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(54) DEVICE FOR CUTTING MULTIPLE-LENGTH RODS OF FILTERING MATERIAL AND UNIT FOR FEEDING RODS OF FILTERING MATERIAL PROVIDED WITH SAID DEVICE

(57) Device (11) for cutting crosswise multiple-length rods (8) of filtering material in a plurality of single-length rod portions (6) of filtering material, which receives the multiple-length rods (8) of filtering material in the area of an input station (IS) and transfers the plurality of single-length rod portions (6) of filtering material in the area of a discharge station (DS); the cutting device (11) comprises a number of cutting stations (21) arranged one after the other between the input station (IS) and the discharge station (DS), wherein each cutting station (21) comprises a number of circular blades (12), which rotate, with a continuous motion, around a common rotation axis (Y), and wherein each cutting station (21) receives the multiple-length rods (8) of filtering material and cuts them crosswise so as to obtain the multiple-length rods (8) of filtering material and/or single-length rod portions (6) of filtering material; wherein the cutting device (11) comprises a number of separating elements (23, 25, 27) arranged downstream of the circular blades (12) so as to axially space apart the multiple-length rods (8) of filtering material.

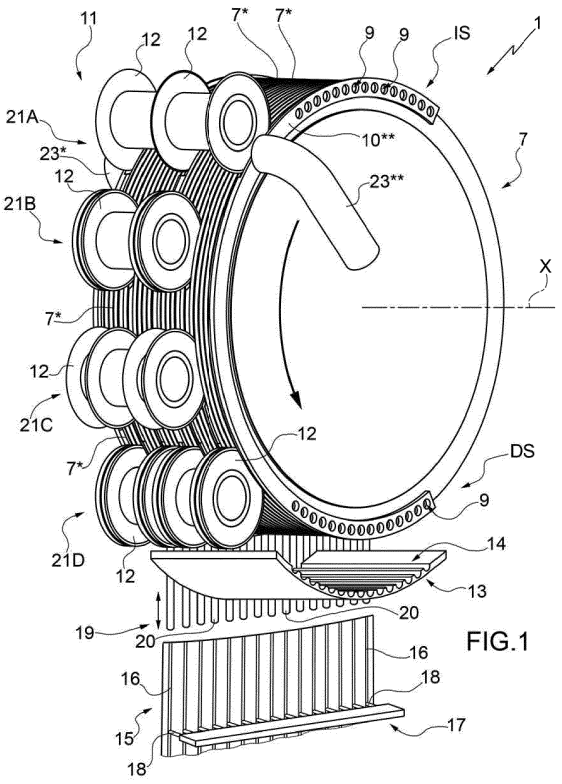

FIG.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a device for cutting multiple-length rods of filtering material and to a unit for feeding rods of filtering material provided with said device.

PRIOR ART

[0002] Recently, single-use (i.e. disposable) cartridges for electronic cigarettes have been made available comprising a tubular shaped casing made of plastic material with a micro-perforated bottom wall containing a quantity of powdered tobacco on top of which a rod of filtering material of a small size, for example having a length of 4.75 mm is arranged; and sealed at an upper end with a sealing ring.

[0003] The manufacturing of said cartridges provides for the filling of casings with a measured quantity of powdered tobacco, slightly compressing the mass of powdered tobacco inside each casing for obtaining the desired density and then capping the cartridges by applying to the upper open end both the rod of filtering material and the sealing ring.

[0004] Presently, the production of cartridges is mostly performed manually or with rudimentary packaging machines which require a continuous use of labour. Consequently, the production of cartridges and blister packs takes place in a slow manner (that is, with a low productivity) and with a very variable quality (being generally modest).

[0005] For example, the disposable cartridge packaging machines of a known type comprise a feeding unit to feed multiple-length rods of filtering material provided with a rotating drum rotating around its own horizontal rotation axis and provided with a plurality of peripheral sucking seats, each of which receives a respective multiple-length rod of filtering material, for example having a length of 120 mm, held by suction during the cutting step and cooperates with a device provided with circular blades that are inserted inside the peripheral seats to cut crosswise the multiple-length rods of filtering material. However, it has been found that the cutting devices of the type described above are not sufficiently precise to obtain small size rods of filtering material, for example having a length of 4.75 mm, due to the compression effect that the cutting edges of the various circular blades exert on the rods of filtering material.

DESCRIPTION OF THE INVENTION

[0006] The object of the present invention is to provide a device for cutting multiple-length rods of filtering material, which device has no drawbacks of the state of the art, it allows to achieve high productivity by guaranteeing high quality standards and at the same time is easy and inexpensive to implement.

[0007] A further object of the present invention is to provide a unit for feeding rods of filtering material provided with said device, which unit is free from the disadvantages of the state of the art and is, at the same time, easy and inexpensive to implement.

[0008] According to the present invention a device, for cutting multiple-length rods of filtering material, and a unit for feeding rods of filtering material provided with said device as claimed in the appended claims are provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present invention will now be described with reference to the accompanying drawings, which illustrate an example of a non-limiting embodiment, wherein:

Figure 1 is a perspective view of a filter feeding unit of a machine for packaging disposable cartridges for electronic cigarette provided with a device for cutting multiple-length rods of filtering material made according to the present invention;

Figure 2 is a sectional view of a disposable cartridge for electronic cigarettes;

Figure 3 is a side view in section and with parts removed for clarity of an assembly formed by the cutting device cooperating with a drum of the filter feeding unit of Figure 1;

Figure 4 is a perspective view and with parts removed for clarity of the assembly of Figure 3;

Figure 5 is a schematic representation of the various steps of the cutting process according to a preferred embodiment of the present invention;

Figure 6 illustrates a detail of a first cutting step of the process of Figure 5;

Figure 7 illustrates in detail a second cutting step of the process of Figure 5; and

Figure 8 illustrates a detail with particular parts enlarged for clarity of the second cutting step of Figure 7.

PREFERRED EMBODIMENTS OF THE INVENTION

[0010] In Figure 1, number 1 denotes a whole a unit for feeding rods of filtering material of a packaging machine of disposable cartridges 2 for electronic cigarettes. As illustrated in Figure 2, each disposable cartridge 2 comprises a tubular casing 3 made of plastic material having a micro-perforated bottom wall 4 and a substantially cylindrical shaped side wall 5 containing a quantity of powdered tobacco on top of which a rod 6 of filtering material is arranged.

[0011] The unit 1 for feeding rods of filter comprises a drum 7 which rotates in a counterclockwise manner around its own rotation axis X and receives a plurality of multiple-length rods 8 of filtering material, for example having a length equal to 120 mm.

[0012] The drum 7 is set into rotation with an intermittent motion, i.e. a non-continuous motion which involves a cyclic alternating of motion steps, in which the drum 7 is moving, and rest steps in which the drum 7 stops.

[0013] The drum 7 is provided with a number of tubular cavities 9 obtained along the periphery of the drum 7 and is divided into two groups; wherein each group has the same number of openings 4, e.g. 15 openings 4, and are arranged in areas diametrically opposed to each other on the periphery of drum 2; in particular, in Figure 1, the first group of tubular cavities 9 is arranged in the area of an input station IS whereas the second group of tubular cavities 9 is arranged in the area of a discharge station DS. Each tubular cavity 9 is made so as to house, on the inside, a multiple-length rod 8 of filtering material.

