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(72) Inventors:
• **FIGARSKI, Radoslaw**
26-600 Radom (PL)
• **CIESLIKOWSKI, Bartosz**
26-600 Radom (PL)

(74) Representative: **Markieta, Jaroslaw Franciszek**
Kancelaria Rzeczników Patentowych
J. Markieta, M. Zielinska-Lazarowicz Sp. p.
Bukowinska 2 lok 160
02-703 Warszawa (PL)

(71) Applicant: **International Tobacco Machinery**
Poland Sp. z o.o.
26-600 Radom (PL)

(54) **FEEDING UNIT FOR FEEDING BEADS AND APPARATUS FOR MANUFACTURING RODS**

(57) The objects of the application are a feeding unit and a rod manufacturing apparatus. The feeding unit (21) for feeding beads (C) comprises a supply channel (24) for feeding a stream of beads (C), a transferring wheel (26) provided with at least one transferring pocket (34), a pushing mechanism (25) comprising a holding pocket (29) for receiving the beads (C) from the supply channel (24), and a pushing element (31) for transferring the beads (C) individually from the holding pocket (29) to the transferring wheel (26). The unit (21) is characterised in that the pushing element (31) having a pushing edge (32) is a rotatable element of a horizontal rotational axis (n). The pushing edge (32) is arranged for passing during the rotation through the holding pocket (29) and the transferring channel (30) in order to push the bead (C) out of the holding pocket (29) through the transferring channel (30) to the transferring pocket (34).

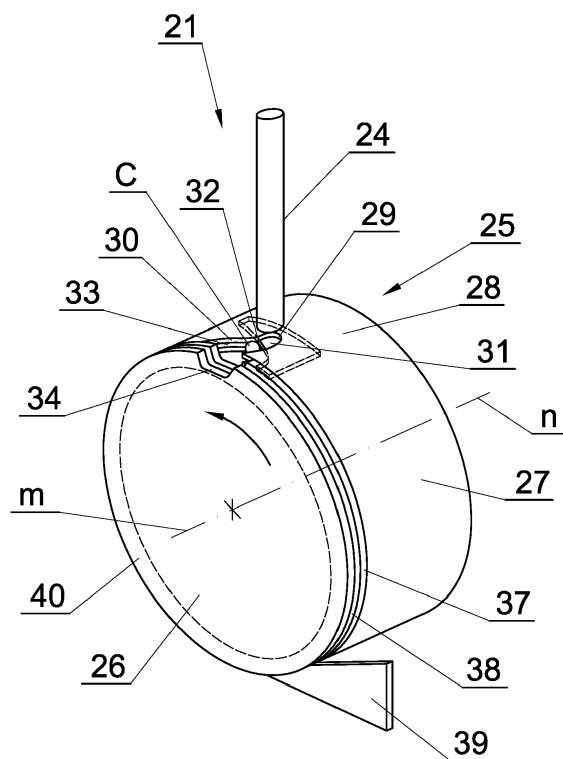


Fig. 7

Description

[0001] An object of the application is a feeding unit for feeding beads and an apparatus for manufacturing rods of tobacco industry.

[0002] This invention relates to a feeding of spherical or oval objects which are placed into rods being tobacco industry products or semi-finished products. For the sake of simplicity, such objects will be hereinafter referred to as beads. A known product in the market are cigarettes whose filters are provided with beads comprising aromatic or odorous substances. The substances comprised in the beads are released during smoking or yet before lighting up a cigarette by squeezing the filter resulting in crushing a bead. In the production process, the beads are placed in continuous rods which are cut into rods, and the rods are cut into segments which are connected with other semi-finished products.

[0003] A difficult and a very significant issue is the feeding of individual beads to a machine forming filters at great speeds in a way which guarantees that the beads remain undamaged and a high feeding efficiency is maintained, i.e. each manufactured filter rod actually comprises correctly placed beads.

[0004] There are known bead feeders in which, tubes are used for feeding the beads to an area from which they are transferred to a bead delivery wheel with the function of the said wheel being to place the delivered beads into the filter material, between the fibres of the filter material or between the segments made of filter or other material.

[0005] Patent US 7,975,877B2 discloses a bead feeder, wherein the bead feeding unit is provided with a plurality of tubes which are radially connected with a cylindrical bowl, whereas the tubes rotate together with the bowl, and the beads are picked up by means of vacuum by a bead transfer wheel from pockets situated at the outlets of the tubes, and then transferred to a bead delivery wheel.

[0006] The document WO 2009/071271 discloses a bead feeder in which the bead feeding unit is provided with passageways rotating with the bowl, where the beads are fed to a bead delivery wheel after separating the lowermost bead from those situated above it using a stationary arched wedge-ended element.

[0007] The document WO 2009/071272 discloses a similar bead feeder, where the beads are fed to a bead delivery wheel using two plates having a plurality of openings and rotating relative to each other, and a bead is fed after aligning respective openings directly on top of each other.

[0008] Patent EP2617302B1 discloses a solution, in which the beads are fed through supply channels to holding pockets from which they are further transferred to a feeding wheel after pushing them out of the pockets by means of a cam.

[0009] The object of this invention is to develop an improved feeding unit for the feeding of beads in a rod man-

ufacturing apparatus to be applied in different configurations of the apparatus.

[0010] The object of the invention is a feeding unit for bead feeding comprising a supply channel to feed a stream of beads, a transferring wheel provided with at least one transferring pocket, a pushing mechanism comprising a holding pocket to receive the beads from the supply channel and a pushing element to transfer the beads individually from the holding pocket to the transferring wheel. The unit according to the invention is characterised in that the pushing element having a pushing edge is a rotational element with a horizontal rotational axis, with the pushing edge being adapted to pass during the rotation through the holding pocket and the transferring channel in order to push the bead out of the holding pocket through the transferring channel to the transferring pocket.

[0011] The unit according to the invention is characterised in that the pushing element is a plate with a cylindrical surface.

[0012] The unit according to the invention is characterised in that the transferring channel leads tangentially to the transferring wheel.

