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(54) **A GARNITURE DEVICE AND A MACHINE AND A METHOD FOR MANUFACTURING MULTI-SEGMENT FILTER RODS**

(57) A garniture device for a machine used in tobacco industry for manufacturing a continuous rod (CR) comprising a loose material wrapped with a wrapper, wherein the garniture device comprises: a lower garniture part (7); a garniture duct (9) formed in the lower garniture part (7); a garniture belt movable in the garniture duct (9) for transporting the wrapper along the garniture duct (9); an upper garniture part (11) comprising wrappers (11a) for forming the wrapper (101) around the loose material; wherein the garniture duct (9) comprises: an inlet part for transforming the garniture belt from a flat configuration into a U-shaped configuration; a U-shaped part for guiding the garniture belt in the U-shaped configuration; an outlet part for transforming the garniture belt from the U-shaped configuration into the flat configuration; characterized in that: the U-shaped part of the garniture duct (9) comprises, at the side of the inlet part, a first section (9a) having a first diameter (D1) and, at the side of the outlet part, a second section (9b) having a second diameter (D2) being smaller than the first diameter (D1), wherein the first section (9a) is connected to the second section (D2) by a transition section (9c) having a surface of a variable diameter.

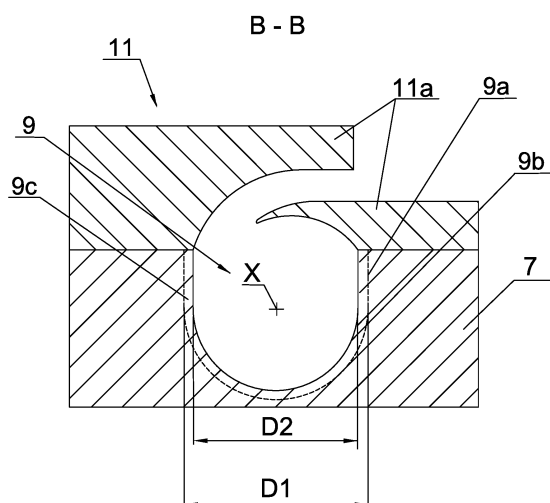


Fig. 6

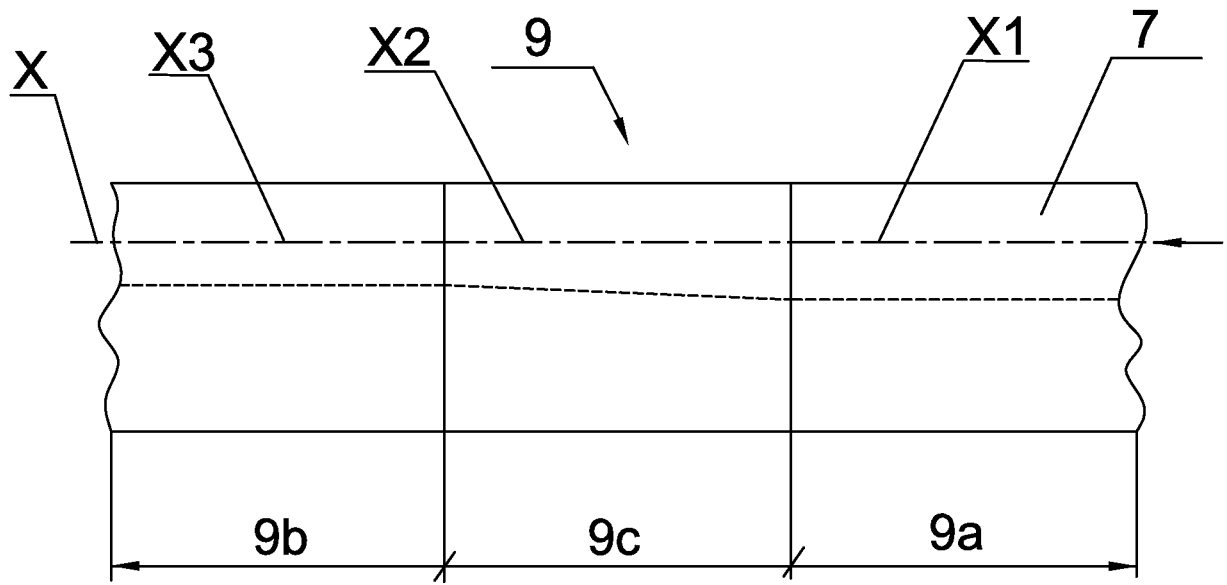


Fig. 7

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a garniture device, a machine for manufacturing multi-segment filter rods and a method for manufacturing multi-segment filter rods

BACKGROUND

[0002] Tobacco industry products, such as cigarettes, may comprise segment filters with various filtering materials, in particular loose materials, such as activated charcoal in a form of a loose granulate located between neighboring segments of a solid form. A segment with activated charcoal can be formed by placing the charcoal between the neighboring solid segments, which typically have a form of rod-like elements having filtering properties (for example segments made of acetate) a or rod-like elements having non-filtering properties (for example paper pipes or other elements made of plastic). Manufacturers of filters comprising charcoal or other granulate materials aim for placement of portions of the loose material such that the space between the solid segments is filled up as much as possible, preferably in 100%. In such a filter, smoke passes through the filtering material, wherein undesired substances contained in the smoke are filtered out. In the filter wherein the spaces between the solid form segments is not sufficiently filled with the loose material, smoke may bypass the filtering material and pass through empty spaces present in the filter. Moreover, such a filter is prone to deformations in the region filled with the loose material.