[0014] A plurality of multiple-length rods 8 of filtering material coming from storage (not illustrated) is fed in the area of the input station IS which comprises an arm (not illustrated) provided with a number of pusher members equal to the number of tubular cavities 9 of each group arranged near to and facing the drum 7. The arm is movable in a direction parallel to the rotation axis X between a forward position and a rear position to allow the insertion of a multiple-length rod 8 of filtering material inside each tubular cavity 9; and vice versa.

[0015] The drum 7 is obtained by means of a plurality of discs 7*, which are arranged besides one another and can rotate in a stepwise manner around the common rotation axis X, and is provided, at its ends, with two side edges, denoted with 10* and 10**, having a variable thickness and, in use, serving as a counterpart for the rods 8 of filtering material as further described in the following discussion.

[0016] The drum 7 cooperates with a cutting device 11 provided with blades 12 rotating around respective rotation axes Y parallel one to the other and parallel to the rotation axis X for cutting crosswise the multiple-length rods 8 of filtering material so as to obtain single-length rod portions 6 of filtering material, for example having a length of 4.75 mm.

[0017] The filter feeding unit 1 then comprises a bent tile-like element 13 which receives the single-length rod portions 6 of filtering material from the drum 7 in the area of the discharge station DS. The bent tile-like element 13 is provided with a number of sucking seats 14 to hold the single-length rod portions 6 of filtering material and is movable between a withdrawal position, in which the axes of the single-length rod portions 6 of filtering material are parallel to the rotation axis X, and a release position (not illustrated) in which, instead, the axes of the single-length rod portions 6 of filtering material are orthogonal to the rotation axis X.

[0018] The bent tile-like element 13 rotates by 90° from the withdrawal position to the release position and advances longitudinally until being placed in a position directly facing a storage 15 for collecting the single-length rod portions 6 of filtering material; the suction of the sucking seats is interrupted so that the bent tile-like element 13 can release the stacks of single-length rod portions 6 of filtering material on the inside of respective channels 16 of the magazine 15. The magazine 15 is also provided with a comb-like element 17 movable both in a horizontal direction and in a vertical direction, and provided with a plurality of teeth 18 each of which is inserted, in use, inside a respective channel 16 to hold the stack of single-length rod portions 6 of filtering material. In particular, the comb-like element 17 is movable, in a horizontal direction, between a rear position and an forward position in which the end of each tooth 18 engages a respective channel 16; from the advanced position, the comb-like element 17 is able to move, in a vertical direction, by going down along the channels 16 and to stop immediately above the stacks of single-length rod portions 6 of filtering material already collected on the inside of the channels 16.

[0019] In addition, on top of the bent tile-like element 13 a pushing member 19 is also provided, movable in a vertical direction, and provided, as well, with a plurality of arms 20 made to be inserted inside respective channels 16 and accompany the descent of the stacks of single-length rod portions 6 of filtering material within the respective channel 16.

[0020] In use, when the bent tile-like element 13 releases the stacks of single-length rod portions 6 of filtering material inside the channels 16, the comb-like element 17 is in the forward position so that the end of each tooth 18 acts as a support for a respective stack of single-length rod portions 6 of filtering material. The comb-like element 17 is then lowered to allow the simultaneous descent of single-length rod portions 6 of filtering material inside the channels 16 and, at the same time, the pusher element 19 is lowered so that each arm 20 is inserted inside the respective channel 16 to favour the descent of the stacks of single-length rod portions 6 of filtering material inside the respective channel 16.

[0021] The comb-like element 17 immediately stops on top of the stacks of single-length rod portions 6 of filtering material already collected in the channels 16 and is subsequently extracted from the magazine 15 so that the newly introduced single-length rod portions 6 of filtering material can overlap with those already present.

[0022] As illustrated in Figures 4 and 5, the cutting device 11 comprises a plurality of cutting stations 21 arranged one after the other, in particular four cutting stations 21 arranged one after the other on the periphery of the drum 7, denoted by 21A, 21B, 21C and 21D. Each cutting station 21 is provided with a number of blades 22 rotating around the common rotation axis Y to cut crosswise the multiple-length rods 8 of filtering material so as to obtain the single-length rod portions 6 of filtering material. In use, each circular blade 12 is inserted between two adjacent discs 7* of the drum 7 to cut the multiple-length rods 8 of filtering material crosswise.

[0023] As illustrated in Figure 6, the cutting station 21A receives the multiple-length rods 8 of filtering material, which subsequently feeds to the cutting station 21B, and

comprises three circular blades denoted with 22^1, 22^2 and 22^3. The blades 22^1 and 22^3 are arranged at the end of the multiple-length rod 8 of filtering material to trim both sides of said multiple-length rod 8 of filtering material. In the area of the blades 22^1 and 22^3 two conduit 23* and 23** for collecting the waste end portions 24* and 24** of the rod 8 of filtering material, which will be at least of multiple-length, are also arranged. In particular, each waste conduit 23* and 23** is arranged so as to face a respective blade 22^1 and 22^3 for collecting the end portions 24* and 24** cut off from the multiple-length rod 8 of filtering material as a result after the cutting of the ends 24* and 24**.

[0024] The blade 22^2 is instead arranged in the area of the midpoint of the multiple-length rod 8 of filtering material so as to divide the multiple-length rod 8 of filtering material into two multiple-length semi-rods 8 of filtering material having the same length. The blade 22^2 is provided with a perfectly symmetrical V-shaped cutting edge that, during the cutting step, compresses each of the two multiple-length semi-rods 8 of filtering material. For example, in the case of a cutting edge of the blade 22^2 having a thickness of 0.3 mm each of the two semi-rods 8 of filtering material obtained is compressed by 0.15 mm.

[0025] The blades 22^1 and 22^3 are instead provided with an asymmetrical cutting edge, with an inclined cutting edge facing outward, that is, facing the conduit 23* and 23** for collecting the waste end portions 8* and 8** of the multiple-length rod 8 of filtering material, and a substantially flat side facing the blade 22^2. The substantially flat side facing the blade 22^2 allows to not further compress the respective semi-rods 8 of filtering material.

[0026] Downstream of the cutting station 21A a separating element 23 is placed. The separating element 23 is arranged immediately downstream of the blade 22^2 and has a variable thickness. According to a preferred alternative, the separating element 23 extends until reaching the entrance of the cutting station 21D. In particular, the separating element 23 has a V-shaped symmetrical profile in an initial segment; the V-shaped symmetrical profile substantially reproduces the V-shaped symmetrical profile of the cutting edge 22^2. The separating element is able to axially space the two semi-rods 8 of filtering material so that each of the semi-rods 8 of filtering material is arranged with an inner end in contact with a respective surface of the separating element 23 and an outer end in contact with an inner surface of a respective lateral side board 10. Thanks to the discharge of the end portions 24* and 24**, each multiple-length semi-rods 8 of filtering material has a clearance within the defined seat between the separating element 23 and the respective lateral side board 10 allowing it to axially move.

[0027] As better illustrated in Figures 7 and 8, the cutting station 21B receives the two multiple-length rods 8 of filtering material from the cutting station 21A, which subsequently feeds to the cutting station 21C, and comprises six circular blades denoted with numbers from 24^1 to 24^6. The six circular blades from 24^1 to 24^6 are divided into two groups (only one of which is described in the following discussion), arranged on opposite sides of the separating element 23 and each of the two groups acts on a respective multiple-length rod 8 of filtering material.