[0013] The unit according to the invention is characterised by being provided with at least one guide next to the path of movement of the transferring pocket.

[0014] The unit according to the invention is characterised in that the guide on a side of supply channel has the form of two concentric circular surfaces.

[0015] The unit according to the invention is characterised in that the rotational axis of the pushing element overlaps a rotational axis of the transferring wheel.

[0016] The object of the invention is also an apparatus for manufacturing rods of a continuous rod provided with a filling material feeding unit, a feeding unit for bead feeding, a forming unit for continuous rod forming, a cutting head for continuous rod cutting into individual rods, with the feeding unit for bead feeding being provided with a feeding wheel having a plurality of transporting pockets to transfer the beads, and at least one feeding unit according to the invention.

[0017] The feeding unit according to the invention guarantees that each position of the bead after leaving the supply channel on the path to the continuous rod being formed is fully controlled. Furthermore, it is possible to use the feeding unit in different configurations of the rod manufacturing apparatus. Among others, it is possible to use the feeding unit to manufacture the rods of a continuous rod in which the beads are unevenly spaced.

[0018] The object of the invention is shown in a preferred embodiment in a drawing in which:

Figs. 1 to 4 show rods comprising various filling materials including beads,
Fig. 5 shows a rod manufacturing apparatus in the first embodiment,
Fig. 6 shows a feeding unit,

Figs. 7, 8 show the feeding unit,

Fig. 9 shows a cross-section through a guiding channel,

Fig. 10 shows the rod manufacturing apparatus in the second embodiment, and

Fig. 11 shows the rod manufacturing apparatus in the third embodiment.

[0019] An example filter rod R shown in a cross-section in Fig. 1 comprises four objects in the form of beads C situated among the fibres F of the filter material. The beads C are placed along the axis k of the filter rod R and centrally relative to the axis k. Fig. 2 shows a filter rod R' comprising the segments S1, S2 and the beads C placed in the spaces between the segments. A rod R" shown in Fig. 3 comprises the segments S1, S2 and two kinds of beads C1 and C2 situated alternately in successive spaces between the segments.

[0020] Fig. 5 shows an apparatus 1 for manufacturing the rods R of a continuous material strip 2 in the first embodiment. The material strip 2 comprises acetate fibres supplied from a material bale 3, alternatively the material strip may be made of a different filling material in the form of tobacco, cellulose foil, paper or fibres having filtering properties, both smooth and corrugated. The apparatus 1 for manufacturing the rods R is provided with feeding unit 4 for feeding a material 2 (generally filling material) wherein the material strip 2 is subjected to processing. The apparatus 1 comprises a feeding unit 5 arranged to feed the beads C, a forming unit 6 and a cutting head 7. In the manufacturing process, the beads C, generally spherical objects, are placed within the material strip, whereas the said beads C after forming a continuous rod CR in the forming unit 6 will be situated inside the continuous rod, and after cutting such continuous rod by means of the cutting head 7 will be situated inside individual rods R. The apparatus 1 comprises a guiding unit 8 for material strip guiding and preliminary material compression, a compressing unit 9 for strip compression and continuous rod CR forming. Whilst forming the continuous rod CR is wrapped with a band of a wrapping material P fed by a wrapping material feeding unit 10. The apparatus 1 is provided with a forming unit 12 for final forming and lengthwise gluing of the continuous rod CR. The guiding unit 8, the compressing unit 9 and the forming unit 12 constitute together a forming apparatus for forming the continuous rod CR.

[0021] Fig. 6 shows the feeding apparatus 5 comprising a feeding wheel 20 and five feeding units 21 feeding the beads C to the transporting pockets 22 situated on a circumferential surface 23 of the feeding wheel 20. The number of feeding units depends on the quantity of beads which are to be placed into the continuous rod CR. As shown in Fig. 7, the feeding unit 21 comprises a supply channel 24, a pushing mechanism 25 and a transferring wheel 26 with the rotational axis m. The pushing mechanism 25 comprises a body 27 which in the embodiment shown has the shape of a cylinder. In the body 27, on its

lateral surface 28, there are situated a holding pocket 29 and a transferring channel 30 extending from the holding pocket 29 towards the transferring wheel 26. The transferring channel 30 is situated diagonally to the generator of the body 27 and tangentially to the transferring wheel 26, whereas the transferring channel 30 is directed in accordance with the direction of rotation of the transferring wheel 26 marked with an arrow. The pushing mechanism 25 comprises a movable pushing element 31 having a pushing edge 32. The pushing element 31 has the form of a plate which may be flat or may be shaped as a sector of a cylindrical surface. The pushing element 31 is rotatably mounted so as to rotate around the axis n, whereas the pushing element 31 moves in a groove 33 made in the body 27, also shown in Fig. 8 and Fig. 9. The rotational axis n of the pushing element 31 may overlap the rotational axis m of the transferring wheel 26. The pushing element 31 moves with a speed v1. The pushing element 31 rotates so that the pushing edge 32 passes through the holding pocket 29 and the transferring channel 30 as shown in Fig. 7. The bead C fed from the supply channel 24 falls into the holding pocket 29. The movement of the pushing element 31 causes that the pushing edge 32 pushes the bead C out of the holding pocket 29 through the transferring channel 30 towards the transferring wheel 26 to the transferring pocket 34. The pushing element 31 makes a rotation as a result of which the bead C is transferred from the holding pocket 29 through the transferring channel 30 to the transferring pocket 34. The transferring wheel 26 may be provided with two transferring pockets 34, and the pushing mechanism 25 may be provided with two pushing elements 31. A greater number of transferring pockets 34 and pushing elements 31 is also possible. The transferring pocket 34 moves with a speed v2, whereas the speed v2 may be equal to the speed v1. At the time of pushing the bead C out of the holding pocket 29 and of the transferring channel 30 the speed v1 may be momentarily greater than the speed v2, as a result of which the time of transfer of the bead C to the transferring pocket 34 is shortened.

