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(54) **Title:** METHOD AND APPARATUS FOR MANUFACTURING FILTER RODS OF TOBACCO INDUSTRY

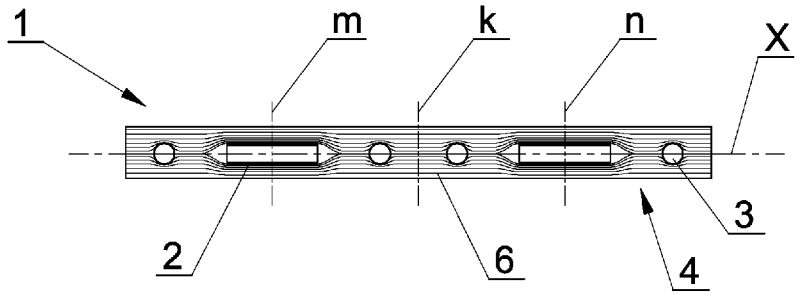


Fig. 1

(57) **Abstract:** The object of the invention is an apparatus for manufacturing filter rods (1) of tobacco industry from a continuous filter rod (CR) containing a repeated sequence of elongated objects (2) and spherical objects (3), comprising a preparation assembly (11) for preparing a strand of filter material (F), a forming assembly (12) for forming a continuous filter rod (CR) from at least one strand of filter material, a wrapping material feeding assembly (19) for feeding a wrapping material (P), a spherical object feeding assembly (14) for feeding spherical objects (3) to a positioning unit (15) along a first movement path (R3), an elongated object feeding assembly (13) for feeding elongated objects (2) to a positioning assembly (15) along a second movement path (R2), a positioning assembly (15) for forming and moving a combined stream (S) of spherical objects (3) and elongated objects (2) along a third movement path with a repeated sequence of spherical objects (3) and elongated objects (2) and placing the formed combined stream (S) in the continuous filter rod (CR) being formed, a cutting head (17) for cutting the formed continuous filter rod (CR), containing filter fibers, spherical objects (3) and elongated objects (2), into individual filter rods (1), wherein the individual filter rod (1) contains a sequence of spherical objects (3) and elongated objects (2).

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METHOD AND APPARATUS FOR MANUFACTURING FILTER RODS OF TOBACCO INDUSTRY

The object of the invention is a method and a device for manufacturing filter rods of tobacco industry.

The invention is applicable in the engineering industry, in particular in machines used for production of filters used in tobacco products.

In the state of the art, there are known solutions for inserting capsules or tubes into strands of acetate fibers in the process of forming an endless rod, which is cut into filter rods.

DE2749947 discloses a filter making apparatus which comprises in combination: a rotating wheel having a plurality of circumferential recesses, means for inserting a tube into each of said recesses, means for continuously supplying a strand to an insertion station under said wheel and means for inserting each tube from a respective recess into a strand at said insertion station.

EP0295518 discloses an apparatus for providing pellet-type objects for use in the manufacture of tobacco articles, each rod containing identical pellets individually spaced at predetermined intervals along its length. The apparatus includes: means for providing a continuous supply of rod filling material, means for continuously inserting individual solid pellets at predetermined intervals into the filling material, means for forming a continuous rod having individual pellets placed at predetermined intervals within the rod and means for cutting the continuous rod at predetermined intervals into single rods.

EP2636322 discloses a device having an acceleration chamber that transfers objects from a storage device to an object feeder, the acceleration chamber including a vortex chamber defining a periphery and an opening on the periphery. A metering drum rotates about the vortex chamber, the metering drum including metering apertures offset in line with an aperture on the periphery of the vortex chamber. The metering apertures receive objects through the opening on the periphery of the swirl chamber and transfer the objects to an insertion wheel.

The problem faced by the present invention is to provide a solution for inserting, in a single process, objects with different geometrical parameters and in particular with different symmetries such as a tube and a capsule.

The object of the invention is an apparatus for manufacturing filter rods of tobacco industry from a continuous filter rod containing a repeated sequence of elongated objects and spherical objects, comprising a preparation assembly for preparing a strand of filter material, a forming assembly for forming a continuous filter rod from at least one strand of filter material, a wrapping material feeding assembly for feeding a wrapping material, a spherical object feeding assembly for feeding spherical objects to a positioning unit along a first path, an elongated object feeding assembly for feeding elongated objects to a positioning assembly along a second path, a positioning assembly for forming and moving a combined stream of spherical objects and elongated objects along a third movement path with a repeated sequence of spherical objects and elongated objects and placing the formed combined stream in the continuous filter rod being formed, a cutting head for cutting the formed continuous filter rod, containing filter fibers, spherical objects and elongated objects, into individual filter rods, wherein the individual filter rod contains a sequence of spherical objects and elongated objects.

The apparatus is characterized in that the positioning assembly is provided with a positioning wheel having first seats for receiving and transporting elongated objects and second seats for receiving and transporting spherical objects.

The apparatus is characterized in that the positioning wheel is adapted such that in the combined stream the geometrical center of the elongated object is located inside the space encompassed by the spherical object travelling along the third movement path.

The apparatus is characterized in that the positioning wheel is adapted such that in the combined stream the axis of the elongated object is positioned substantially tangentially to the movement path (R) of the combined stream.

The apparatus is characterized in that the positioning wheel is adapted to position the spherical objects and the elongated objects centrally in the continuous filter rod.

The apparatus is characterized in that the first seats for receiving and transporting elongated objects and the second seats for receiving and transporting spherical objects have different depths.

The apparatus is characterized in that it is adapted to operate with filter material in the form of paper.

The apparatus is characterized in that the elongated object feeding assembly for feeding the elongated objects to the positioning assembly has protrusions on which the elongated objects are transported axially longitudinally.

The apparatus is characterized in that the elongated object feeding assembly for feeding the elongated objects into the positioning unit has recesses into which the spherical objects transported in the second seats of the positioning unit are immersed while transferring of the elongated objects from the elongated object feeding unit to the positioning unit.

The apparatus is characterized in that the feeding assembly for feeding spherical objects or elongated objects is provided with recesses for momentarily receiving the spherical objects or elongated objects transported on the positioning wheel.

The apparatus is characterized in that the positioning assembly is provided with seats for momentarily receiving protrusions adapted for transporting spherical objects or elongated objects in the spherical object feeding assembly.

Further the object of the invention is a method for manufacturing tobacco filter rods comprising spherical objects and elongated objects, comprising the steps of preparing a strand of filter material, forming a continuous filter rod from at least one filter material strand, feeding a stream of spherical objects along the first movement path, feeding a stream of elongated objects along the second movement path, forming a combined stream of spherical objects and elongated objects with a repeating sequence of objects by combining the stream of spherical objects and the stream of elongated objects, feeding the combined stream of spherical objects and elongated objects along the third movement path, placing the formed combined stream of the elongated objects and spherical objects into the formed continuous filter rod by means of the positioning unit, cutting the formed continuous filter rod into individual filter rods, wherein the filter rod comprises a repeated sequence of spherical objects and elongated objects.

The method is characterized in that during the formation of the combined stream the geometric center of the elongated object is positioned inside the space encompassed by the spherical object moving along the path of the combined stream.

The method is characterized in that during transport of the combined stream the axis of the elongated object is positioned substantially tangential to the path of the combined stream.