[0003] A US patent US411602 discloses a device for compacting filtering segments containing charcoal granulate. One of its disadvantages is that the segments are deformed by a pin, which pushes an inner part of the segment made of filtering fiber into a charcoal segment which is not sufficiently filled, such as to eliminate an empty space.

[0004] A US patent US6656412 discloses a device for increasing the degree of filling of a space located between segments with granulate. The granulate is introduced on two stations, wherein after each introduction it is pressed into the space between the segments. One disadvantage of such a solution is contamination of the product with the granulate and dust. Moreover, such solution occupies lots of space in the machine and therefore its application is problematic in modern machines, which are expected to have compact size.

[0005] There is a need to provide a device for manufacturing multi-segment filter rods with segments filled with a loose material, wherein the segments are filled up as much as possible, preferably at least close to 100%. Moreover, there is a need to provide a solution that does not cause significant contaminations of the rods with the loose material.

SUMMARY

[0006] An object of the invention is a garniture device for a machine used in tobacco industry for manufacturing a continuous rod comprising a loose material wrapped with a wrapper, wherein the garniture device comprises: a lower garniture part; a garniture duct formed in the lower garniture part; a garniture belt movable in the garniture duct for transporting the wrapper along the garniture duct; an upper garniture part comprising forming parts for forming the wrapper around the loose material; wherein the garniture duct comprises: an inlet part for transforming the garniture belt from a flat configuration into a U-shaped configuration; a U-shaped part for guiding the garniture belt in the U-shaped configuration; an outlet part for transforming the garniture belt from the U-shaped configuration into the flat configuration; characterized in that: the U-shaped part of the garniture duct comprises, at the side of the inlet part, a first section having a first diameter and, at the side of the outlet part, a second section having a second diameter being smaller than the first diameter, wherein the first section is connected to the second section by a transition section having a surface of a variable diameter.

[0007] The transition section may have a conical surface.

[0008] The first section and the second section can be arranged co-axially with respect to each other.

[0009] Generating lines of the first section, of the transition section and of the second section can be located on a common plane.

[0010] The length of the transition section can be equal from 30 to 100mm, preferably from 50 to 80mm.

[0011] The second diameter can be from 1 to 5% smaller than the first diameter, preferably from 2.5 to 3% smaller.

[0012] Another object of the invention is a machine used in tobacco industry for manufacturing multi-segment filter rods, comprising: a garniture device; a feeding unit for arranging, longitudinally along an axis in a spaced-apart relationship, rod-like elements in a train on a wrapper transported on a garniture belt of the garniture device; a filling unit for supplying a loose material to compartments between the rod-like elements; a glue nozzle for gluing the wrapper around the loose material; a cutting head for cutting the continuous rod into multi-segment filter rods; characterized in that: the garniture device is the device according to any of claims 1 to 6, wherein the transition section of the duct of the garniture device is located at least partially between the filling unit for supplying the loose material and the upper garniture part.

[0013] A difference of dimension of the first greater diameter of the garniture duct and the second smaller diameter of the garniture device can be not greater than an average grain size of a loose material.

[0014] Between the filling unit for supplying the loose material and the upper garniture part there can be located a cleaning unit for removing contaminations of the loose

material from the rod-like elements, comprising at least one suction element for receiving contaminations of the loose material and covering elements displaceable to positions in which the covering elements at least partially cover compartments filled with the loose material between the rod-like elements during the movement of the train in a vicinity of the suction element.

[0015] The transition section can be located between the filling unit for supplying the loose material and the cleaning unit.

[0016] The transition section can be located within the covering elements.

[0017] The covering elements can be adapted to be located in a position in which a pressing surface of the covering elements is lowered with respect to the upper surface of the rod-like elements.

[0018] The pressing surface of the covering elements can be lowered in the range of up to 1% of height of the rod-like elements.

[0019] Another object of the invention is a method for manufacturing multi-segment filter rods, characterized by: arranging rod-like elements longitudinally along an axis, in a spaced-apart relationship, in a train on a wrapper located on a garniture belt; supplying a loose material to compartments located between the rod-like elements; decreasing a volume of the compartments located between the segments, wherein the compartments are partially filled with the loose material; applying glue to the wrapper and wrapping the wrapper around the rod-like elements and the loose material located in the compartments between the rod-like elements in order to form a continuous filter rod; and cutting the continuous filter rod into multi-segment filter rods.

[0020] The rods can be formed by means of the machine according to any of claims 7 to 13.

BRIEF DESCRIPTION OF FIGURES

[0021] The system is shown by means of example embodiments in a drawing, in which:

Fig. 1 shows a fragment of an exemplary continuous rod, which is a multi-segment rod with segments filled insufficiently with a loose material;

Fig. 2 shows a fragment of an exemplary continuous multi-segment rod with segments properly filled with a loose material;

Fig. 3 shows schematically a fragment of a machine for manufacturing multi-segment filter rods;

Fig. 4 shows a cross-sectional view A-A of a garniture part;

Fig. 5 shows a cross-sectional view B-B of the garniture part;

Fig. 6 shows a cross-sectional view C-C of the garniture part;

Fig. 7 shows an arrangement of longitudinal axes of sections of a garniture duct with respect to each other;

Fig. 8 shows an arrangement of generating lines of the sections of the garniture duct with respect to each other;

Fig. 9 shows a location of an element covering the compartments filled with a loose material in the region of decreasing compartments volume;

Fig. 10 shows a location of the element covering the compartments filled with the loose material in front of the region of decreasing compartments volume;

Fig. 11 shows a location of the element covering the compartments filled with the loose material behind the region of decreasing compartments volume;

Fig. 12 shows a cross-sectional view C-C of a garniture part;

DETAILED DESCRIPTION

[0022] Fig. 1 shows a fragment of an exemplary continuous multi-segment rod CR1 formed from trains of rod-like elements S1 and insufficiently filled segments SC1, formed by a known device, wherein the segments are wrapped in a wrapper 101. The segments S1 have a solid shape, typically cylindrical, whereas the segment SC1 is formed from a loose material 102 which is located between the respective segments S1.