[0022] The bead C, while being transferred downwards to the transporting pocket 22, moves in the transferring pocket 34 on a circular path in a guiding channel 42 formed by surfaces 35 and 36, a ring 40 and an outer guide 41 (the channel 42 is shown in a cross-section in Fig. 8; in Fig. 7 the guide 41 is not shown, and the ring 40 is shown with a broken line). In the circumferential surface 37 of the transferring wheel 26, there is a groove 38 which passes also through the transferring pocket 34. In the lower part of the transferring wheel 26, there is situated a plough 39 in the form of a flat element inserted into the groove 38, the function of the plough 39 being to push the bead C out of the transferring pocket 34 to the transporting pocket 22 on the feeding wheel 20.

[0023] In the feeding unit 5 in Fig. 6, in the first feeding unit 21 and the third feeding unit 21", the transferring wheel 26 takes the position before feeding the bead C from the transferring pocket 34 to the transporting pocket

22 of the feeding wheel 20. In the second feeding unit 21' and the fourth feeding unit 21'', the transferring wheel 26 takes the position after feeding the bead C from the transferring wheel 34 to the transporting pocket 22 of the feeding wheel 20. In the fifth feeding unit 21''', the transferring wheel 26 takes the position directly after supplying the bead C to the transferring pocket 34. During a rotation of the feeding wheel 20, the successive transporting pockets 22 are filled with the beads C so as to fill all pockets 22 of the feeding wheel 20. For the respective feeding units 21, the plough 39 may take different positions, and the length of the outer guide 41 must be respectively selected. The beads C of one kind or of different kinds may be supplied to the respective feeding units 21. In the case of a need to manufacture rods comprising unevenly spaced beads the transporting pockets 22 have to be unevenly spaced on the circumference of the feeding wheel 20. The feeding units 21 may be spaced at uneven intervals around the feeding wheel 20.

[0024] Fig. 10 shows a feeding unit wherein the body 27' has a smaller diameter than the transferring wheel 26. The pushing element 31' in the pushing mechanism 25' has a rotational axis n parallel to and shifted from the rotational axis m of the transferring wheel 26.

[0025] The rod manufacturing apparatus 1' in the second embodiment shown in Fig. 11 is provided with a unit 4' for the feeding of filling material in the form of segments S1, S2 of which the rod R' shown in Fig. 2 is made. The segments S1, S2 may be segments made of filter material or any other material. The segments S1, S2 are supplied by feeding modules 51, 52 and transferred to a forming unit 6' by means of a transferring module 53. The apparatus 1' is provided with the feeding unit 5 built similar to the first embodiment. If two different kinds of beads C1, C2 are alternately supplied to successive feeding units 21, the apparatus 1' according to the second embodiment may be used to manufacture the rods R'' as shown in Fig. 3.

[0026] The rod manufacturing apparatus 1'' in the third embodiment shown in Fig. 12 is provided with the unit 4' for feeding of filling material in the form of segments S1, S2 similar to the second embodiment. The apparatus 1'' is provided with two feeding units 5', 5'' feeding two different kinds of beads C1, C2 and may be used to manufacture rods in which the beads C1, C2 are placed alternately in successive spaces between the segments S1, S2 as shown in Fig. 3. Furthermore, the apparatus 1'' may be used to manufacture the rods as shown in Fig. 4 where in one space between the segments S1, S2 two beads C1, C2 are situated. The first feeding unit 5' may feed the bead C1 of the first kind, and the second feeding unit 5'' may feed the bead C2 of the second kind.

Claims

1. A feeding unit (21) for feeding beads (C) comprising

a supply channel (24) for feeding a stream of beads (C),
a transferring wheel (26) provided with at least one transferring pocket (34),
a pushing mechanism (25) comprising a holding pocket (29) for receiving the beads (C) from the supply channel (24) and a pushing element (31) for transferring the beads (C) individually from the holding pocket (29) to the transferring wheel (26),