[0028] The blade 24^2 is arranged at the midpoint of the rod 8 of filtering material and is provided with a perfectly symmetrical V-shaped cutting edge. The blades 24^1 and 24^3 are instead arranged at opposite sides and near to the blade 24^2. The blades 24^1 and 24^3 are provided with an asymmetrical cutting edge with an inclined cutting side facing outwards, and a substantially flat side facing the blade 24^2.

[0029] The blade group from 24^1 to 24^3 allows to divide the rod 8 of filtering material so as to obtain two single-length rod portions 6 of filtering material between the blade 24^2 and each of the two blades 24^1 and 24^3; and two multiple-length rods 8 of filtering material but with the same dimensions defined between each of the two blades 24^1 and 24^3 and, the lateral side board 10* and the separating element 23, respectively. During the cutting step, the blade 24^2 compresses each of the two single-length rod portions 6 of filtering material, but the substantially flat cutting side of the blades 24^1 and 24^3 facing the blade 24^2 allows to not further compress the respective single-length rod portion 6 of filtering material.

[0030] The inclined side of the blades 24^1 and 24^3 allows to compress each of the two multiple-length rods 8 of filtering material. In order to not further compress two multiple-length rods 8 of filtering material, both the lateral side board 10* and the separating element 23 have a thickness reduction at the cutting station 21B. As illustrated in Figures 7 and 8, the lateral side board 10* has a width d_1 at the cutting station 21A greater than the width d_2 at the cutting station 21B. The thickness reduction of the lateral side board 10* from d_1 to d_2 is made to compensate for the action of the blade 24^1 that compresses the multiple-length rod 8 of filtering material. By reducing the thickness of the lateral side board 10*, the multiple-length rod 8 of filtering material is not further compressed and moves axially within the defined seat between the lateral side board 10* and the blade 24^1.

[0031] Similarly, the separating element 23 has a width D_1 at the cutting station 21A greater than the width D_2 at the cutting station 21B. The thickness reduction of the separating element 23 from D_1 to D_2 is made to compensate for both the action of the blade 24^3 and the action of the blade 24^4 that compress two respective multiple-length rods 8 of filtering material.

[0032] Downstream of cutting station 21B four separating elements 25 are arranged; in particular, two separating elements 25 are provided for each of the two group of blades from 24^1 to 24^6. The separating elements 25 are arranged immediately downstream of the blades 24^1 and 24^3 and have a constant thickness. According to a preferred alternative, each separating element 24^1 and 24^3 extends until reaching the cutting station 21C.

Each separating element 24^1 and 24^3 is adapted to axially move the two multiple-length rods 8 of filtering material so that each of the two multiple-length rods 8 of filtering material is arranged with an inner end in contact with a surface of the respective separating element 25 and an outer end in contact with the surface of the lateral side board 10 and of the separating element 23, respectively.

[0033] The cutting station 21C receives four multiple-length rods 8 of filtering material and four single-length rod portions 6 of filtering material from the cutting station 21B which feeds, then, to the cutting station 21D and comprises four circular blades denoted with numbers from 26^1 to 26^4. The four circular blades from 26^1 to 26^4 are subdivided into two groups (only one of which is described in detail in the following discussion), arranged on opposite sides of the separating element 23 so that each of said groups acts on a respective pair of multiple-length rods 8 of filtering material.

[0034] In particular, the blades 26^1 and 26^2 are arranged near to the two separating elements 25 and are provided with an asymmetrical cutting edge with an inclined cutting side facing respectively the lateral side board 10* and the separating element 23, and a substantially flat side facing the respective separating element 25.

[0035] The pair of blades 26^1 and 26^2 allows to divide the pair of multiple-length rods 8 of filtering material so as to obtain two single-length rod portions 6 of filtering material defined between each blade 26^1 and 26^2 and the respective separating element 25; and two multiple-length rods 8 of filtering material of the same length but having the same dimensions defined between each of the two blades 26^1 and 26^2 and the lateral side board 10* and the separating element 23, respectively. During the cutting step, the substantially flat cutting side of the blades 26^1 and 26^2 allows to not excessively compress the respective single-length rod portions 6 of filtering material.

[0036] The inclined side of the blades 26^1 and 26^2 allows, instead, to compress each of the two multiple-length rods 8 of filtering material obtained between each of the two blades 26^1 and 26^2 and the lateral side board 10* and the separating element 23, respectively. In order to not excessively compress the two multiple-length rods 8 of filtering material, both the lateral side board 10* and the separating element 23 have a thickness reduction at the cutting station 21C. As illustrated in Figure 5, the thickness d_2 of the lateral side board 10* at the cutting station 21B is greater than the width d_3 at the cutting station 21C. The thickness reduction of the lateral side board 10* from d_2 to d_3 is made to compensate for the action of the blade 26^1 which compresses the multiple-length rod 8 of filtering material. Due to the thickness reduction of the lateral side board 10*, the multiple-length rod 8 of filtering material is not further compressed and has a clearance inside the seat defined between the lateral side board 10* and the blade 26^1.

[0037] Likewise, the separating element 23 has a width D_2 at the cutting station 21B greater than the width D_3 at the cutting station 21C. The thickness reduction of the separating element 23 from D_3 to D_2 is made to compensate for both the action of the blade 26^2 and for the action of the blade 26^3 that compress respective multiple-length rods 8 of filtering material.

[0038] Downstream of cutting station 21C four separating elements 27 are arranged; in particular, two separating elements 27 are provided for each group of blades from 26^1 to 26^4. The separating elements 27 are arranged immediately downstream of the blades from 26^1 to 26^4 and have a variable thickness. According to a preferred alternative, each separating element 27 extends until reaching the cutting station 21D. Each separating element 27 is adapted to axially move a respective multiple-length rod 8 of filtering material so that said multiple-length rod 8 of filtering material is arranged with an end in contact with a surface of the respective separating element 27 and with an outer end in contact with the surface of the lateral side board 10 and of the separating element 23, respectively.

[0039] Finally, the cutting station 21D receives four multiple-length rods 8 of filtering material and eight single-length rod portions 6 of filtering material from the cutting station 21C and comprises twelve circular blades denoted with numbers from 28^1 to 28^{12}. The twelve circular blades from 28^1 to 28^{12} are divided into four groups (only one of which is described in detail in the following discussion) of three equally spaced blades; each of the four groups of circular blades 28^1 to 28^{12} acts on a respective multiple-length rod 8 of filtering material.

[0040] In particular, the blade 28^2 is arranged at the midpoint of the multiple-length rod 8 of filtering material and is provided with a perfectly symmetrical V-shaped cutting edge. The blades 28^1 and 28^3 are instead arranged at opposite sides of the blade 28^2 and are provided with an asymmetrical cutting edge, with a substantially flat side facing the blade 28^3 and with an inclined cutting side facing the opposite side, that is, facing respectively the lateral side board 10* and the separating element 27.

[0041] The circular blades from 28^1 to 28^3 divide the multiple-length rod 8 of filtering material to obtain four single-length rod portions 6 of filtering material. During the cutting step, the blade 28^2 compresses the two single-length rod portions 6 of filtering material; but the substantially flat side of the blades 28^1 and 28^3 facing the blade 28^2 allows to not excessively compress the respective single-length rod portions 6 of filtering material.