[0023] Fig. 2 shows a fragment of an exemplary continuous multi-segment rod CR2 formed from trains of rod-like elements: S1, S2 and SC2 (or, alternatively, only S1 and SC2), which is formed by the device presented herein. The segments S1, S2 and SC2 are wrapped in the wrapper 101 to form a continuous rod and are subsequently are cut into multi-segment rods, as presented in Fig. 3. A machine 1 comprises a feeding unit 2 which is configured to arrange the rod-like elements S1, S2 as a train ST1, wherein the rod-like elements S1, S2 are transported in a substantially preset spaced relationship. The rod-like elements S1, S2 are fed to a garniture belt 5 moving in a duct 9 along a garniture bar 7 (alternatively called a lower garniture part), wherein edges of the wrapper 101 and front surfaces of the elements S1 and S2 form compartments 3, in which the loose material 102 is supplied from a filling unit 103, forming a segment SC filled with the loose material. The train ST2 of the rod-like elements S1, S2 and SC that moves on the garniture belt 5 is wrapped in the wrapper 101 by a garniture device 6. A cleaning unit 104 may be located next to the filling unit 103, for removing contamination from the rod-like elements, i.e. particles of the loose material which fall on the surface of the rod-like elements S1 and S2 in the preceding step, i.e. when the loose material is supplied from the filling unit 103. The manufactured continuous rod CR is transported further and, after the wrapper 101 is glued by a gluing nozzle 4 and the garniture device 6, it is subsequently cut by a cutting head 8 into individual multi-segment rods R.

[0024] Fig. 4 shows a cross-sectional view A-A of the garniture bar 7 with the garniture belt 5, on which the wrapper 101 is located, on which the rod-like elements

S1, S2 are located and the loose material 102 is already supplied into spaces between the rod-like elements S1, S2. In this step of manufacturing, the wrapper 101 is U-shaped by the garniture belt 5. A diameter D1 of the garniture bar 7 in a location where the loose material 102 is supplied is greater than a sum of a diameter of the rod-like element S2 and a double thickness T of the garniture belt 5. The thickness T of the garniture belt 5 is preferably between 0.2 to 1.5 mm. It aims to receive greater amount of the loose material 102 in the compartments between the rod-like elements, so that in subsequent steps of manufacturing it is possible to decrease the volume of the compartments filled with the loose material 102. The decreasing of the compartments volume is realized by decreasing the diameter of the garniture duct 9 in the garniture bar 7 (in which the garniture belt 5 with the segments S1, S2 and the loose material is guided) from the dimension D1 into the dimension D2. The dimension D1 of the diameter of the garniture duct 9 is specified so that it prevents the grains of the loose material 102 to fall between the segments S1, S2 and the wrapper 101. The difference in values of the dimensions D1 and D2 depends on the type of material from which the segments S1, S2 are made of, on the type of the loose material 102 and a degree of filling of the compartment with the loose material 102. Preferably, the difference in values between dimensions D1 and D2 is not greater than an average size of a grain of the loose material 102. Preferably, the difference between the diameters D1 and D2 is from 0.2 to 1mm, and more preferably from 0.2 to 0.5mm or from 0.2 to 0.3mm. Moreover, the second diameter D2, may be smaller than the first diameter D1 from 1 to 5%, preferably from 2.5 to 3%. The decrease of the diameters of the garniture duct 9 is effected on a certain distance L, which may be equal from 30 to 100mm, preferably from 40 to 90mm. The dimension D2 is preferably equal to a sum of the diameter of the rod-like element S2 and a double thickness T of the garniture belt 5.

[0025] Fig. 5 shows a location, wherein the diameter of the garniture duct 9 is decreased to dimension D2 and the compartment filled with the loose material 102 is covered from the top by a covering element 10 of the cleaning unit 104.

[0026] Pressing surfaces 10a of the covering elements 10 touch the loose material 102 accumulated in the consecutive compartments between the rod-like elements S1, S2. The pressing surfaces 10a may be made of an air permeable or impermeable material, depending on the type of the loose material. The covering elements 10 are resilient, for example they may be made of rubber or a sponge-like material. Furthermore, the cleaning unit 104 is equipped with a suction element 12, preferably a suction nozzle, supplying negative pressure to the zone in which the covering elements 10 have contact with the loose material or enclose the loose material. The suction element 12 is intended to remove contaminations from the rod-like elements, i.e. particles of the loose material which fall on the surface of the rod-like elements S1, S2

in the preceding step, i.e. when the loose material is supplied from the filling unit 103.