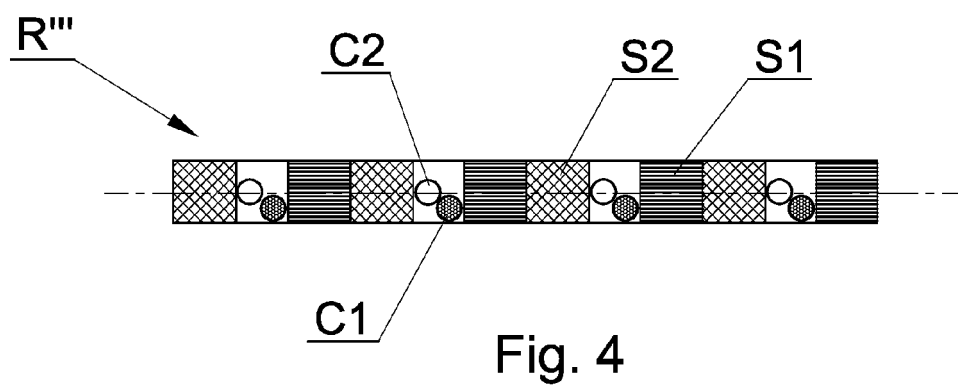
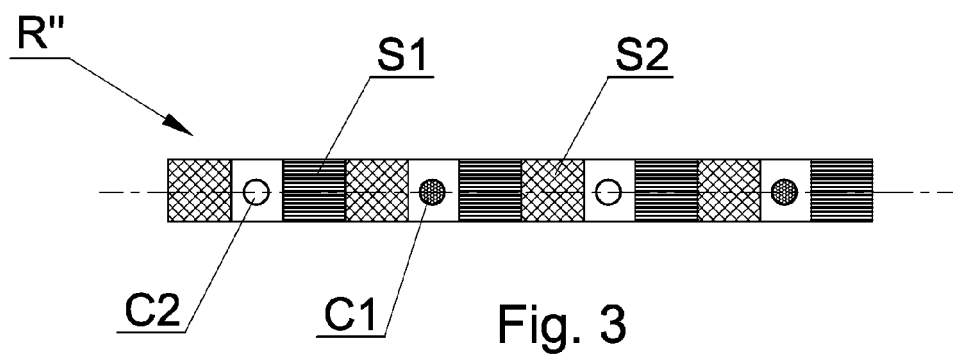
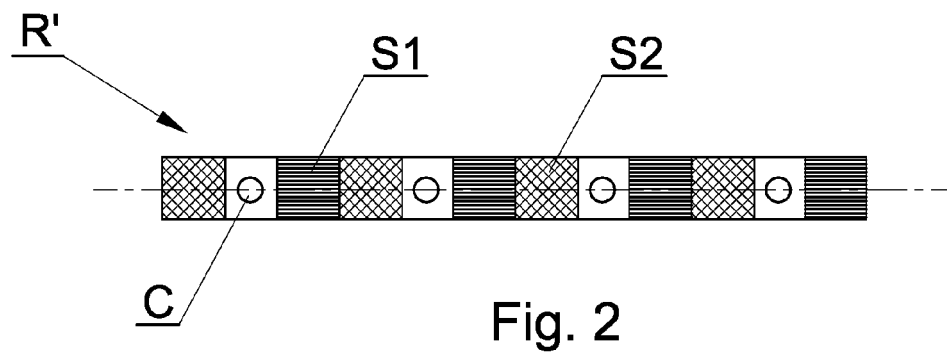
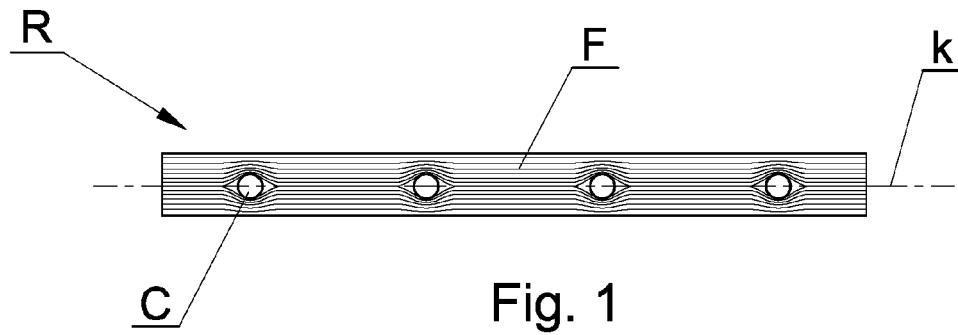
characterised in that

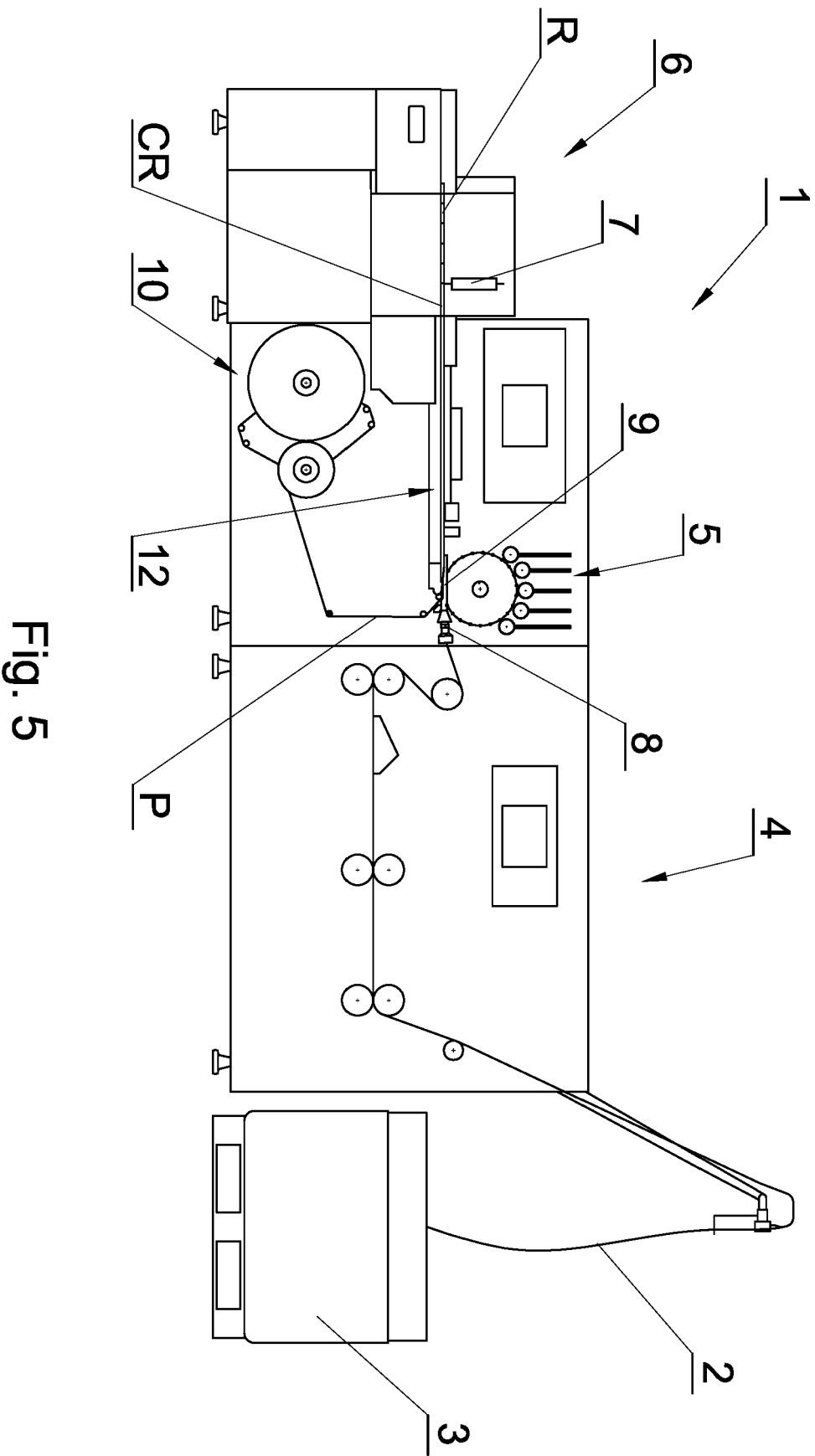
the pushing element (31) having a pushing edge (32) is a rotatable element of a horizontal rotational axis (n),
the pushing edge (32) being arranged for passing during the rotation through the holding pocket (29) and the transferring channel (30) in order to push the bead (C) out of the holding pocket (29) through the transferring channel (30) to the transferring pocket (34).