[0042] The inclined side of the blades 28^1 and 28^3 allows to compress each of the two single-length rod portions 6 of filtering material and, in order to not compress them excessively, both the lateral side board 10* and the separating element 27 have a thickness reduction at the cutting station 21D.

[0043] The lateral side board 10* has a width d_3 at the cutting station 21C greater than the width d^4 at the cutting

station 21D. The thickness reduction of the lateral side board 10* from d_3 to d_4 is made to compensate for the action of the blade 28^1 that compresses the single-length rod portion 6 of filtering material.

[0044] Similarly, the separating element 27 has a width at the cutting station 21C greater than the width at the cutting station 21D. The thickness reduction of the separating element is made to compensate for the action of the blade 28^1 that compresses the single-length rod portions 6 of filtering material.

[0045] Downstream of the cutting station 21D twenty-four single-length rod portions 6 of filtering material are obtained, to be transferred to the bent tile-like element 13 in the area of the discharge station DS, diametrically opposite to the input station IS.

[0046] According to a preferred alternative, the drum 7 has a sucking device 30 obtained by means of an internal chamber 31 connected through a conduit to a sucking pump 32, which is suited to produce a depression in the chamber 31 with respect to the external atmospheric pressure. The inner chamber 31 is arranged in the area of the cutting device 11 and is connected to each tubular cavity 9 through a respective intake conduit so as to put into communication each tubular cavity 9 with the sucking device 30 during the cutting step and, so as to improve the holding of the rods 8 of filtering material within the tubular cavities 9.

[0047] It is important to note that the separating elements 23, 25, 27 are arranged downstream of all those circular blades 12 by means of which multiple-length rods 8 of filtering material are obtained.

[0048] It is also important to note that for each blade 12 provided with an asymmetrical cutting edge, the separating element 23, 25, 27 or the lateral side board 10 directly facing the inclined side of the asymmetrical cutting edge, undergoes a reduction of thickness.

[0049] In addition, it should be noted that in each cutting station 21, where provided, the circular blade 12, provided with a V-shaped symmetrical cutting edge, is interposed between a pair of circular blades 12 provided with an asymmetrical cutting edge with the substantially flat side facing the circular blade 12 with a V-shaped symmetrical cutting edge so as to not compress the multiple-length rods 8 of filtering material and/or the single-length rod portions 6 of filtering material during the cutting steps.

[0050] It will be apparent that the cutting device 11 can be provided with any number of cutting stations 21 and that each cutting station 21 can comprise any number of circular blades 12 for cutting crosswise multiple-length rods 8 of filtering material; in particular, the number of cutting stations 21, the number, the position and the type (with symmetrical or asymmetrical cutting edge) of the circular blades 12 are determined as a function of the length of the multiple-length rods 8 of filtering material and of the number of single-length rod portions 6 of filtering material to be obtained at the end of the cutting step for each multiple-length rod 8 of filtering material.

[0051] Similarly, it is apparent that the cutting device 11 can be arranged in a different area of the conveyor device than the drum 7, such as, for example, a linear guide, and is also suitable to cut the rods 8 of filtering material for any type of application.

[0052] The device 11 for cutting multiple-length rods of filtering material described above has numerous advantages.

[0053] First, the device 11 for cutting multiple-length rods of filtering material allows to achieve high hourly productivity, while guaranteeing a high quality standard. In particular, it is possible to guarantee high performance in terms of precision and uniformity in the production of single-length rod portions 6 of filtering material, avoiding compressions and deformations of the rod portions 6 of filtering material.

[0054] In addition, the cutting device 11 described above comprises structurally simple elements and can be easily adapted by varying the number of cutting stations 21, the number, position and type (symmetrical or asymmetrical cutting edges) of the circular blades 12, as a function of the length of the multiple-length rods 8 of filtering material and of the number of single-length rod portions 6 of filtering material to be obtained at the end of the cutting step for each multiple-length rod 8 of filtering material.

Claims

1. A device (11) for cutting crosswise rods (8) of filtering material of at least one multiple-length into a plurality of single-length rod portions (6) of filtering material, which receives the multiple-length rods (8) of filtering material in the area of an input station (IS) and transfers the plurality of single-length rod portions (6) of filtering material in the area of a discharge station (DS); the cutting device (11) comprises a number of cutting stations (21) arranged one after the other between the input station (IS) and the discharge station (DS), wherein each cutting station (21) comprises a number of circular blades (12), which rotate, with a continuous motion, around a rotation axis (Y), and wherein each cutting station (21) receives the multiple-length rods (8) of filtering material and cuts them crosswise so as to obtain multiple-length rods (8) of filtering material and/or single-length rod portions (6) of filtering material; wherein the cutting device (11) comprises a number of separating elements (23, 25, 27) arranged downstream of the circular blades (12) so as to axially space apart the multiple-length rods (8) of filtering material.

2. A device according to claim 1, wherein at least one cutting station (21) comprises a number of circular blades (12) provided with an asymmetrical cutting edge with an inclined cutting side and a substantially flat cutting side, which, during the cutting steps, prevents the multiple-length rods (8) of filtering material

and/or the single-length rod portions (6) of filtering material from being compressed.

3. A device according to claim 2, wherein at least one cutting station (21) comprises at least one circular blade (12) provided with a V-shaped symmetrical cutting edge.

4. A device according to claim 3, wherein at least one cutting station (21) comprises a circular blade (12) provided with a V-shaped symmetrical cutting edge interposed between a pair of circular blades (12) provided with an asymmetrical cutting edge with the substantially flat side facing the circular blade (12) provided with a V-shaped symmetrical cutting edge, so as not to compress the multiple-length rods (8) of filtering material and/or the single-length rod portions (6) of filtering material during the cutting steps.

5. A device according to any of the previous claims, wherein the separating elements (23, 27) arranged downstream of the circular blades (12) have a variable thickness, so as to compensate the axial movement of the multiple-length rods (8) of filtering material.

6. A device according to any of the previous claims, wherein the circular blades (12) of each cutting station (21) are arranged so as to obtain multiple-length rods (8) of filtering material having the same dimensions.

7. A unit (1) for feeding single-length rod portions (6) of filtering material comprising a conveyor (7), which receives a plurality of multiple-length rods (8) of filtering material and transfers a plurality of single-length rod portions (6) of filtering material in the area of a discharge station (DS) and cooperates with a cutting device (11) provided with circular blades (12) to cut crosswise the multiple-length rods (8) of filtering material so as to obtain single-length rod portions (6) of filtering material; wherein the cutting device (11) is made according to any of the claims from 1 to 6.

8. A unit according to claim 7, wherein the conveyor (7) comprises at least one side board (10) with a variable thickness, so as to compensate the axial movement of the multiple-length rods (8) of filtering material.

9. A unit according to claim 7 or 8, wherein the conveyor (7) is made by means of a drum (7), which can rotate in a stepwise manner around a rotation axis (X) and comprises a plurality of discs (7*), which are arranged besides one another and can rotate in a stepwise manner around the common rotation axis (X); wherein each circular blade (12) is inserted between two adjacent discs (7*) to cut crosswise the multiple-length rods (8) of filtering material.