[0027] Fig. 6 shows the garniture device 6 comprising the garniture bar 7 and an upper garniture part 11, which has forming parts 11a for wrapping the segments S1, S2 and the loose material 102 with the wrapper 101. After transporting the segments S1, S2 and the compartments with the loose material 102 to the section of the garniture bar 7 with a decreased diameter D2, the loose material 102 is concentrated in the decreased compartment between the segments, which increases the quality of filling of the compartment. The section of the garniture duct 9a is a section having a greater diameter D1 and is located at the inlet side of the garniture duct 9. The section of the garniture duct 9b is a section having smaller diameter D2 and is located at the outlet side of the garniture duct 9. Between the section 9a and 9b of the garniture duct 9 there is a transition section 9c of the garniture duct 9. A longitudinal axis X of the garniture duct 9 may coincide, respectively, with the axes X1, X2, X3 of the sections of the garniture duct having the greater diameter 9a, the transition section 9c and the section of the duct having smaller diameter 9b, as shown in Fig. 7. Another embodiment is also possible, as shown in Fig. 8, wherein the longitudinal axis X of the garniture duct 9 does not coincide with all longitudinal axes X1, X2, X3 of the sections of the garniture duct 9a, 9c, 9b.

[0028] The sections of the garniture duct 9a, 9c, 9b have respectively generating lines Y1, Y3, Y2 which are arranged in parallel with respect to each other on one common plane Z. Moreover, it is advantageous when the generating line Y1 of the section of the garniture duct 9a having the greater diameter, the generating line Y2 of the transition section of the garniture duct 9c and the generating line Y3 of the section of the garniture duct 9b having the smaller diameter, coincide with each other.

[0029] Fig. 9 shows an example of placement of the covering element 10 of the compartment filled with the loose material 102, in a region of the decreasing volume of the compartments between the segments S1, S2, in a top view. The segments S1, S2 and the compartments with the loose material 102 together with the wrapper 101 placed on the garniture belt 5 are moved downwards towards the cutting head in the garniture duct 9 of the garniture bar 7. In the position where the loose material 102 is supplied to the compartments between the segments S1, S2, the diameter of the garniture duct is equal to D1, next it is gradually decreased within the section L until the dimension of the diameter is equal to D2. While decreasing the diameter of the garniture duct 9, the loose material 102 becomes concentrated and the filling of the compartment increases, the loose material being slightly lifted towards the top of the compartment. Moreover, in the section L there is located a cleaning unit 104, in which the covering element 10 covers the loose material 102 from the top and simultaneously preses and concentrates it in the direction of the compartment interior and causes initial shaping of the upper surface of the compartment

with the loose material 102. When the covering element 10 covers the loose material 102, the contaminations of the loose material from the rod-like elements are removed by the suction element 12. The covering element 10 prevents the loose material, which rises due to the narrowing of the garniture duct, from elevating above the upper edge of the segments S1, S2.

[0030] The cleaning unit 104 may be also located in front of the section L, in which the diameter of the garniture duct 9 is decreased, as shown in the second embodiment in Fig. 10. In this example, the contaminations of the loose material generated in the step of filling of the loose material 102 in the filling unit 103, are removed by the cleaning unit 104. The loose material 102 supplied to the compartments between the segments S1, S2 is initially concentrated and shaped from the top by the pressing surface 10a of the covering element 10. Subsequently, such initially shaped loose material 102 with the segments S1, S2 and the wrapper 101 is transported downstream, along the garniture duct 9 of the garniture bar 7 by the section L, in which the diameter of the garniture duct 9 is decreased from D1 to D2, what additionally causes concentration of the loose material 102 and the increase of filling of the compartment which decreases volumetrically.

[0031] Another embodiment is shown in Fig. 11, where the cleaning unit 104 is located behind the section L which decreases the diameter of the garniture duct 9. The advantage of such a solution is that after the decrease of the diameter of the garniture duct 9 to the dimension D2, the loose material 102 inside the compartment is shaped so that its surplus is pushed towards the top, wherein the compartment with the loose material 102 is covered from the top by the pressing surface 10a of the covering element 10, and the loose material 102 located outside the covered region is removed by the suction element 12.

[0032] Fig. 12 shows a cross-section C-C of the garniture bar 7. The figure shows the garniture device 6 comprising the lower part, in other words the garniture bar 7 and the upper garniture part 11, which is used to wrap the rod-like elements S1, S2 and the loose material 102 with the wrapper 101. This process is performed after the segments S1, S2 of the compartments 3 with the loose material pass through the sections of the duct 9a, 9c and after the cleaning of the upper surface of the rod-like elements from the contaminations in location where the garniture duct 9 has the final diameter D2. In so formed continuous multi-segment rod, defects in the segments CR2 (that would result from insufficient filling with the loose material 102) are avoided.

List of elements:

[0033]

1 - a tobacco industry machine for manufacturing multi-segment filter rods

2 - a rod-like element feeding unit
 3 - a compartment
 4 - a glue nozzle
 5 - a garniture belt
 6 - a garniture device
 7 - a lower garniture part
 8 - a cutting head
 9 - a garniture duct
 9a - a section of the garniture duct of a greater diameter
 9b - a section of the garniture duct of a smaller diameter
 9c - a transition section of the garniture duct
 10 - a covering element
 10a - a pressing surface
 11 - an upper garniture part
 12 - a suction element
 101 - a wrapper
 102 - a loose material
 103 - a loose material filling unit
 104 - a cleaning unit
 SC - a segment filled with a loose material
 SC1 - an insufficiently filled segment
 SC2 - a properly filled segment
 S1, S2 - rod-like elements
 CR1 - a continuous multi-segment rod
 L - a length of the transition section
 D1, D2 - diameters of the garniture duct
 ST1 - a train of the rod-like elements
 R - single multi-segment rods