The method is characterized in that a combined stream is formed comprising a repeated sequence: a spherical object, an elongated object, a spherical object.

The advantage of the apparatus and the method according to the invention is obtaining an apparatus combining the possibility of inserting into the filter strands various types of objects with different geometrical symmetries and filtration properties, while maintaining high precision of placement. The invention is also characterized by maintaining repeatability of the point of placement of the object inside the created endless rod, and consequently inside the finally cut rods.

The object of the invention is described in detail with reference to the embodiment shown in the drawing in which:

Figs. 1, 1a show exemplary filter rods,

Figs. 2, 2a show individual mouthpieces produced from the rods of Figs. 1, 2,

Fig. 3 shows a tube, fragments of which are placed in the rod of Fig. 1, 2,

Fig. 4 shows a machine for making filter rods of Fig. 1, 2,

Fig. 5 shows a fragment of the machine of Fig. 4,

Fig. 6 shows schematically the flow of tubes and capsules.

Figs. 7 and 8 show schematically positions of capsules and tubes on a positioning wheel and in a combined stream,

Fig. 9 shows the place of joining of a capsule stream and a tube stream and formation of the combined stream,

Fig. 10 shows the place of connection of the capsule and tube streams in another embodiment of the positioning wheel,

Fig. 11 shows another embodiment of a device for making filter rods according to the invention, and

Fig. 12 shows the place of connecting the stream of tubes and the stream of capsules of the device according to the embodiment shown in Fig. 11.

An exemplary filter rod 1 shown in cross-section in Fig. 1 comprises two elongated objects 2 (in particular axisymmetric objects 2) and four spherical objects 3. By the term axisymmetric object is understood an elongated object having a centrally located longitudinal axis, the shape of the lateral surface of this object being symmetrical with respect to the longitudinal axis. Examples of axisymmetric objects are a thin-walled tube, a thick-walled tube with a cylindrical inner surface, a thick-walled tube with a non-cylindrical inner surface, a solid rod of a flexible or rigid material. In the embodiment a tube 2 is shown as an axisymmetric object and a capsule 3 is shown as a spherical object, the tube 2 and the capsule 3 being arranged in a strand of filter fibers 6. The tubes 2 and capsules 3 are centrally located along the axis X of the filter rod 1, the tubes 2 and capsules 3 being arranged along the axis X such that the filter rod 1 can be cut in half in a plane k perpendicular to the axis X, and each of the produced parts can be cut in planes m and n, also perpendicular to the axis X, which are distant from each other and from the plane k. Thus, from one filter rod 1 four mouthpieces 4 may be produced, the mouthpiece 4 comprising one capsule 3 and half of the

tube 2. Both a solid tip 4A and a tubular tip 4B (Fig. 2), i.e. the part with the cut tube 2 visible, may face towards the tobacco rod in the cigarette. The mouthpiece 4 may also be used as one segment of a segmented mouthpiece. Fig. 3 shows a tube 5 (having a length being multiple of the length of the tube 2) which is cut into several tubes 2 in the process of making filter rods, the tube 5 being cut in several planes e perpendicular to the Z axis of the tube 5. The axis Z is the axis of each of the produced tubes 2. Fig. 1a shows another exemplary filter rod 1' comprising four capsules 3 and two tubes 2, similarly as for the filter rod 1 the capsules 3 and the tubes 2 are centrally located in the filter fiber strand 6. The filter rod 1' can be cut into four mouthpieces 4' (Fig. 2a), the mouthpiece 4' containing two capsules 3 and half of the tube 2. Two types of capsules may be used, so that the smoker has the choice of releasing the flavor from one of the capsules or from two capsules simultaneously. Other combinations of the number of tubes 2 and capsules 3 in the filter rod and other locations for cutting the rod into mouthpieces are also possible.

The machine 10 (Fig. 4) for manufacturing filter rods 1 containing tubes 2 and capsules 3, comprises a preparation assembly 11 for preparing the strand F of filter fibers, a forming assembly 12 for forming a continuous filter rod CR, an elongated object feeding assembly 13 for feeding tubes 2, a spherical object feeding assembly 14 for feeding capsules 3, a positioning assembly 15 for placing tubes 2 and capsules 3 in the filter fiber strand of the formed filter rod CR, a cutting head 17 for cutting the formed continuous filter rod CR containing the strand F of filter fibers, tubes 2 and capsules 3 into individual filter rods 1.

In the preparation unit 11 for preparing the strand F of the filter fibers, the strand F of filter fibers is subjected to a stretching process both along the transport direction and transverse to this direction. Both acetate and paper fibers (crimped paper strand) can be used. The individual fibers of the fiber strand F are separated so that a homogeneous circular rod can be formed in the preforming unit 18 of the filter fiber strand F, wherein the filter fiber strand F is gradually thickened so that a continuous circular rod CR can be finally formed at the exit of the forming unit 12. It is possible to form a continuous rod CR from two or more sub-strands fed from a single fiber manufacturing machine, such that the extruded strand is divided into several sub-strands or fed from several machines. The rod making machine 1 is provided with a wrapping material feeding assembly 19 for feeding the wrapping material P.

The elongated object feeding assembly 13 for feeding tubes 2 is located downstream of the preparation assembly 11 for preparing the strand F of filter fibers, above the inlet to the forming assembly 12. The elongated object feeding assembly 13 (Fig. 5) includes a channel 20 adapted to feed tubes 5 of multiple lengths of tubes 2, in the form of a mass flow MF, i.e. a multilayer stream of tubes 5. The feeding assembly 13 includes a hopper 21 located directly above the cutting assembly 16. The cutting assembly 16 is provided with a multi-groove drum conveyor 22 and a disc knife assembly 23. The tubes 5 are placed in grooves of a drum conveyor 22, and the individual tubes 2 formed after cutting are received from the grooves of this conveyor to form a stream SF of tubes 2. The tubes 2 are transferred as a stream SF of tubes 2 along a substantially horizontal channel 25. In the illustrated embodiment the tubes 2 are further transferred by a transfer drum 26 provided with a spiral element 27 which pushes the tubes 2 as the transfer drum 26 rotates. The tubes 2 are transferred to a transfer assembly 30 and further through the transfer assembly 30 to a positioning assembly 15.

The transferring assembly 30 of the elongated object feeding assembly 13 includes a transferring wheel 31 provided with pushers 32 for transferring the individual tubes 2. The transferring assembly 30 also includes a feeding wheel 33 provided with pushers 34 for receiving the individual tubes 2 from the transferring wheel 31. The tubes 2 move in a stream S2 of individual tubes 2 along a circular path R2 (Fig. 6). The feeding unit 13 transmits the stream S2 of tubes 2 to the positioning unit 15 at point A.

The spherical object feeding assembly 14 for feeding capsules 3 comprises a transfer wheel 35 to which the capsules 3 are supplied by the feeding assemblies 36. The capsules 3 move in a stream S3 of individual capsules 3 along the circular path R3 (Fig. 6). The spherical object feeding assembly 14 transmits the stream S3 of capsules 3 to the positioning assembly 15 at point B, whereby the combination of the stream S2 and the stream S3 occurs at point A.