2. The unit as in claim 1 **characterised in that** the pushing element (31) is a plate having a cylindrical surface.
3. The unit as in claim 1 or 2 **characterised in that** the transferring channel (30) adjoins tangentially to the transferring wheel (26).
4. The unit as in any of the claims from 1 to 3 **characterised by** being provided with at least one guide arranged next to a path of movement of the transferring pocket (34).
5. The unit as in any of the claims from 1 to 4 **characterised in that** the guide on a side of the supply channel (24) has the form of two concentric circular surfaces (35, 36).
6. The unit as in any of the claims from 1 to 5 **characterised in that** the rotational axis (n) of the pushing element (31) overlaps a rotational axis (m) of the transferring wheel (26).
7. An apparatus for manufacturing rods of a continuous rod (CR) provided with a filling material feeding unit (4, 4'), a feeding unit (5, 5') for feeding beads (C), a forming unit for forming a continuous rod (CR), a cutting head (7) for cutting the continuous rod (CR) into individual rods (R, R', R''),

characterised in that

the feeding unit (5, 5') for feeding beads (C) is provided with a feeding wheel (20) having a plurality of transporting pockets (22) for transferring the beads (C), and at least one feeding unit (21) according to any of the claims from 1 to 6.





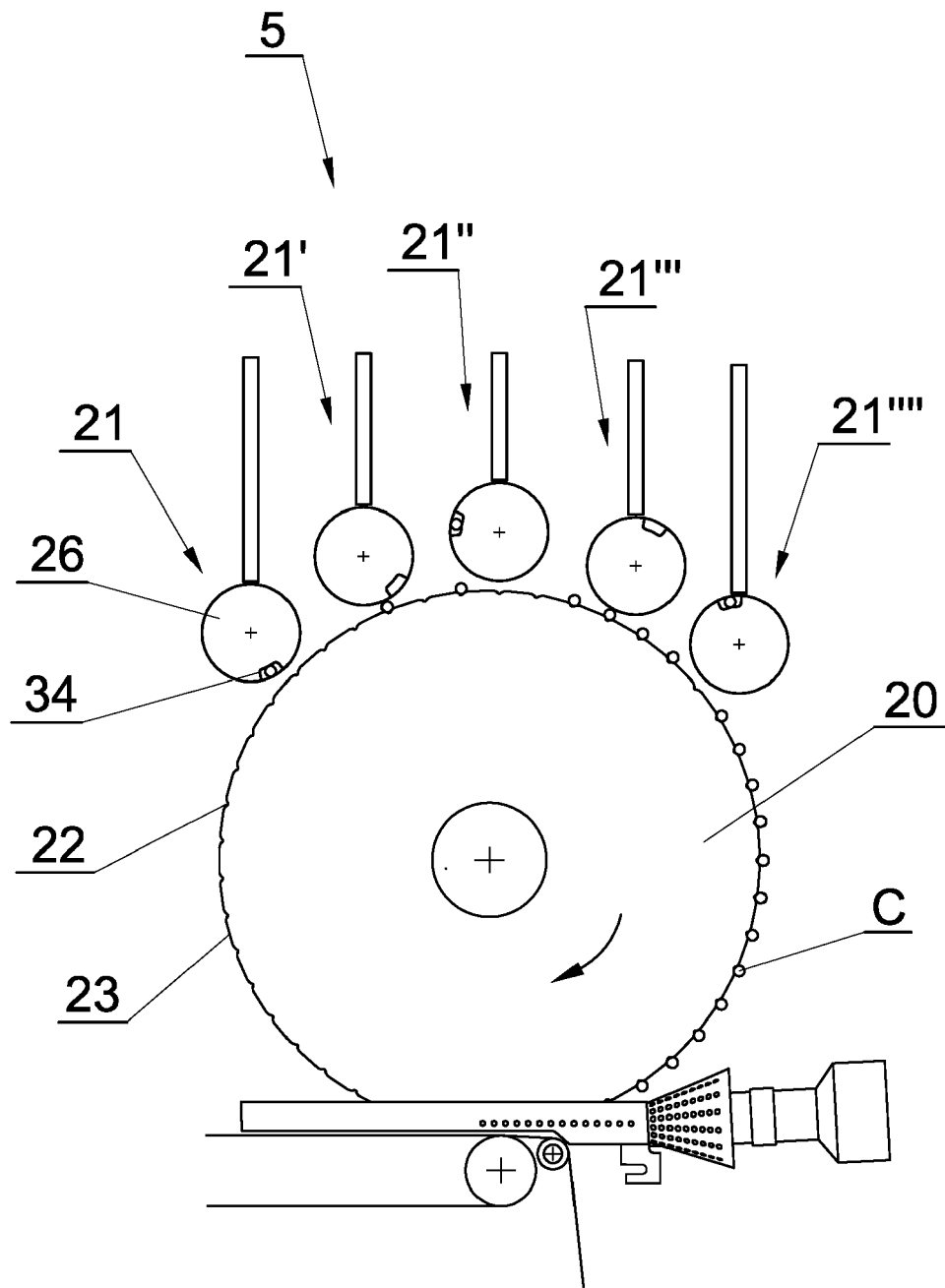


Fig. 6

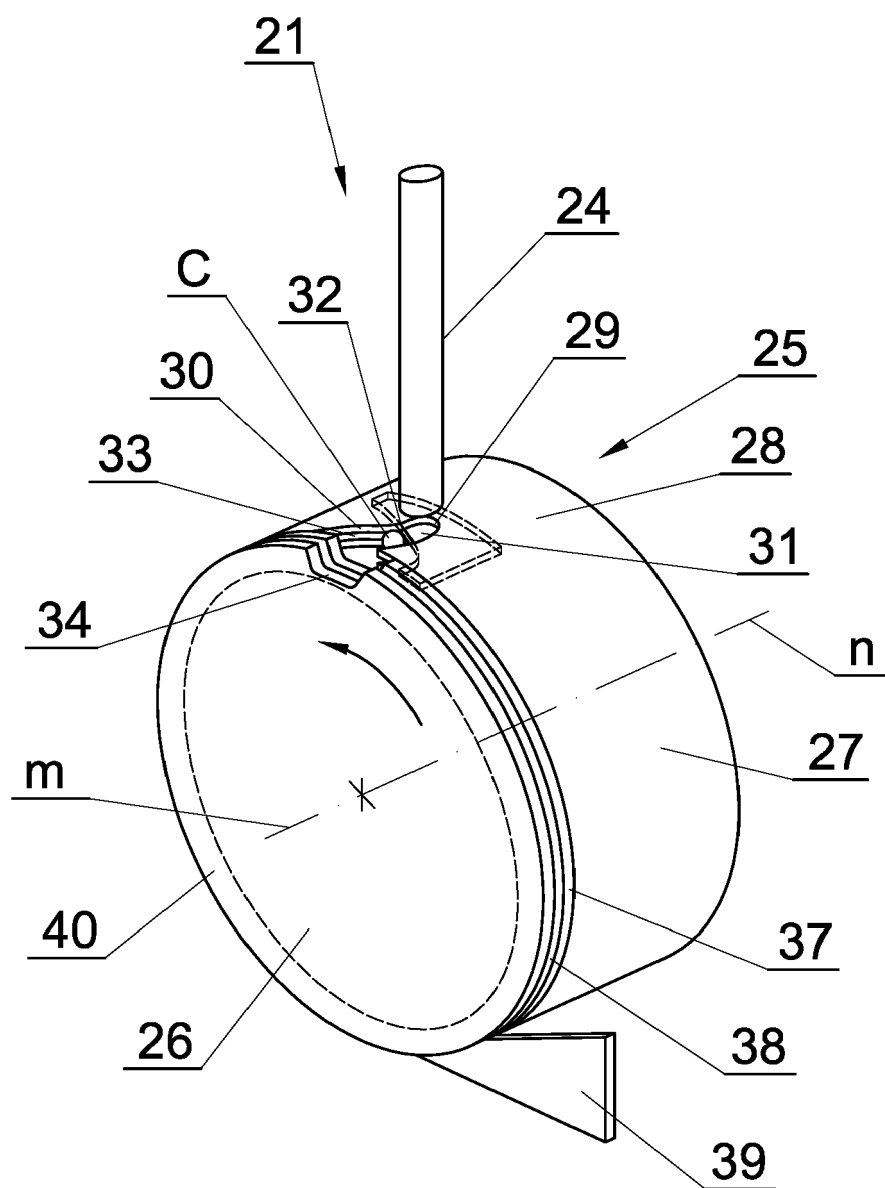
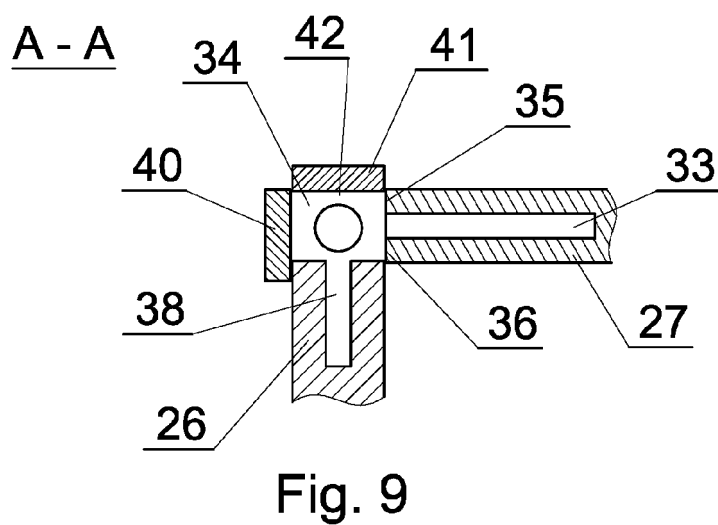
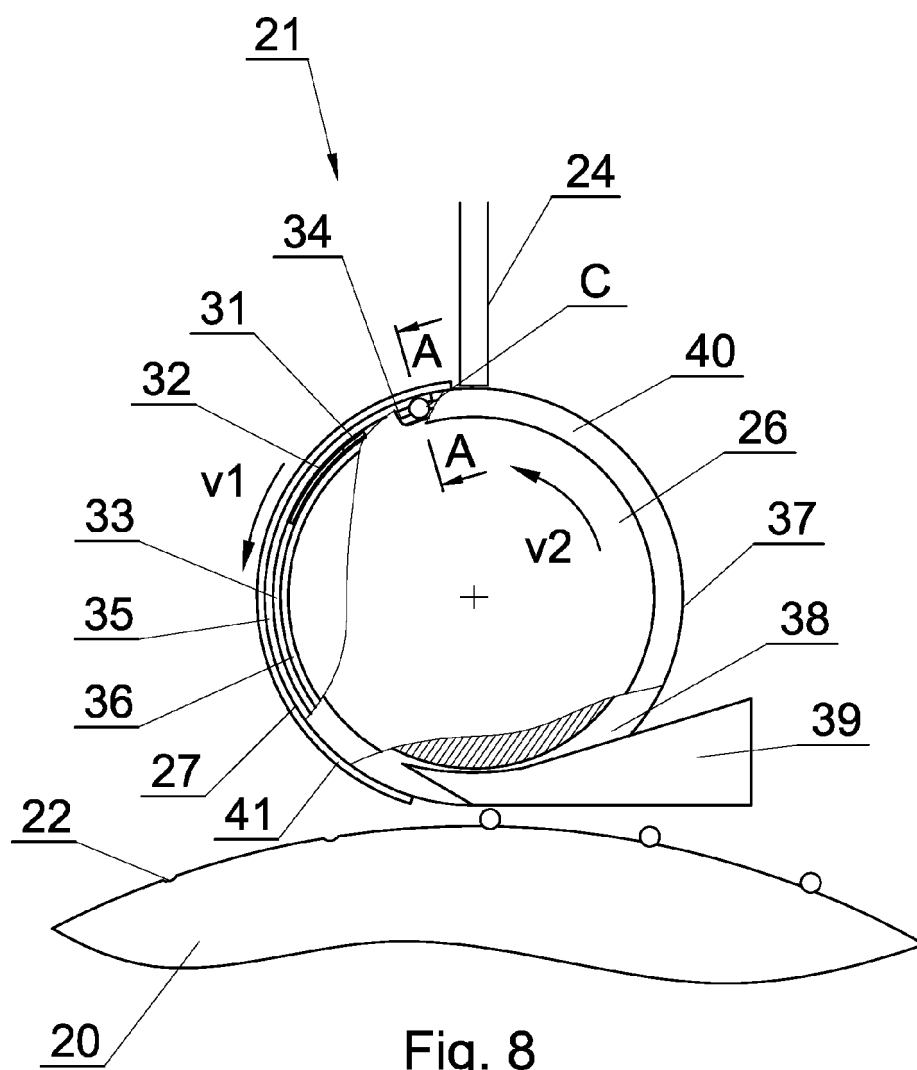