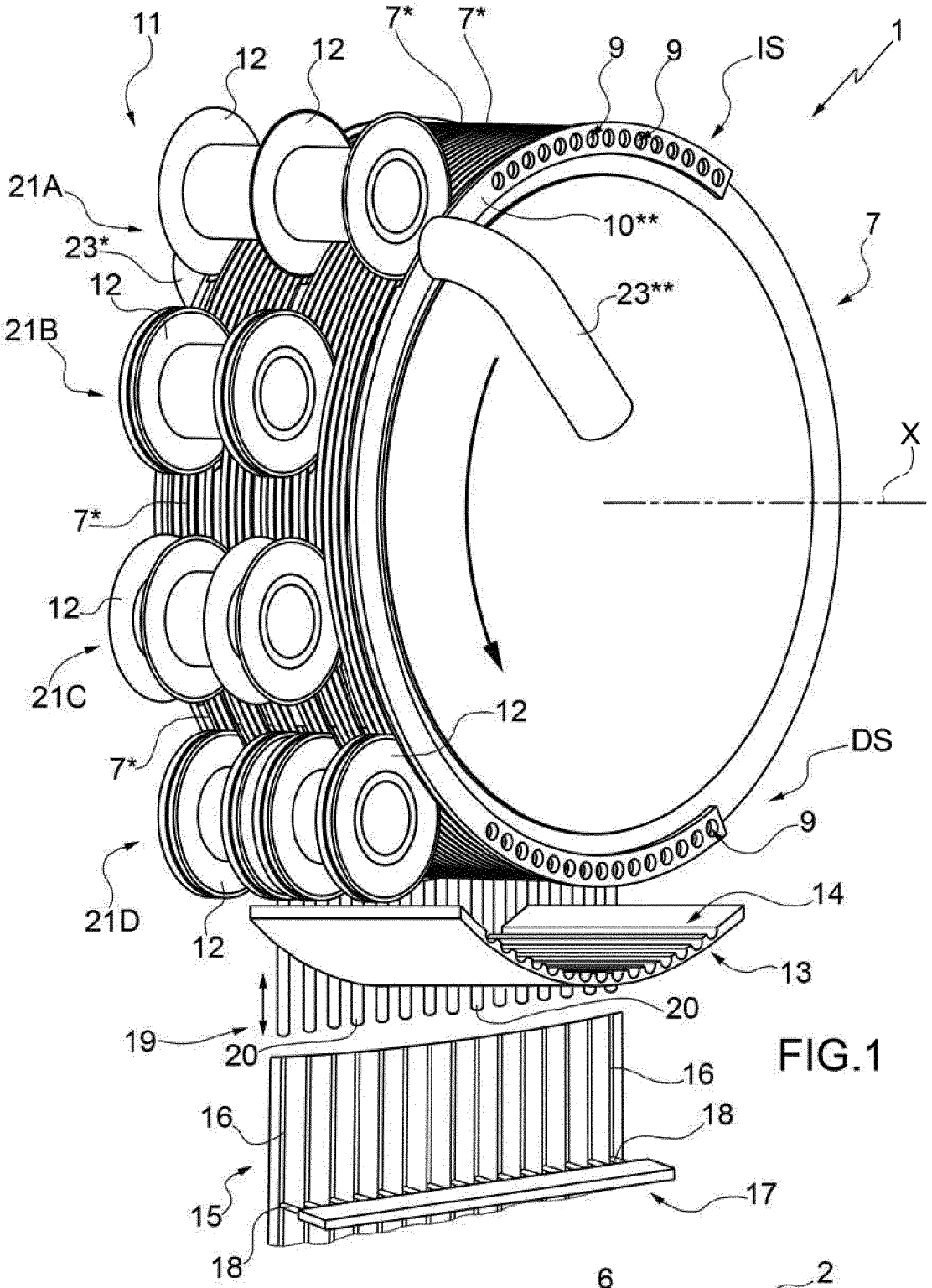
10. A unit according to claim 9, wherein the drum (7) is provided with a plurality of tubular cavities (9) made along the periphery of the drum (7) itself, each made so as to house, on the inside, a respective multiple-length rod (8) of filtering material.

11. A unit according to claim 7 or 8, wherein the conveyor (7) is made by means of a linear guide.

12. A unit according to any of the claims from 7 to 11 and comprising a sucking device (30) made by means of an inner chamber (31), which is obtained on the inside of the conveyor (7) and is connected to a sucking pump (32), which is designed to create, in the inner chamber (31), a depression relative to the external atmospheric pressure.

13. A unit according to claim 12, wherein the inner chamber (31) is obtained in the area of the cutting device (11), so as to improve the hold on the multiple-length rods (8) of filtering material while they are being cut crosswise.

14. A unit according to any of the claims from 7 to 13 and comprising at least one collecting conduit (23*, 23**) to collect the waste end portions (24*, 24**) of the multiple-length rod (8) of filtering material; wherein said collecting conduit (23*, 23**) is arranged so as to face a first cutting station (21A) of the cutting device (11).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9
IS
1
21A
23*
12
10**
7
23**
21B
X
7*
12
21C
12
DS
7*
9
14
21D
12
13
20
19
20
16
16
18
15
17
18