The positioning assembly 15 for feeding the tubes 2 and the capsules 3 comprises a positioning wheel 40. The positioning wheel 40 receives the stream S2 of the tubes 2 at point A and the stream S3 of the capsules 3 at point B, the combined stream S formed by the combination of the stream S2 of the tubes 2 and the stream S3 of the capsules 3 and moves along a circular path R. Between points A and B, the stream S3 also moves along a circular path R. The combined stream S may comprise a repeated sequence: a spherical object 3, an elongated object 2, a spherical object 3. An embodiment may be considered in which the positioning wheel 40 is adapted such that, in the combined stream S, the axis Z of the elongated object 2 is positioned substantially tangential to the movement path R of the combined stream S. Moreover, the positioning wheel 40 may be adapted to position the spherical objects 3 and the elongated objects 2 centrally in the continuous filter rod CR.

The function of the positioning assembly 15 is to place the tubes 2 and capsules 3 inside a formed, continuous, cylindrically shaped strand F of filter fibers by means of a positioning wheel 40 at point C. The positioning wheel 40 is provided with first transport seats 42 for the tubes 2 and second transport seats 43 for the capsules 3. The insertion of the tubes 2 and capsules 3 is carried out when the fibers are pre-formed loosely enough so that during the insertion of the tubes 2 and capsules 3 the fibers of the strand F are spread apart, and during further forming the fibers of the strand F surround these objects so as to obtain a uniform density of the filter material around these objects. The density of the strand of filter fibers F is at this stage so small and uniform in the cross section of the strand that high accuracy of the central positioning of the tube 2 and the capsule 3 by the positioning wheel 40 in the strand of filter fibers F is maintained in the continuous rod CR. The rotational movement of the positioning wheel 40 determining the position of the tubes 2 and capsules 3 in the rod CR is synchronized with the movement of the wrapper material P and the filter fiber strand F, so that the longitudinal positioning of the tubes 2 and capsules 3 in the formed continuous rod CR is repeatable and determined with high accuracy. In the presented embodiment, the positioning wheel 40 has a horizontal axis of rotation Y, while the filter material fibers are provided in the form of three partial strands F1, F2, F3, which connect in front of the place where the tubes 2 and capsules 3 are fed. The feeding of several sub-strands ensures an even distribution of the filter material fibers around the objects placed inside. The positioning wheel 40 may be positioned at any angle, in particular it may be positioned horizontally i.e. it may have a vertical axis of rotation. Each time the feeding of the partial strands F1, F2, F3 is angularly adapted to the position of the positioning wheel 40.

Fig. 7 shows the position of the capsules 3 and the tubes 2 on the positioning wheel 40 in the stream S. The capsules 3 are located in the second seats 43 so that their centers 3X are moved along a circular movement path R. The capsules 3, moving along the movement path R, occupy a certain circular shaped space in the form of a torus 47, the circles drawn with dotted lines in the figure show the outer diameter 45 and the inner diameter 46 of such torus. The tubes 2 may have different diameters, similarly the capsules 3 may have different diameters depending on the parameters of the products to be manufactured. It is important to ensure that the capsules 3 and tubes 2 are centrally positioned in the continuous shaft CR along the axis of symmetry h, whereby, due to their different diameters and due to the placement of the capsules 3 and tubes 2 in the filter material at high speed, the second seats 43 for the capsules 3 have a depth e different from the depth f of the first seats 42 for the tubes 2. A condition that should be fulfilled in order to ensure the central positioning of the capsules 3 and the tubes 2 in the continuous rod CR is that the geometrical centers 2X of the tubes 2 move in the space 47 occupied by the capsules 3 while moving along the third movement

path R. Another condition that should be fulfilled regarding the movement of the tubes 2 is shown in Fig. 8, where the axes Z of the tubes 2 are tangential to the movement path R while the tubes 2 moving on the positioning wheel 40.

Fig. 9 shows the place of combining of the stream S3 of the capsules 3 and the stream S2 of the tubes 2 and forming the stream S for an embodiment of the wheel 33 and the positioning wheel 40. In the presented embodiment the tubes 2 are transported on the wheel 33 in seats 44 formed in protrusions 48. The protrusions 48 and recesses 49 located between adjacent protrusions 48 ensure that the capsules 3 transported on the positioning wheel 40 are not crushed at point A while combining the streams S3 and S2. In other words, the capsules 3 are momentarily received in the recesses 49.

Fig. 10 shows the place of combining of the stream S3 and S2 are joined and another embodiment of the wheel 33. The wheel 33 is provided with recesses 50 into which the capsules 3 are immersed just before the stream S is formed, remain immersed and then are withdrawn from the recess 50, so that the capsules 3 are not crushed when passing through the point A. The shown two recesses 50 may be combined to form one longer circumferential recess. The recesses 50 are adapted to receive the capsules 3 momentarily.

Fig. 11 shows an embodiment of the apparatus for manufacturing filter rods, in which first the tubes 2 are fed to the positioning assembly 15, then the capsules 3 are fed. The elongated object feeding assembly 13 for feeding the tubes 2 and the spherical object feeding assembly 14 for feeding the capsules 3 are constructed analogously to the embodiment shown in Fig. 1. The stream S2 of the tubes 2 moves along the circumference of the positioning wheel 40, and the stream S3 of the capsules 3 is combined with the stream S2 to form the combined stream S.

Fig. 12 shows the place of combining of the stream S2 of tubes 2 and the stream S3 of capsules 3 on the apparatus presented in Fig. 11. The feeding wheel 35 is provided with projections 52, for example in the form of protrusions 52 having seats 53 for transporting the capsules 3. The positioning wheel 40 is provided with first seats 42 for transporting the tubes 2 and second seats 43 for transporting the capsules 3, whereby at the second seat 43 recesses 54 are provided on both sides of the second seat 43. During the transfer of the capsule 3 from the seat 53 to the seat 43, the tip 55 of the protrusion 52 momentarily immerses into the recesses 54. The recesses 54 enable the transfer of the capsule 3 from the seat 53 to the second seat 43. The recesses 54 serve to momentarily receive the protrusion 52 adapted for transporting spherical objects 3 or elongated objects 2 in the feeding assembly 14.

Claims

1. An apparatus for manufacturing filter rods (1) of tobacco industry from a continuous filter rod (CR) containing a repeated sequence of elongated objects (2) and spherical objects (3), comprising

a preparation assembly (11) for preparing a strand of filter material (F),

a forming assembly (12) for forming a continuous filter rod (CR) from at least one strand of filter material,

a wrapping material feeding assembly (19) for feeding a wrapping material (P),

a spherical object feeding assembly (14) for feeding spherical objects (3) to a positioning unit (15) along a first path (R3),

an elongated object feeding assembly (13) for feeding elongated objects (2) to a positioning assembly (15) along a second path (R2),

a positioning assembly (15) for forming and moving a combined stream (S) of spherical objects (3) and elongated objects (2) along a third movement path with a repeated sequence of spherical objects (3) and elongated objects (2) and placing the formed combined stream (S) in the continuous filter rod (CR) being formed,

a cutting head (17) for cutting the formed continuous filter rod (CR), containing filter fibers, spherical objects (3) and elongated objects (2), into individual filter rods (1), wherein the individual filter rod (1) contains a sequence of spherical objects (3) and elongated objects (2).

2. The apparatus according to claim 1, characterized in that the positioning assembly (15) is provided with a positioning wheel (40) having first seats (42) for receiving and transporting elongated objects (2) and second seats (43) for receiving and transporting spherical objects (3).