T -	thickness of the garniture belt			(D1) and, at the side of the outlet part, a second section (9b) having a second diameter (D2) being smaller than the first diameter (D1), wherein the first section (9a) is connected to the second section (D2) by a transition section (9c) having a surface of a variable diameter.
X -	an axis of the garniture duct			
X1 -	an axis of the garniture duct section of a greater diameter	5		
X2 -	an axis of the transition section of the garniture duct			
X3 -	an axis of the garniture duct section of a smaller diameter	10		
Y1 -	a generating line of the garniture duct section of a greater diameter	15		
Y2 -	a generating line of the transition section of the garniture duct			
Y3 -	a generating line of the garniture duct section of a smaller diameter	20		
Z -	a common plane for generating lines of the garniture sections	25		
Claims				

1. A garniture device (6) for a machine used in tobacco industry for manufacturing a continuous rod (CR) comprising a loose material wrapped with a wrapper (101), wherein the garniture device (6) comprises:
 - a lower garniture part (7);
 - a garniture duct (9) formed in the lower garniture part (7);
 - a garniture belt (5) movable in the garniture duct (9) for transporting the wrapper (101) along the garniture duct (9);
 - an upper garniture part (11) comprising forming parts (11a) for forming the wrapper (101) around the loose material (102);
 - wherein the garniture duct (9) comprises:
 - an inlet part for transforming the garniture belt (5) from a flat configuration into a U-shaped configuration;
 - a U-shaped part for guiding the garniture belt (5) in the U-shaped configuration;
 - an outlet part for transforming the garniture belt (5) from the U-shaped configuration into the flat configuration;

characterized in that:

 - the U-shaped part (4) of the garniture duct (9) comprises, at the side of the inlet part, a first section (9a) having a first diameter
2. The garniture device according to claim 1 **characterized in that** the transition section (9c) has a conical surface.
3. The garniture device according to any of claims from 1 to 2 **characterized in that** the first section (9a) and the second section (9b) are arranged coaxially with respect to each other.
4. The garniture device according to any of claims from 1 to 2 **characterized in that** generating lines of the first section (9a), of the transition section (9c) and of the second section (9b) are located on a common plane (Z).
5. The garniture device according to any of claims from 1 to 4 **characterized in that** the length of the transition section (4) is equal from 30 to 100mm, preferably from 50 to 80mm.
6. The garniture device according to any of claims from 1 to 5 **characterized in that** the second diameter (D2) is from 1 to 5% smaller than the first diameter (D1), preferably from 2.5 to 3% smaller.
7. A machine used in tobacco industry for manufacturing multi-segment filter rods, comprising:
 - a garniture device (6);
 - a feeding unit (2) for arranging, longitudinally along an axis in a spaced-apart relationship, rod-like elements (S1, S2) in a train on a wrapper (101) transported on a garniture belt (5) of the garniture device (6);
 - a filling unit (103) for supplying a loose material (102) to compartments (3) between the rod-like elements (S1, S2);
 - a glue nozzle (6a) for gluing the wrapper (101) around the loose material (102);
 - a cutting head (8) for cutting the continuous rod (CR) into multi-segment filter rods;

characterized in that:

 - the garniture device (6) is the device according to any of claims 1 to 6, wherein the transition section (9c) of the duct (9) of the garniture device is located at least partially between the filling unit (103) for supplying the loose material (102) and the upper garniture part (11).

8. The machine according to claim 7 **characterized in that** a difference of dimension of the first greater diameter (D1) of the garniture duct (9) and the second smaller diameter (D2) of the garniture device (9) is not greater than an average grain size of the loose material (102). 5
9. The machine according to any of claims 7 to 8 **characterized in that** between the filling unit (103) for supplying the loose material and the upper garniture part (11) there is located a cleaning unit (104) for removing contaminations of the loose material from the rod-like elements, comprising at least one suction element (12) for receiving contaminations of the loose material and covering elements (10) displaceable to positions in which the covering elements (10) at least partially cover compartments (3) filled with the loose material (102) between the rod-like elements (S1, S2) during the movement of the train (ST2) in a vicinity of the suction element (12). 10
10. The machine according to any of claims 7 to 9 **characterized in that** the transition section (9c) is located between the filling unit (103) for supplying the loose material and the cleaning unit (104). 15
11. The machine according to any of claims 7 to 9 **characterized in that** the transition section (9c) is located within the covering elements (10). 20
12. The machine according to any of claims 7 to 11 **characterized in that** the covering elements (10) are adapted to be located in a position in which a pressing surface (10a) of the covering elements (10) is lowered with respect to the upper surface of the rod-like elements (S1, S2). 25
13. The machine according to any of claims 7 to 12 **characterized in that** the pressing surface (10a) of the covering elements (10) is lowered in the range of up to 1% of height of the rod-like elements (S1, S2). 30
14. A method for manufacturing multi-segment filter rods, **characterized by**: 35
- arranging rod-like elements (S1, S2) longitudinally along an axis, in a spaced-apart relationship, in a train on a wrapper (101) located on a garniture belt (5);
 - supplying a loose material (102) to compartments (3) located between the rod-like elements (S1, S2);
 - decreasing a volume of the compartments (3) located between the segments (S1, S2), wherein the compartments (3) are partially filled with the loose material (102);
 - applying glue to the wrapper (101) and wrapping the wrapper around the rod-like elements

(S1, S2) and the loose material (102) located in the compartments (3) between the rod-like elements (S1, S2) in order to form a continuous filter rod (CR1); and
- cutting the continuous filter rod (CR1) into multi-segment filter rods (R).

15. The method for manufacturing multi-segment filter rods in which the rods are formed by means of the machine according to any of claims 7 to 13.

Amended claims in accordance with Rule 137(2) EPC.