FIG.1

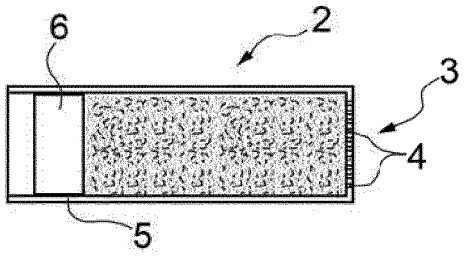
6
2
3
4
5

FIG.2

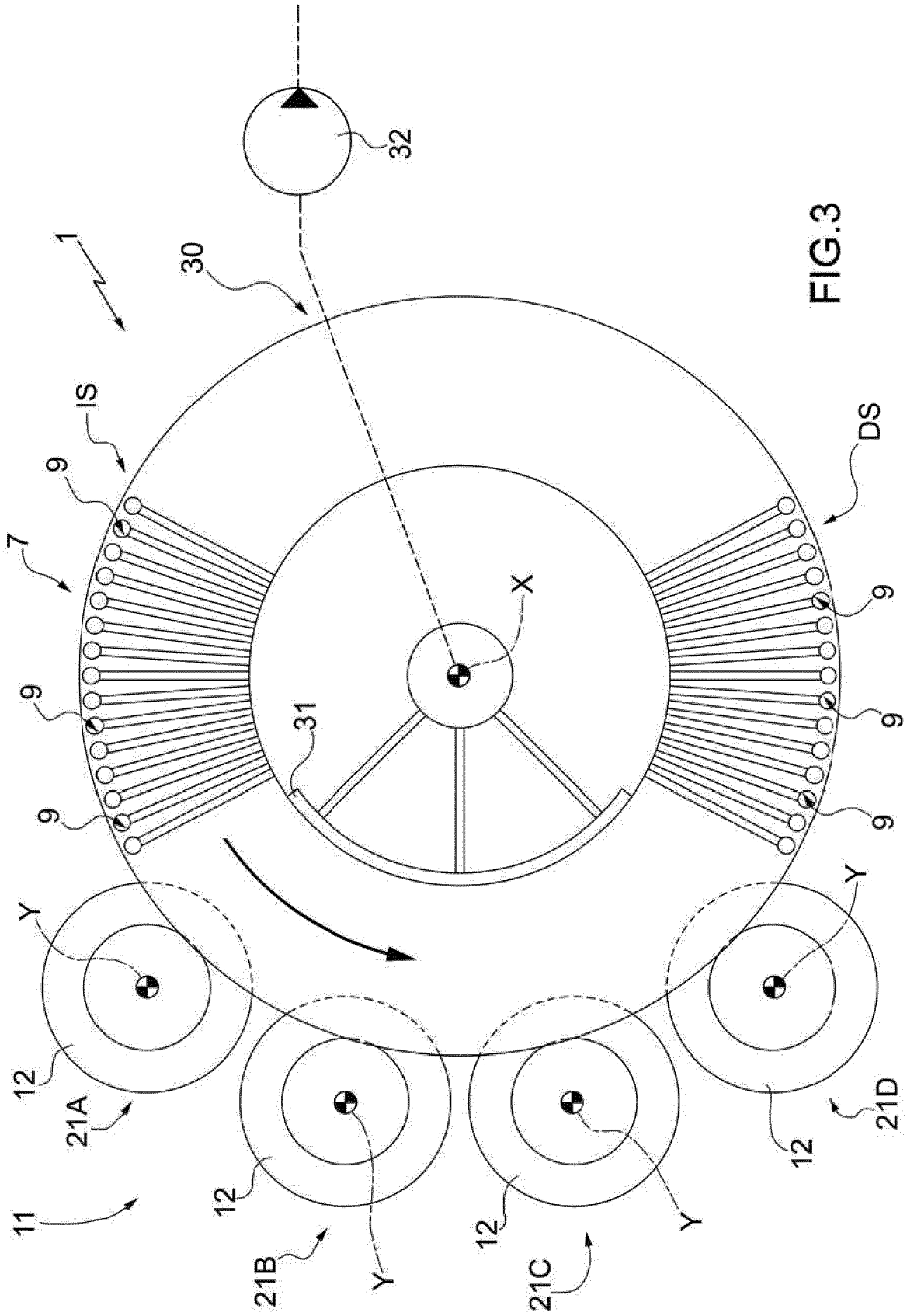

FIG.3

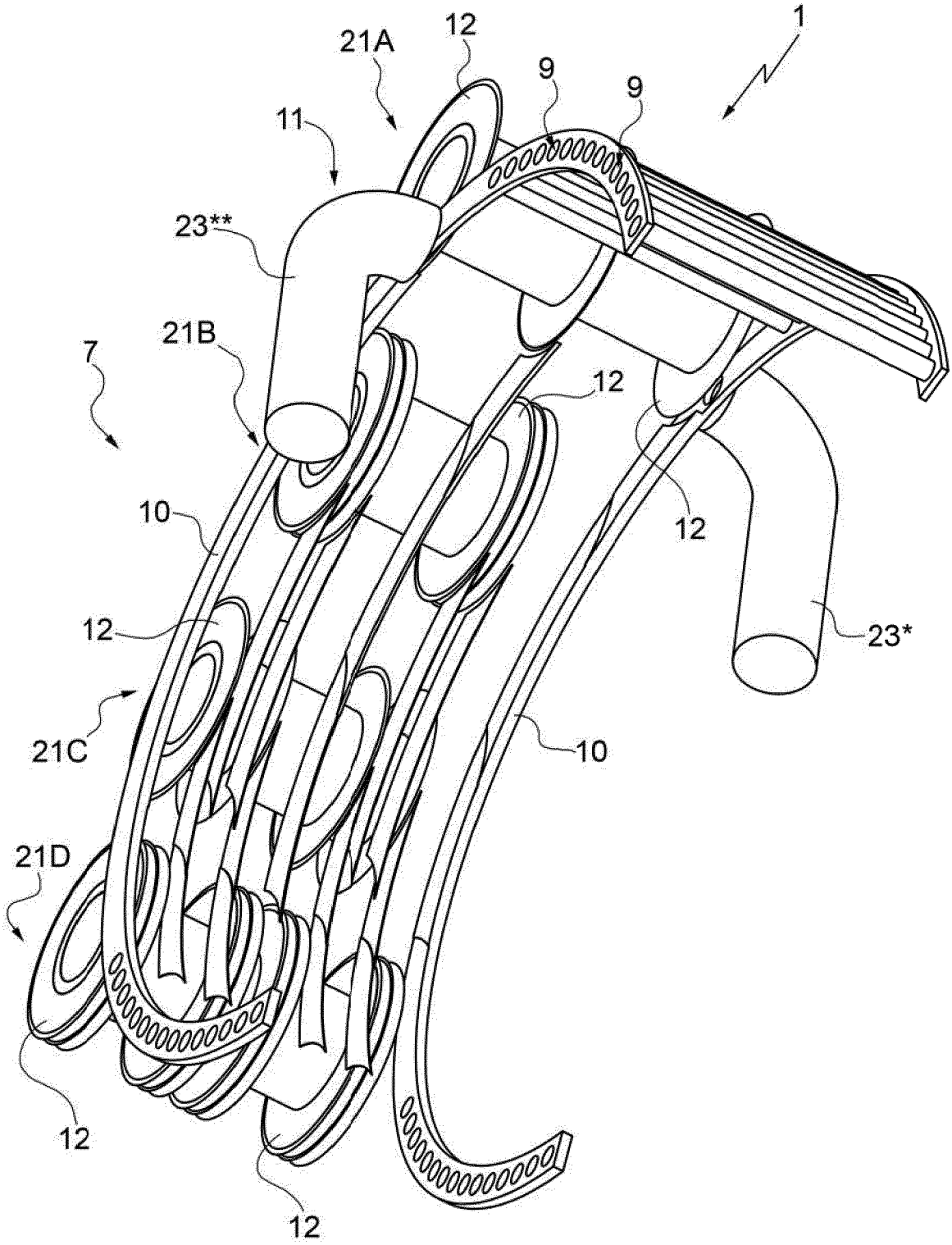

FIG.4