3. The apparatus according to claim 2, characterized in that the positioning wheel (40) is adapted such that in the combined stream (S) the geometrical center (2X) of the elongated object (2) is located inside the space (47) encompassed by the spherical object (3) travelling along the third movement path (R).

4. The apparatus according to claim 2, characterized in that the positioning wheel (40) is adapted such that in the combined stream (S) the axis (Z) of the elongated object (2) is positioned substantially tangentially to the movement path (R) of the combined stream (S).

5. The apparatus according to any claim 1 to 4, characterized in that the positioning wheel (40) is adapted to position the spherical objects (3) and the elongated objects (2) centrally in the continuous filter rod (CR).

6. The apparatus according to any claim 1 to 5, characterized in that the first seats (42) for receiving and transporting elongated objects (2) and the second seats (43) for receiving and transporting spherical objects (3) have different depths (e, f).

7. The apparatus according to any preceding claim, characterized in that it is adapted to operate with filter material in the form of paper.

8. The apparatus according to any preceding claim, characterized in that the elongated object feeding assembly (13) for feeding the elongated objects (2) to the positioning assembly (15) has protrusions (48) on which the elongated objects (2) are transported axially longitudinally.

9. The apparatus according to any preceding claim, characterized in that the elongated object feeding assembly (13) for feeding the elongated objects (2) into the positioning unit (15) has recesses (50) into which the spherical objects (3) transported in the second seats (43) of the positioning unit (15) are immersed while transferring of the elongated objects (2) from the elongated object feeding unit (13) to the positioning unit (15).

10. The apparatus according to any claim 1 to 7, characterized in that the feeding assembly (13, 14) for feeding spherical objects (3) or elongated objects (2) is provided with recesses (49, 50) for momentarily receiving the spherical objects (3) or elongated objects (2) transported on the positioning wheel (40).

11. The apparatus according to any one of claims 1 to 7, characterized in that the positioning assembly (15) is provided with seats (54) for momentarily receiving protrusions (52) adapted for transporting spherical objects (3) or elongated objects (2) in the spherical object feeding assembly (14).

12. A method for manufacturing tobacco filter rods (1) comprising spherical objects (3) and elongated objects (2), comprising the steps of

preparing a strand of filter material (F),

forming a continuous filter rod (CR) from at least one filter material strand (F),

feeding a stream (S3) of spherical objects (3) along the first movement path (R3),

feeding a stream (S2) of elongated objects (2) along the second movement path (R2),

forming a combined stream (S) of spherical objects (3) and elongated objects (2) with a repeated sequence of objects by combining the stream (S3) of spherical objects (3) and the stream (S2) of elongated objects (2)

feeding the combined stream (S) of spherical objects (3) and elongated objects (2) along the third movement path (R),

placing the formed combined stream (S) of the elongated objects (2) and spherical objects (3) into the formed continuous filter rod (CR) by means of the positioning unit (15),

cutting the formed continuous filter rod (CR) into individual filter rods (1), wherein the filter rod (1) comprises a repeated sequence of spherical objects (3) and elongated objects (2).

13. The method according to claim 12, characterized in that during the formation of the combined stream (S) the geometric center of the elongated object (2) is positioned inside the space (47) encompassed by the spherical object (3) moving along the path (R) of the combined stream (S).

14. The method according to claim 12 or 13, characterized in that during transport of the combined stream (S) the axis (Z) of the elongated object (2) is positioned substantially tangential to the path (R) of the combined stream (3).

15. The method according to any claim 12 to 14, characterized in that a combined stream (S) is formed comprising a repeated sequence: a spherical object (3), an elongated object (2), a spherical object (3).

