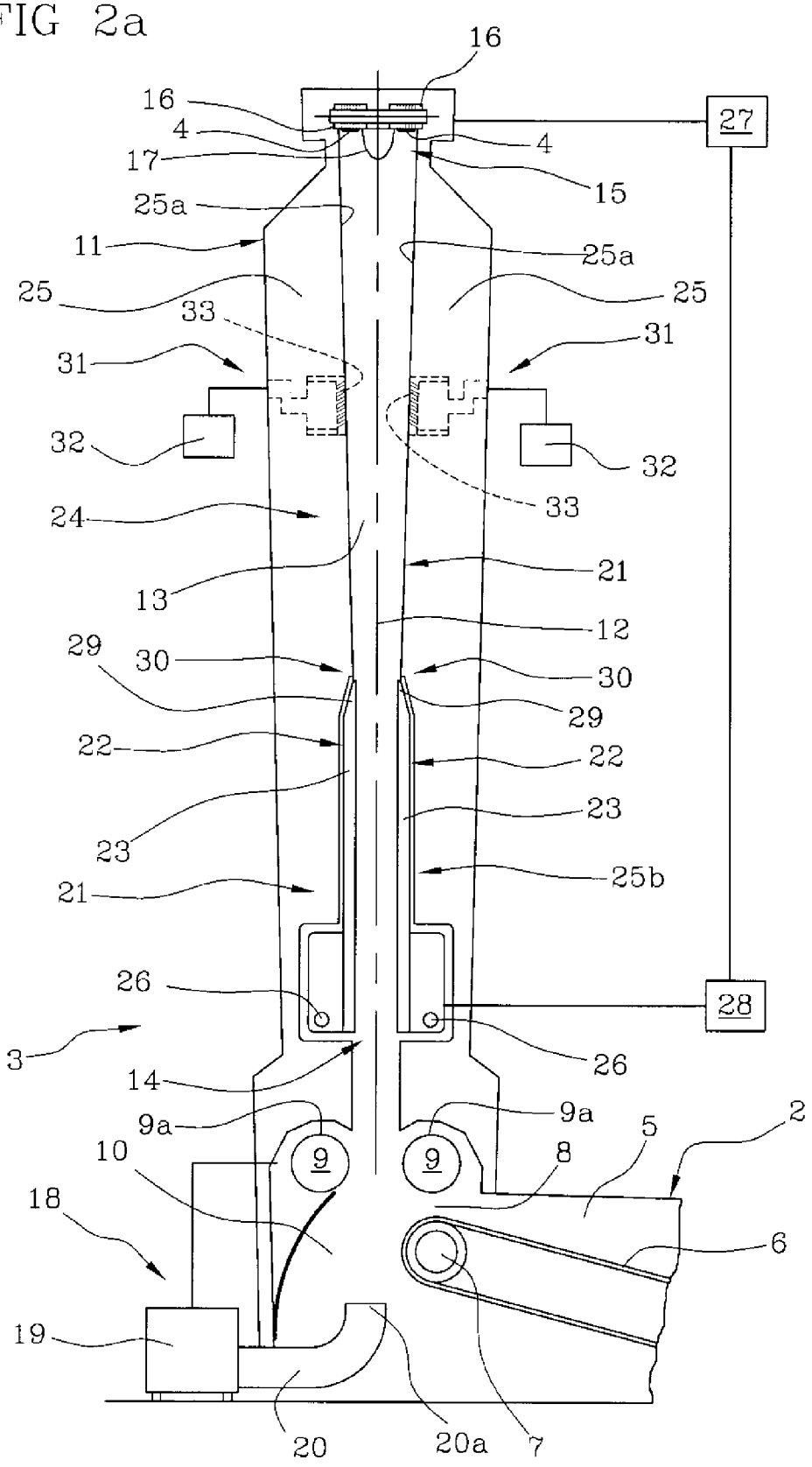
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FIG 2b