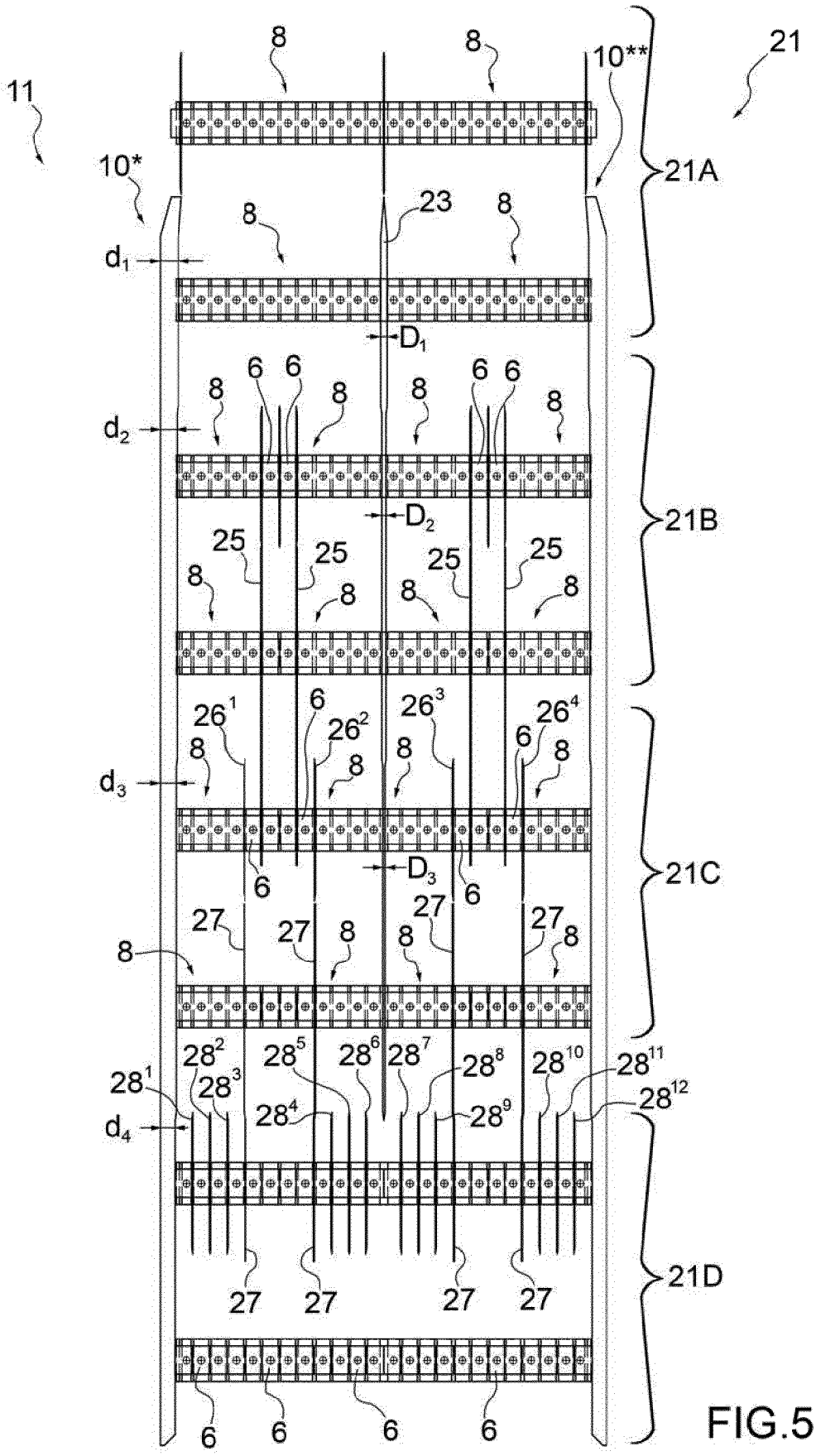
11
21
10*
10**
21A
21B
21C
21D
8
23
6
25
27
d_1
d_2
d_3
d_4
D_1
D_2
D_3
26^1
26^2
26^3
26^4
28^1
28^2
28^3
28^4
28^5
28^6
28^7
28^8
28^9
28^{10}
28^{11}
28^{12}