1. A garniture device (6) for a machine used in tobacco industry for manufacturing a continuous rod (CR) comprising a loose material wrapped with a wrapper (101), wherein the garniture device (6) comprises:
- a lower garniture part (7);
 - a garniture duct (9) formed in the lower garniture part (7);
 - a garniture belt (5) movable in the garniture duct (9) for transporting the wrapper (101) along the garniture duct (9);
 - an upper garniture part (11) comprising forming parts (11a) for forming the wrapper (101) around the loose material (102);
 - wherein the garniture duct (9) comprises:
 - an inlet part for transforming the garniture belt (5) from a flat configuration into a U-shaped configuration;
 - a U-shaped part for guiding the garniture belt (5) in the U-shaped configuration;
- characterized in that:**
- the garniture duct (9) further comprises an outlet part for transforming the garniture belt (5) from the U-shaped configuration into the flat configuration; and
 - the U-shaped part (4) of the garniture duct (9) comprises, at the side of the inlet part, a first section (9a) having a first diameter (D1) and, at the side of the outlet part, a second section (9b) having a second diameter (D2) being smaller than the first diameter (D1), wherein the first section (9a) is connected to the second section (D2) by a transition section (9c) having a surface of a variable diameter.
2. The garniture device according to claim 1 **characterized in that** the transition section (9c) has a conical surface.

3. The garniture device according to any of claims from 1 to 2 **characterized in that** the first section (9a) and the second section (9b) are arranged coaxially with respect to each other.
4. The garniture device according to any of claims from 1 to 2 **characterized in that** generating lines of the first section (9a), of the transition section (9c) and of the second section (9b) are located on a common plane (Z).
5. The garniture device according to any of claims from 1 to 4 **characterized in that** the length of the transition section (4) is equal from 30 to 100mm, preferably from 50 to 80mm.
6. The garniture device according to any of claims from 1 to 5 **characterized in that** the second diameter (D2) is from 1 to 5% smaller than the first diameter (D1), preferably from 2.5 to 3% smaller.
7. A machine used in tobacco industry for manufacturing multi-segment filter rods, comprising:
 - a garniture device (6);
 - a feeding unit (2) for arranging, longitudinally along an axis in a spaced-apart relationship, rod-like elements (S1, S2) in a train on a wrapper (101) transported on a garniture belt (5) of the garniture device (6);
 - a filling unit (103) for supplying a loose material (102) to compartments (3) between the rod-like elements (S1, S2);
 - a glue nozzle (6a) for gluing the wrapper (101) around the loose material (102);
 - a cutting head (8) for cutting the continuous rod (CR) into multi-segment filter rods; **characterized in that:**
 - the garniture device (6) is the device according to any of claims 1 to 6, wherein the transition section (9c) of the duct (9) of the garniture device is located at least partially between the filling unit (103) for supplying the loose material (102) and the upper garniture part (11).
8. The machine according to claim 7 **characterized in that** a difference of dimension of the first greater diameter (D1) of the garniture duct (9) and the second smaller diameter (D2) of the garniture device (9) is not greater than an average grain size of the loose material (102).
9. The machine according to any of claims 7 to 8 **characterized in that** between the filling unit (103) for supplying the loose material and the upper garniture part (11) there is located a cleaning unit (104) for removing contaminations of the loose material from the rod-like elements, comprising at least one suction element (12) for receiving contaminations of the loose material and covering elements (10) displaceable to positions in which the covering elements (10) at least partially cover compartments (3) filled with the loose material (102) between the rod-like elements (S1, S2) during the movement of the train (ST2) in a vicinity of the suction element (12).
10. The machine according to any of claims 7 to 9 **characterized in that** the transition section (9c) is located between the filling unit (103) for supplying the loose material and the cleaning unit (104).
11. The machine according to any of claims 7 to 9 **characterized in that** the transition section (9c) is located within the covering elements (10).
12. The machine according to any of claims 7 to 11 **characterized in that** the covering elements (10) are adapted to be located in a position in which a pressing surface (10a) of the covering elements (10) is lowered with respect to the upper surface of the rod-like elements (S1, S2).
13. The machine according to any of claims 7 to 12 **characterized in that** the pressing surface (10a) of the covering elements (10) is lowered in the range of up to 1% of height of the rod-like elements (S1, S2).
14. A method for manufacturing multi-segment filter rods, **characterized by:**
 - arranging rod-like elements (S1, S2) longitudinally along an axis, in a spaced-apart relationship, in a train on a wrapper (101) located on a garniture belt (5);
 - supplying a loose material (102) to compartments (3) located between the rod-like elements (S1, S2);
 - decreasing a volume of the compartments (3) located between the segments (S1, S2), wherein the compartments (3) are partially filled with the loose material (102);
 - applying glue to the wrapper (101) and wrapping the wrapper around the rod-like elements (S1, S2) and the loose material (102) located in the compartments (3) between the rod-like elements (S1, S2) in order to form a continuous filter rod (CR1); and
 - cutting the continuous filter rod (CR1) into multi-segment filter rods (R).
15. The method for manufacturing multi-segment filter rods in which the rods are formed by means of the machine according to any of claims 7 to 13.