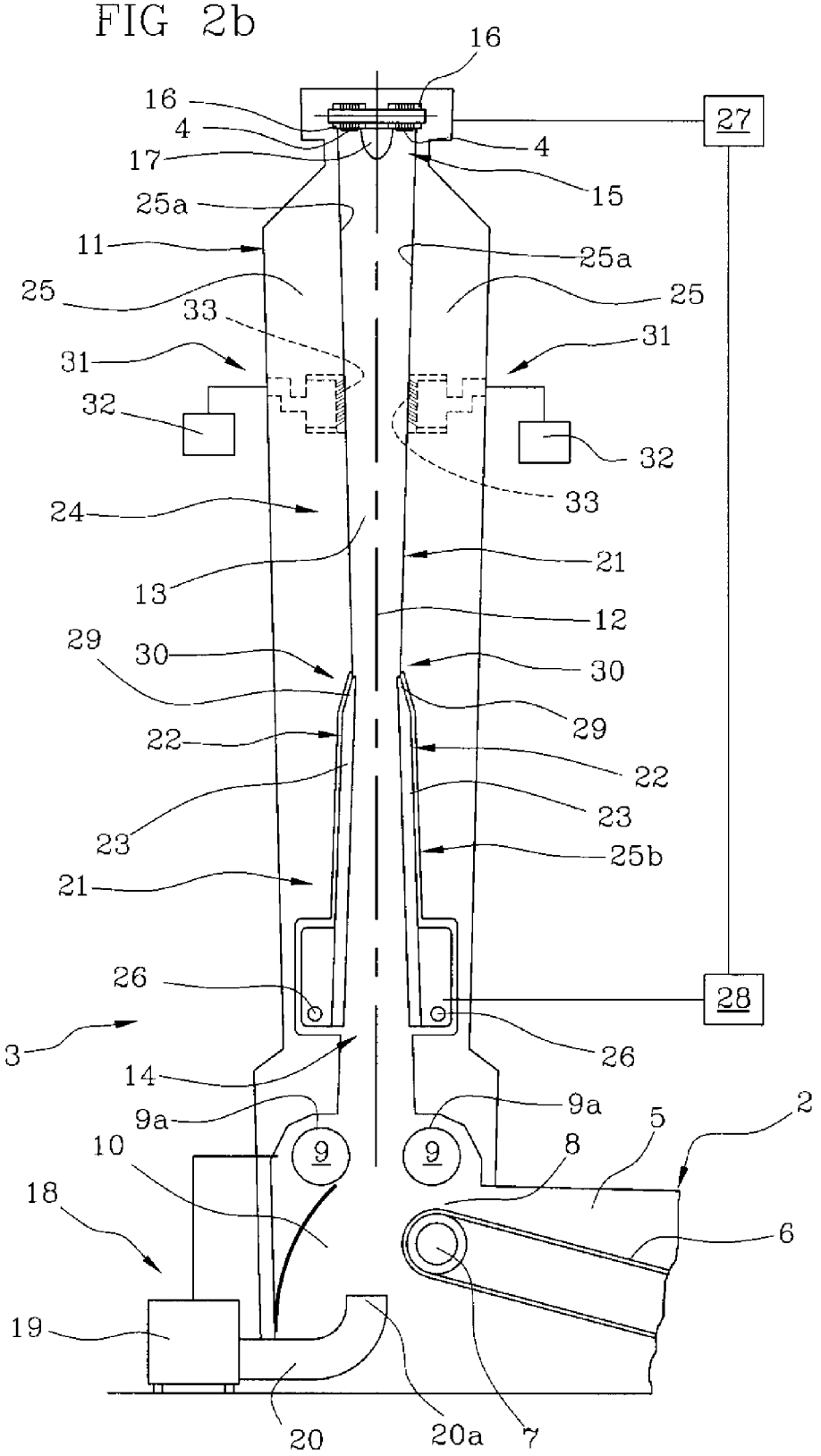
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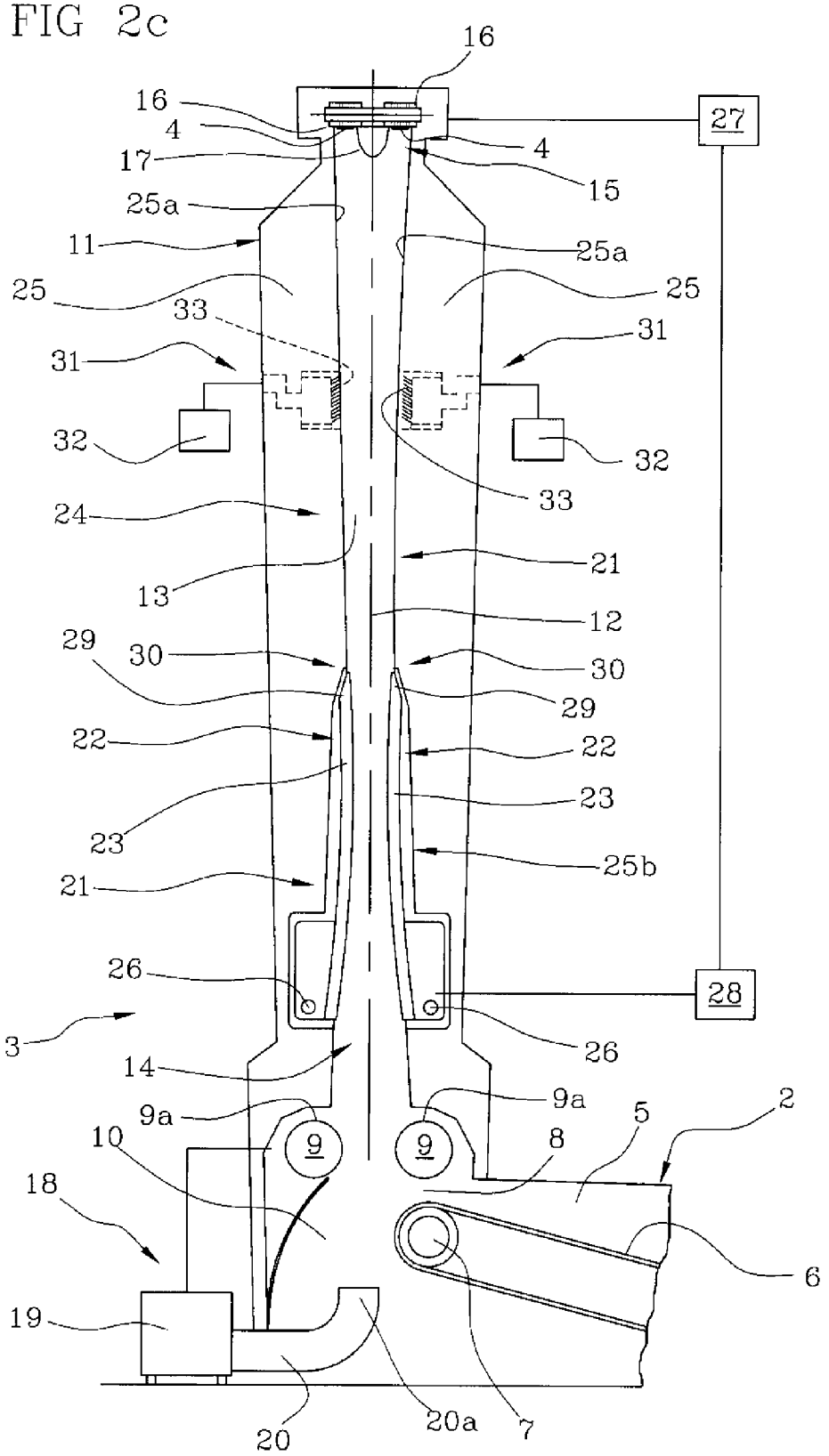
FIG 2c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# EUROPEAN SEARCH REPORT

Application Number
EP 07 10 8437

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A24C

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 21 September 2007 | MARZANO MONTEROSSO |

CATEGORY OF CITED DOCUMENTS

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