FIG.5

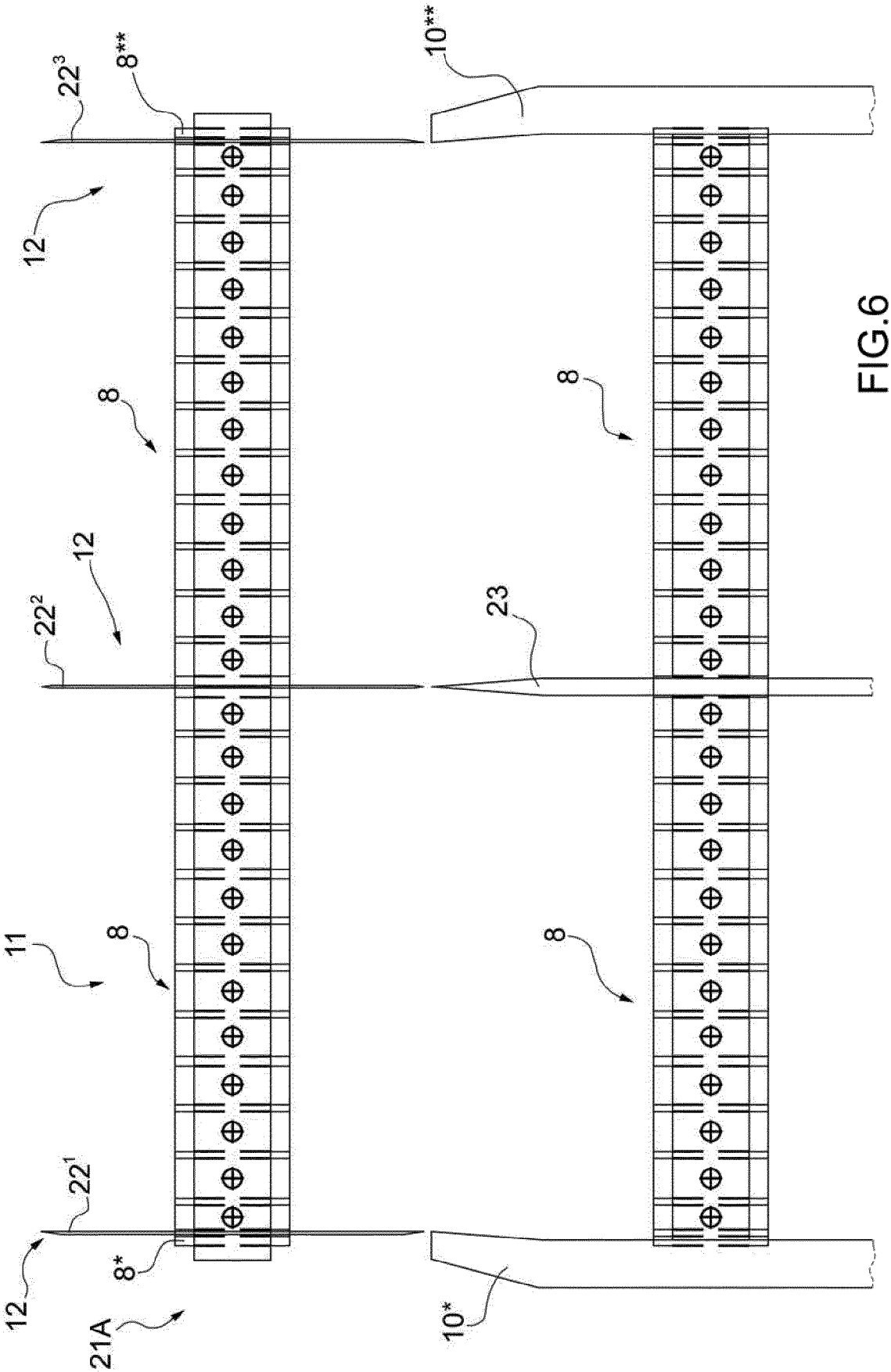

FIG.6

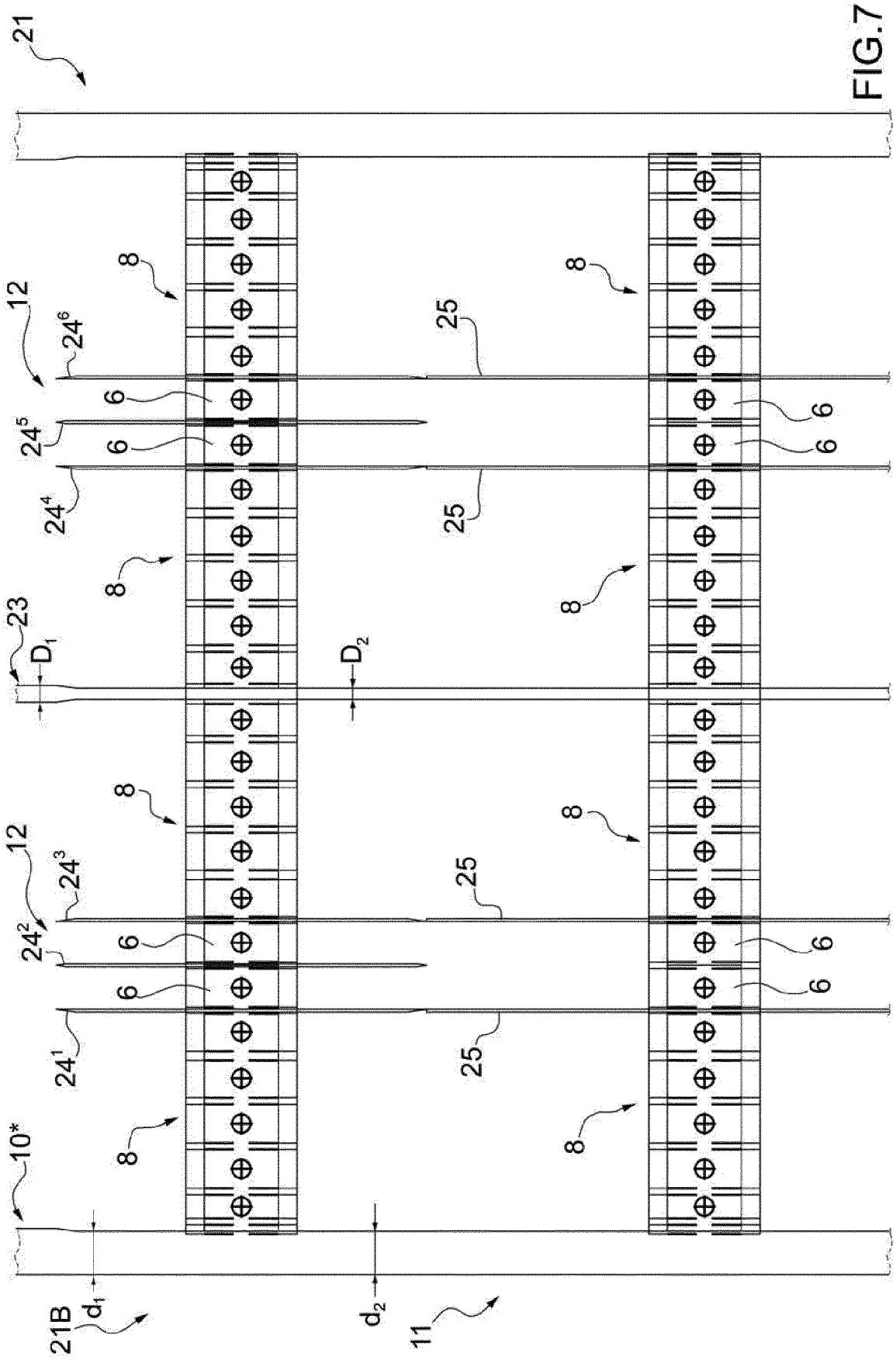

FIG.7

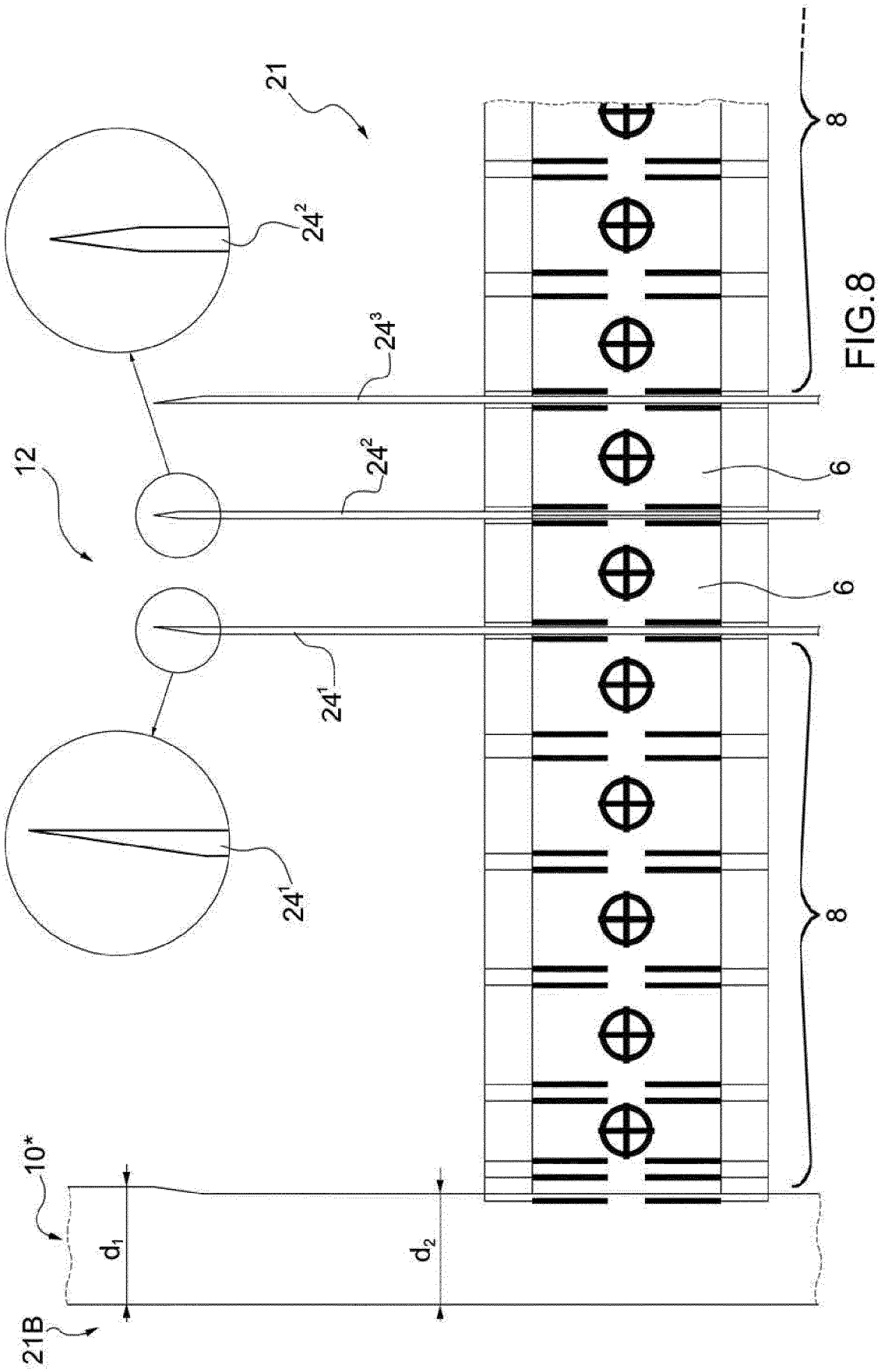

FIG.8

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EUROPEAN SEARCH REPORT

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EP 17 19 2488

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X	US 3 039 367 A (CARL STELZER) 19 June 1962 (1962-06-19) * column 2, line 43 - column 3, line 27; figures *	1,6,7	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 January 2018	Marzano Monterosso

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