Fig. 7



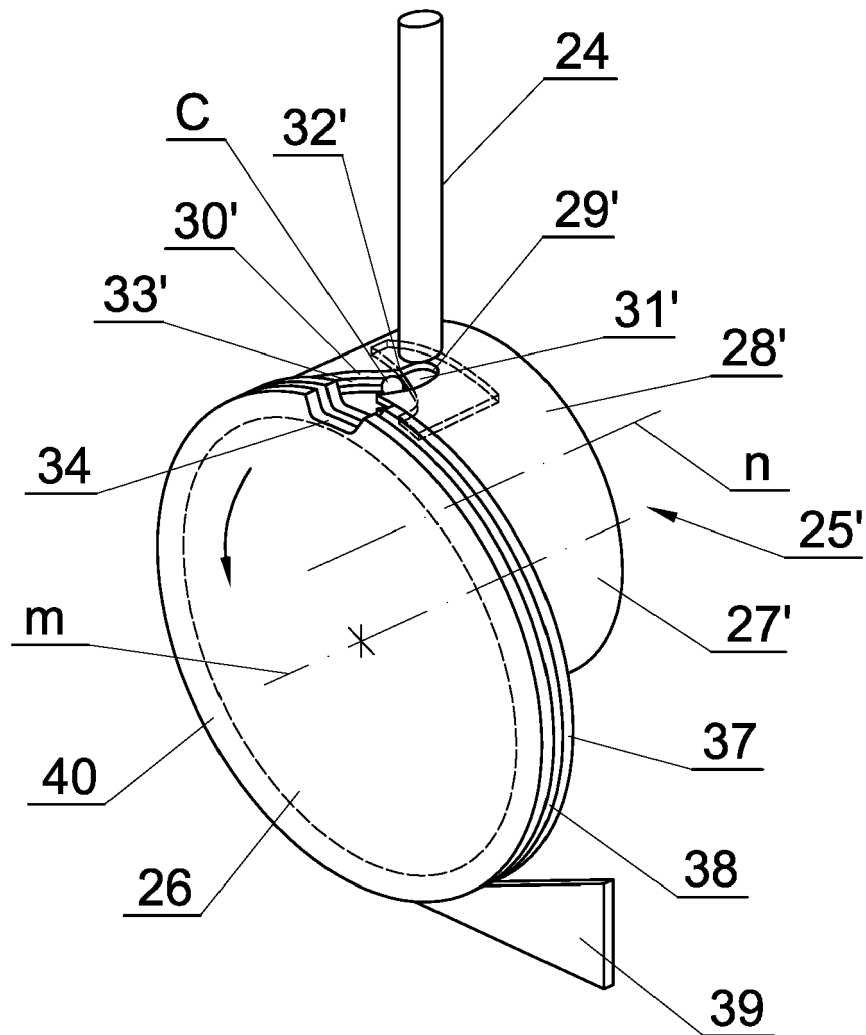


Fig. 10

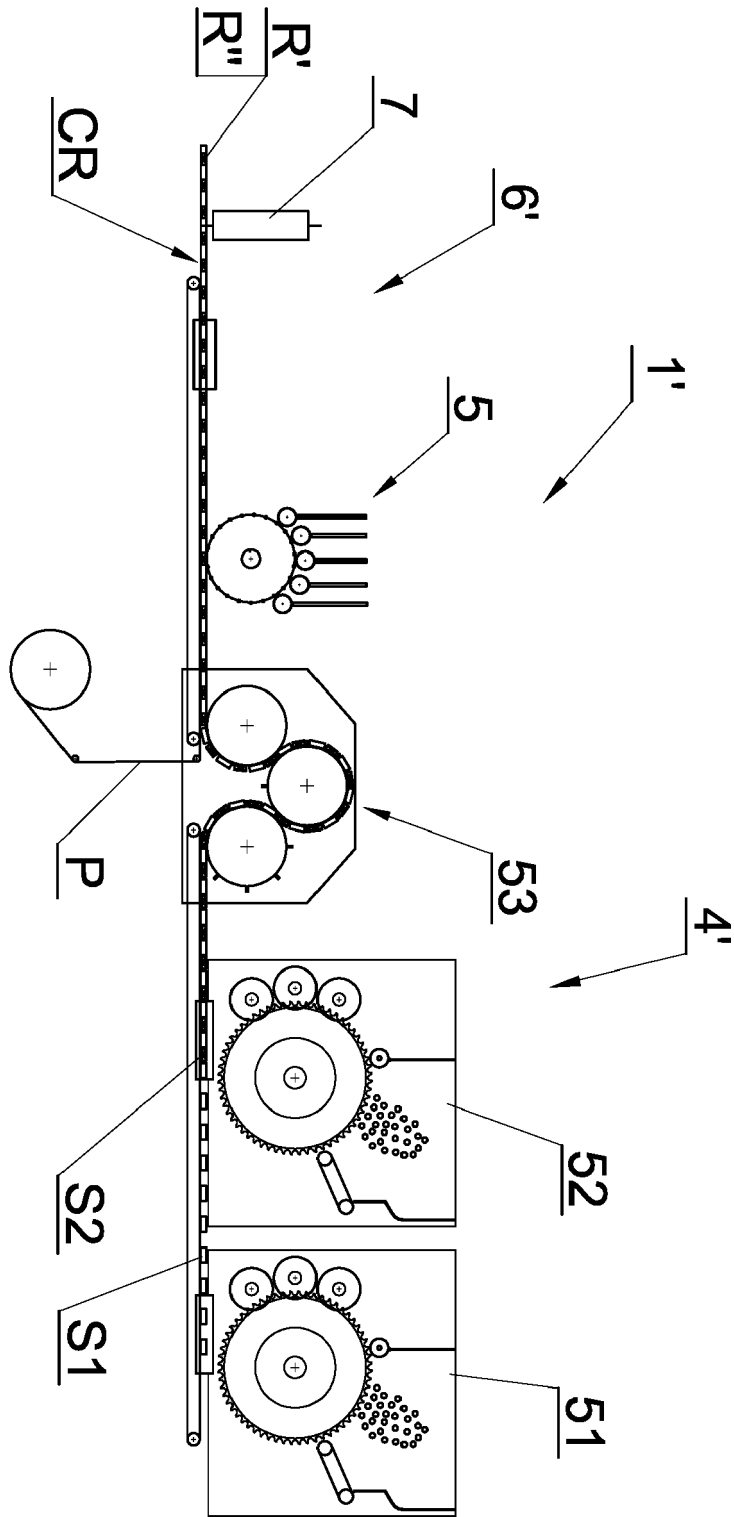


Fig. 11

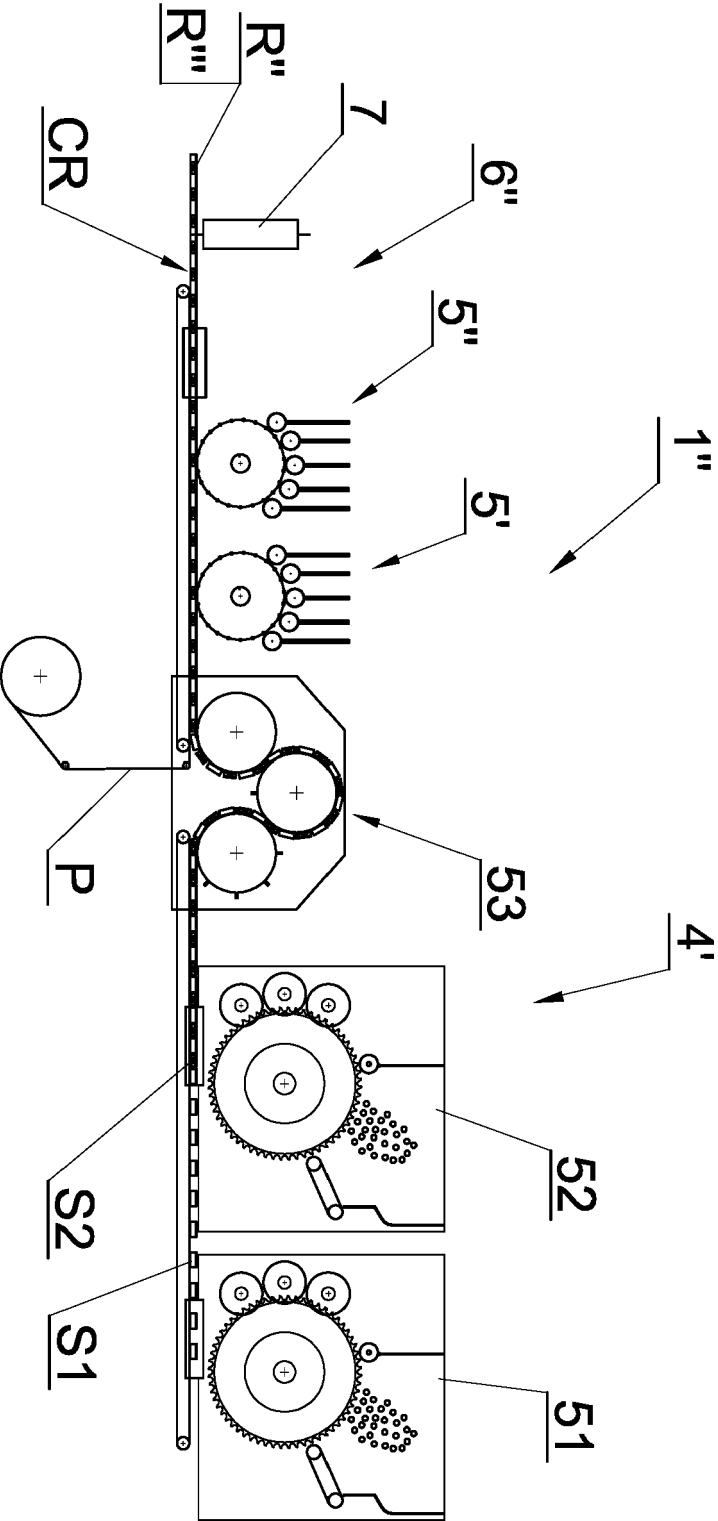


Fig. 12



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Application Number
EP 20 18 8288

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			TECHNICAL FIELDS SEARCHED (IPC)
			A24D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 December 2020	Examiner Cardan, Cosmin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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