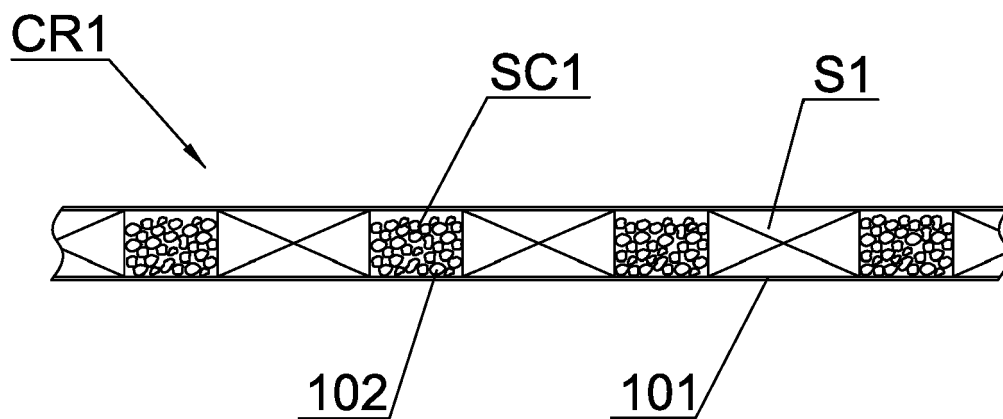


Fig. 1

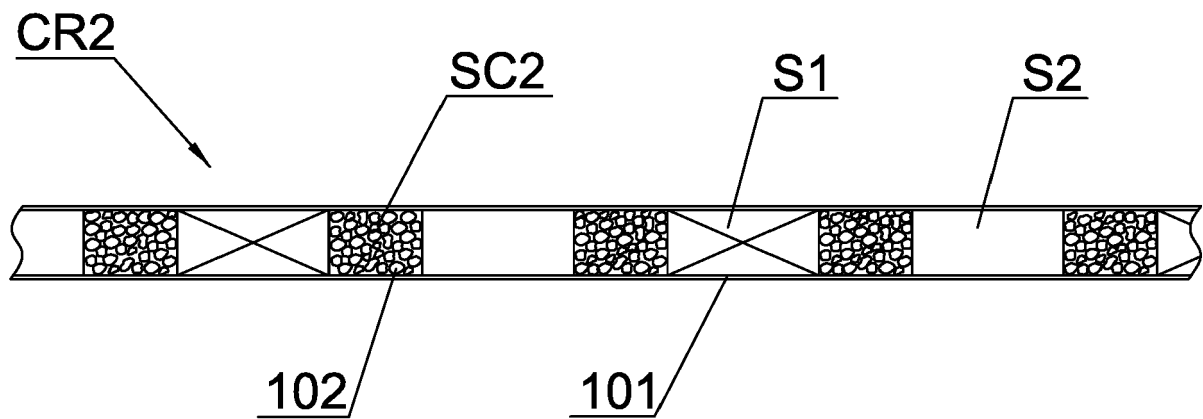


Fig. 2

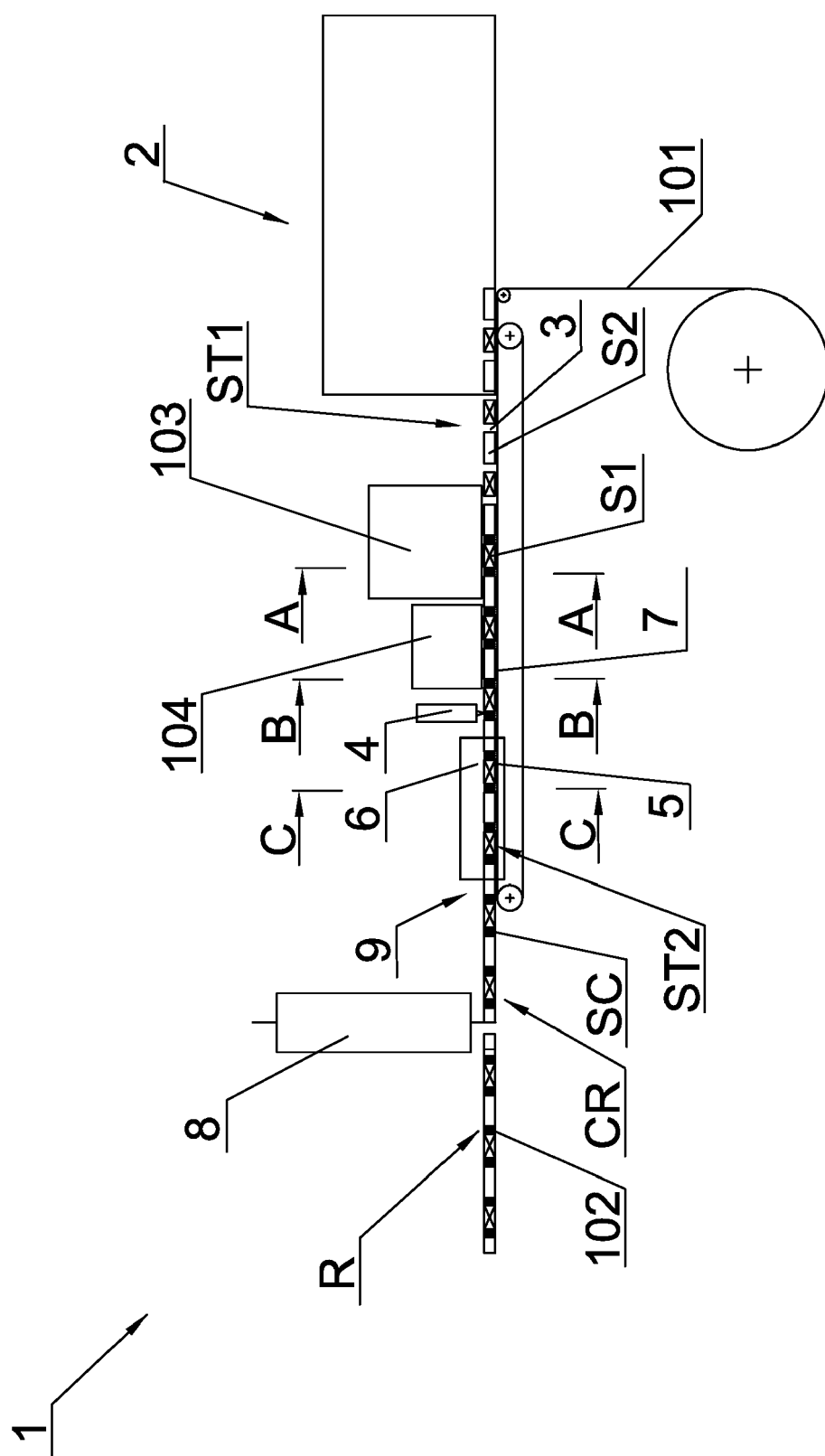