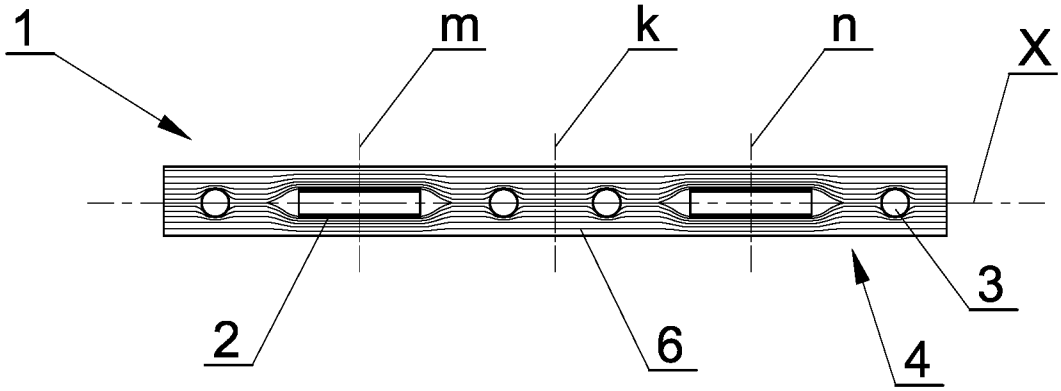


Fig. 1

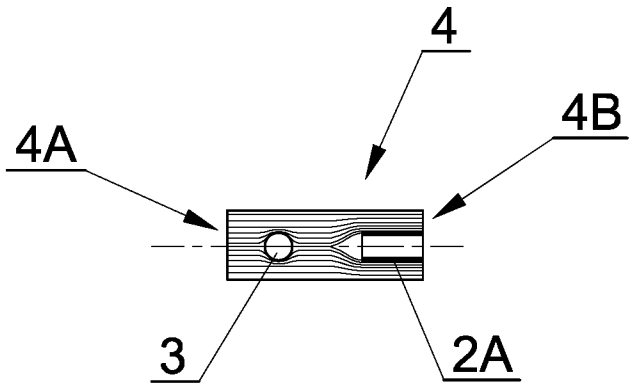


Fig. 2

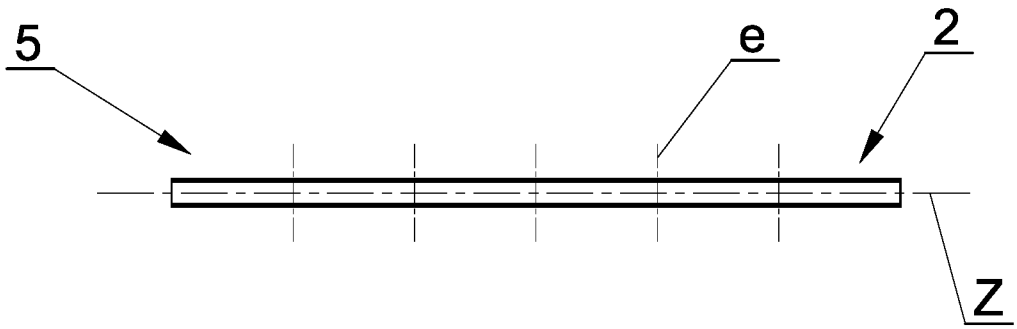


Fig. 3

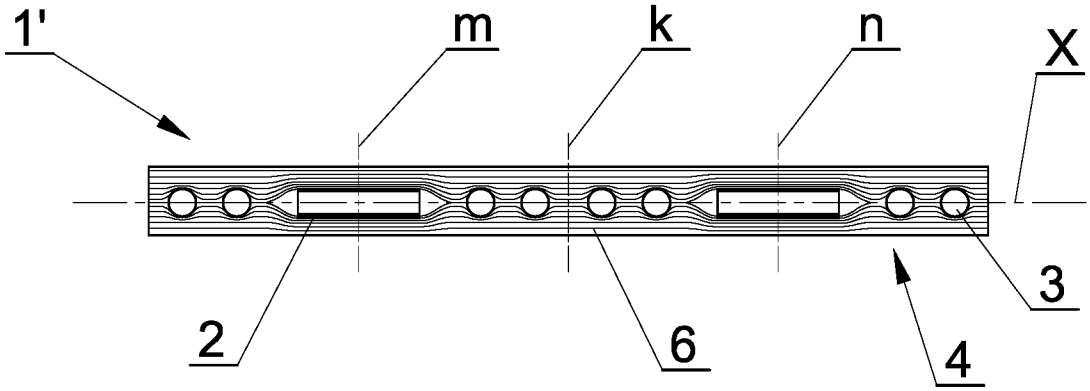


Fig. 1a

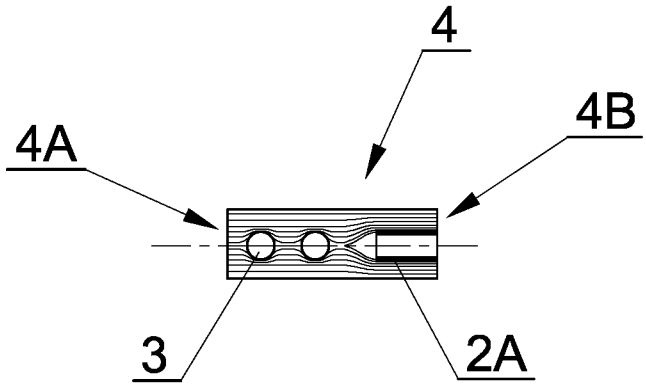


Fig. 2a

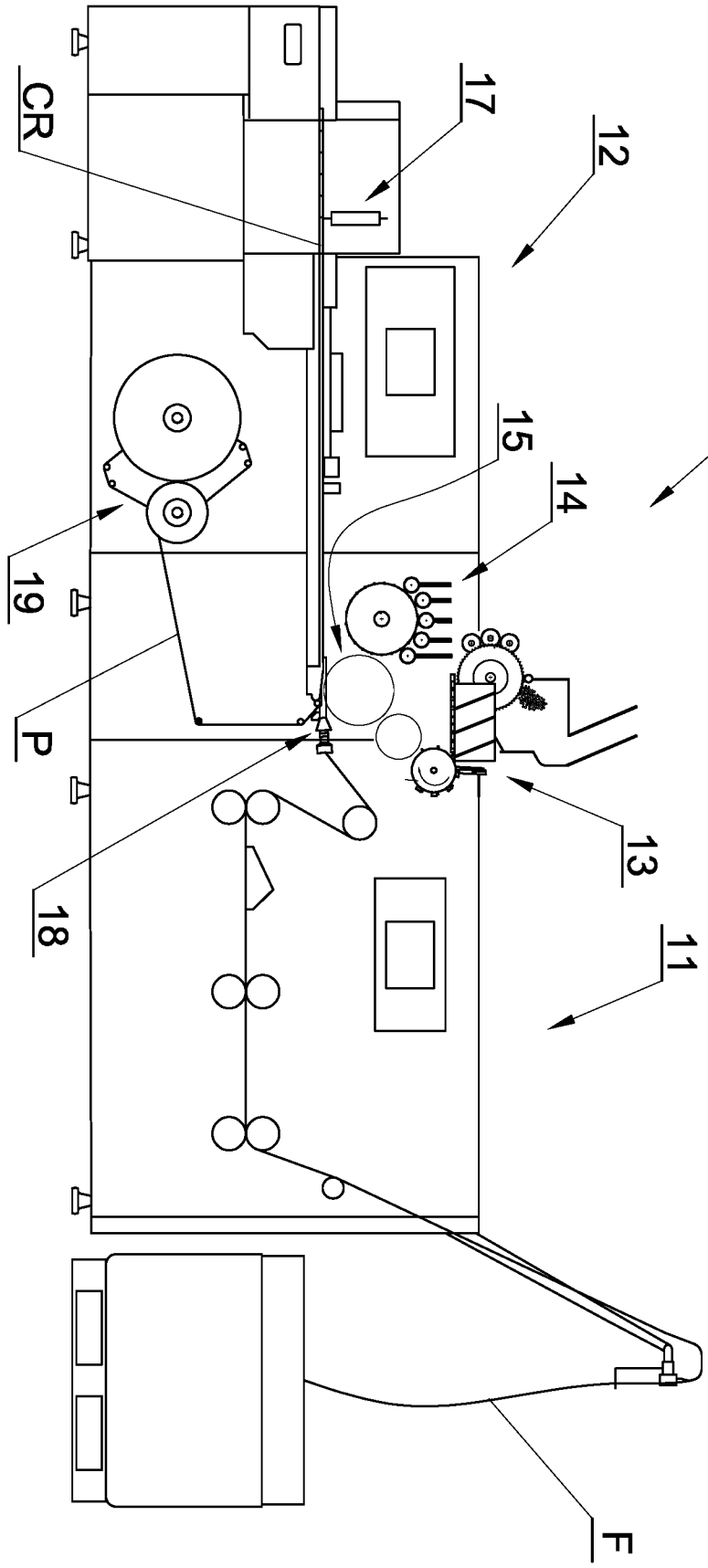


Fig. 4

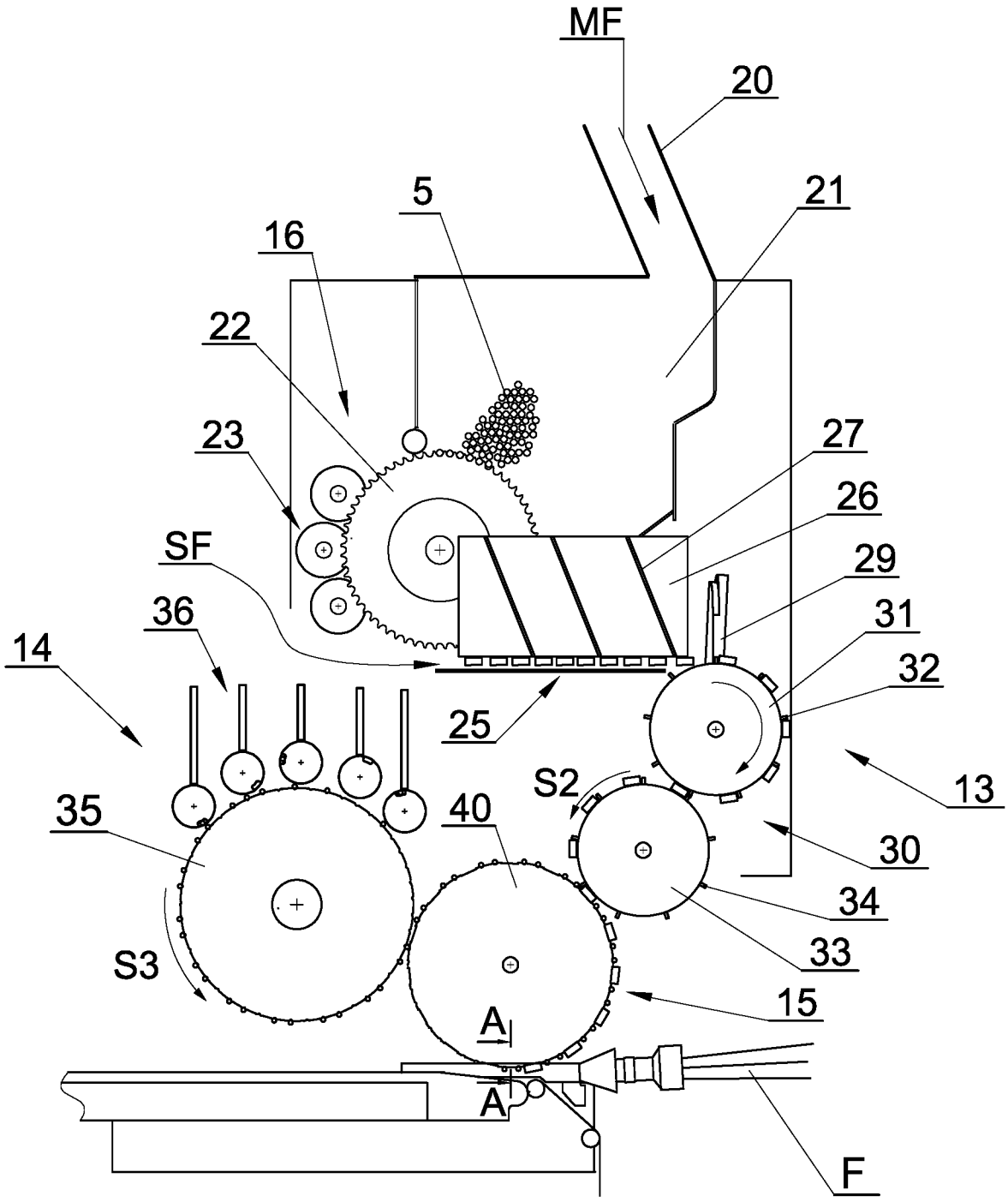

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Fig. 5

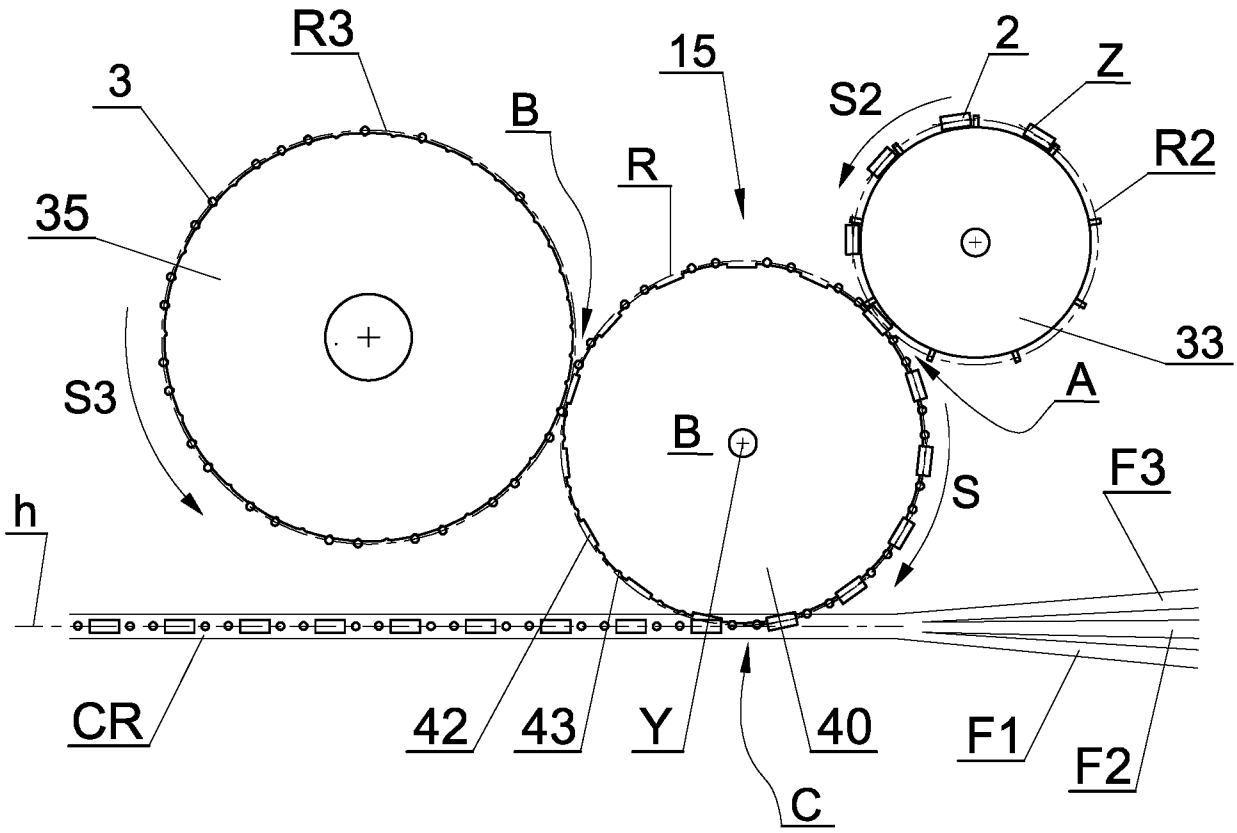


Fig. 6

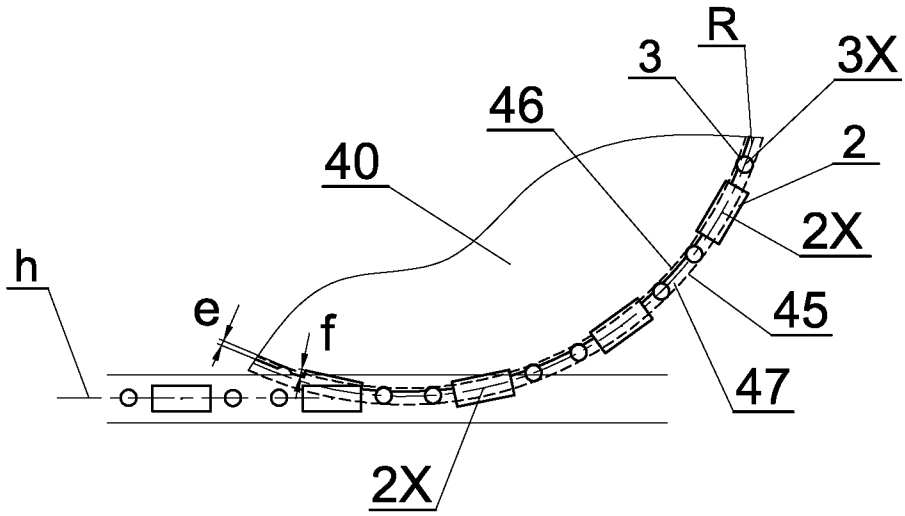


Fig. 7

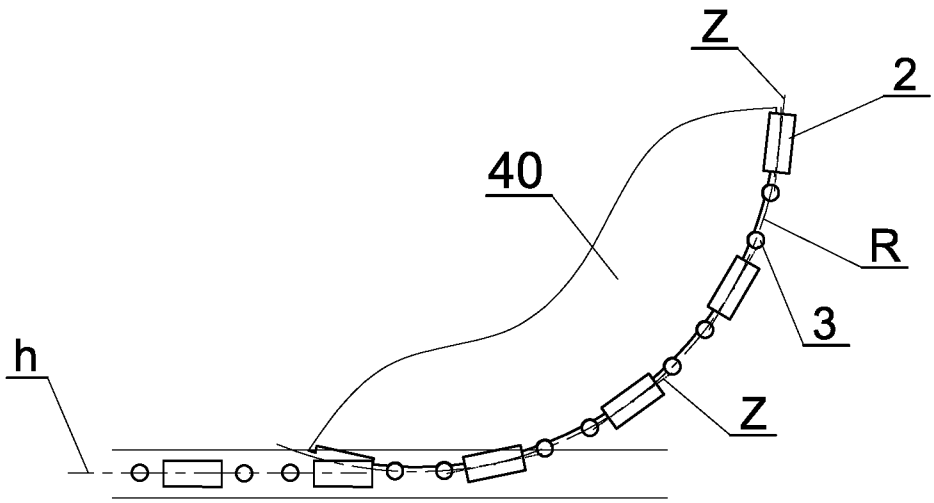


Fig. 8

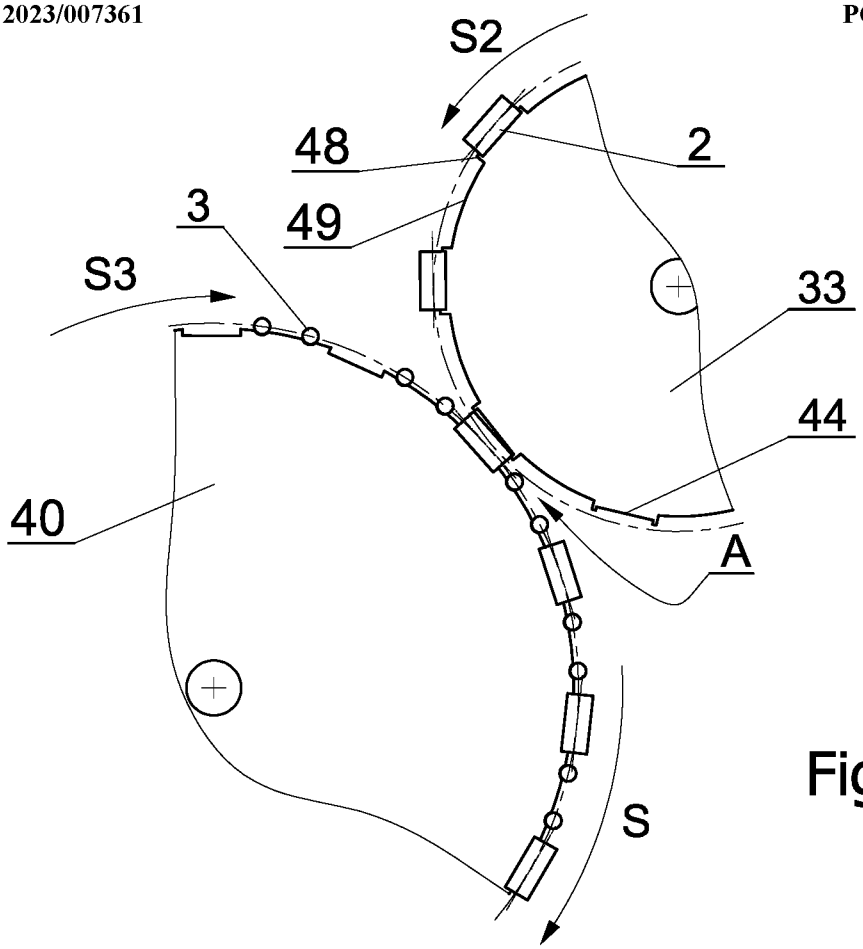


Fig. 9

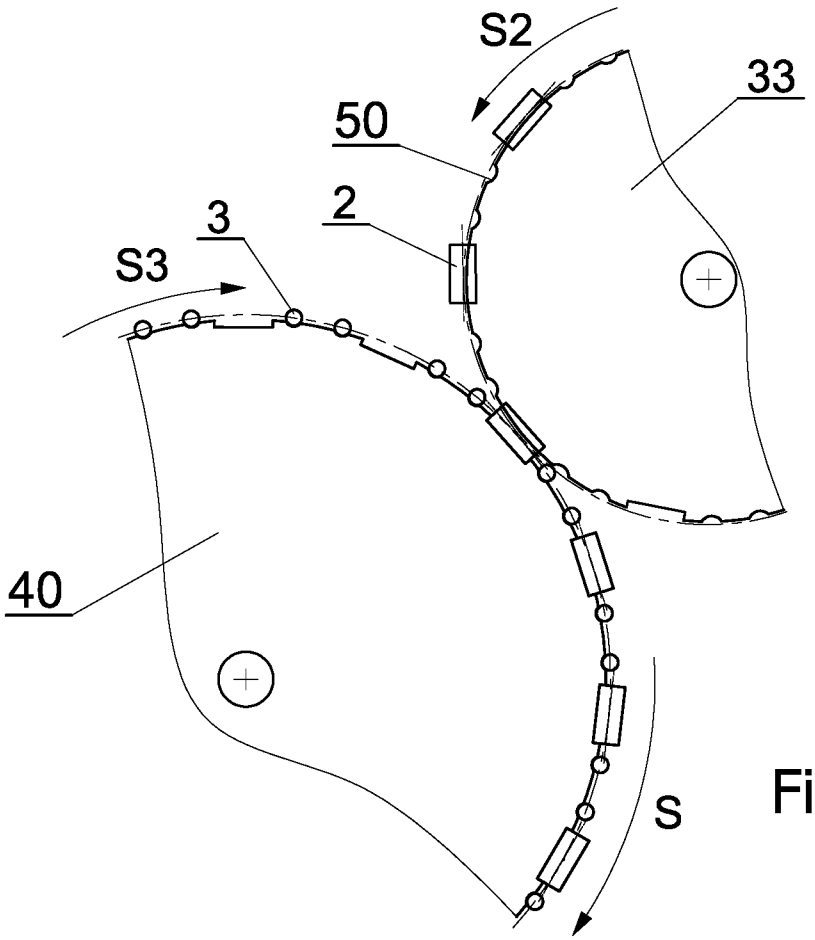


Fig. 10

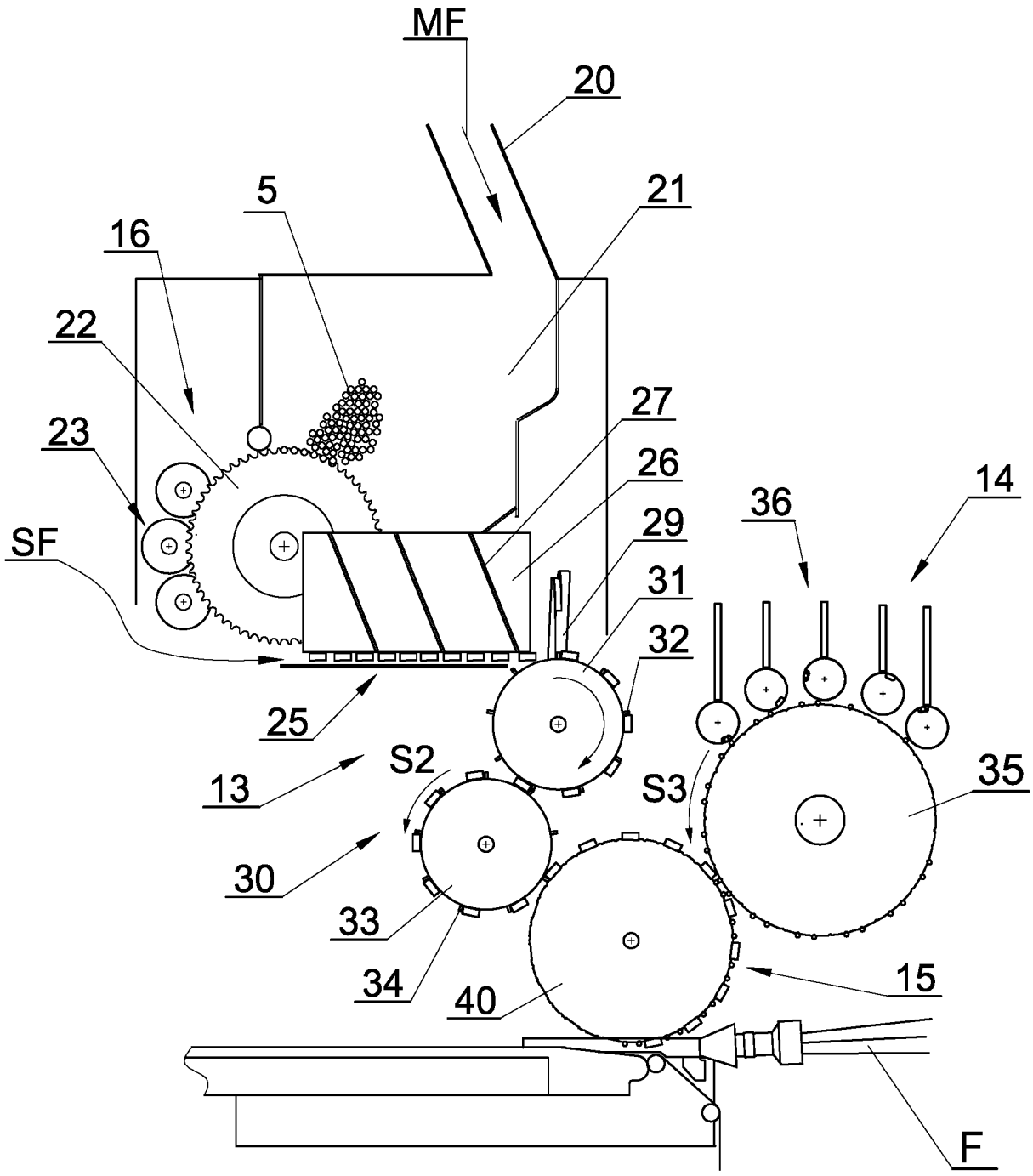

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Fig. 11

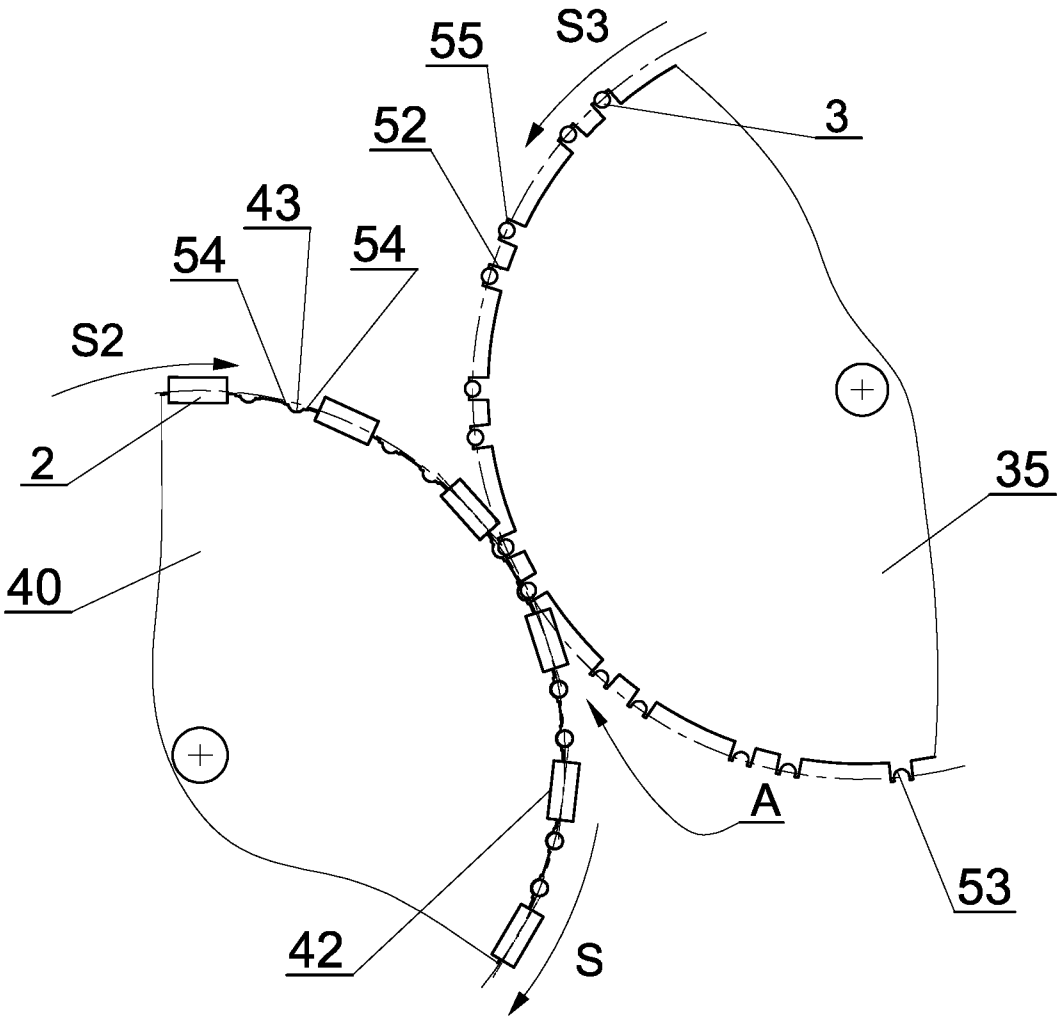


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2022/056869

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24D3/02 A24D3/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24D A24B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/298120 A1 (BARNES VERNON BRENT [US] ET AL) 29 November 2012 (2012-11-29) paragraphs [0003], [0039], [0041], [0043], [0047], [0053], [0055]; figures 1, 2, 6-8	1-15
X	US 2008/302373 A1 (STOKES CYNTHIA STEWART [US] ET AL) 11 December 2008 (2008-12-11) paragraphs [0016], [0037], [0038], [0040], [0045], [0051], [0071], [0059]; figures 1, 3a, 10	1-15
X	EP 3 808 192 A1 (INT TOBACCO MACHINERY POLAND SP ZOO [PL]) 21 April 2021 (2021-04-21) paragraphs [0018] - [0021]; figures 1,2,4,6	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 November 2022	07/12/2022

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schwarzer, Bernd

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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