Fig. 3

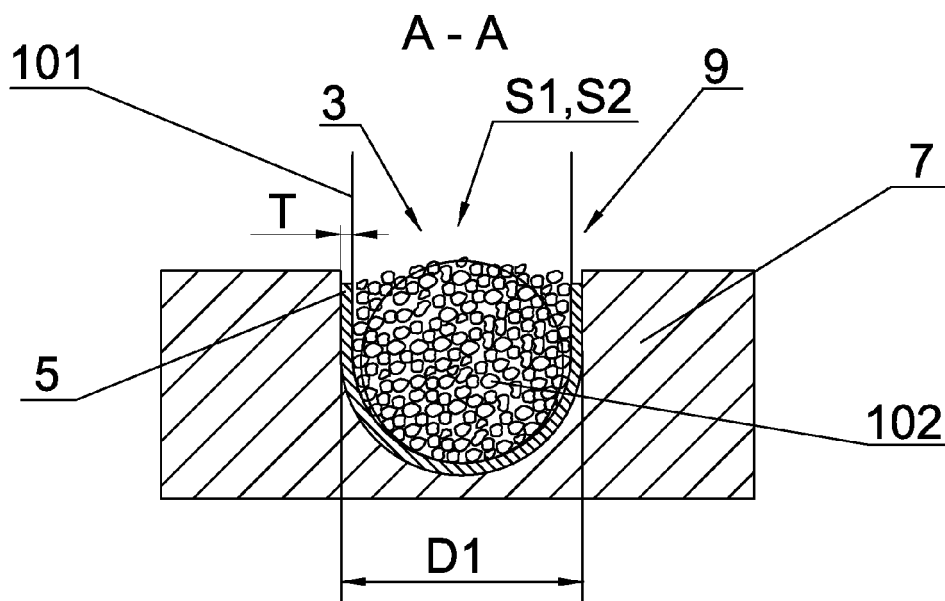


Fig. 4

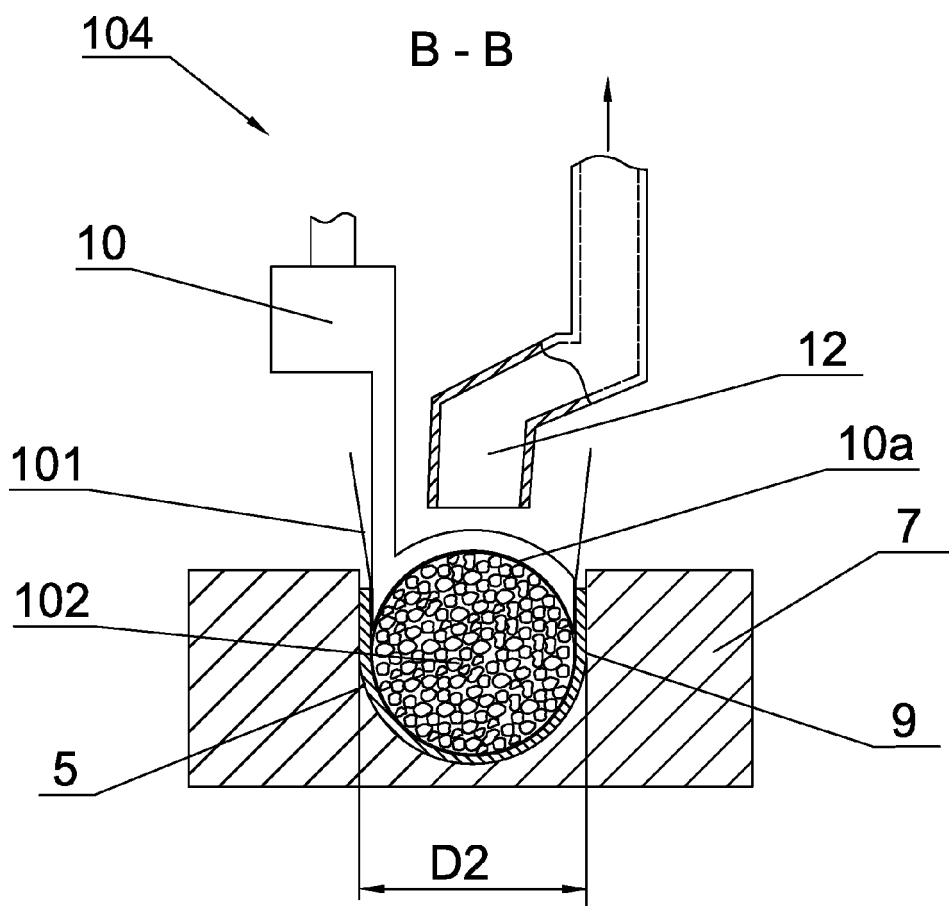


Fig. 5

B - B

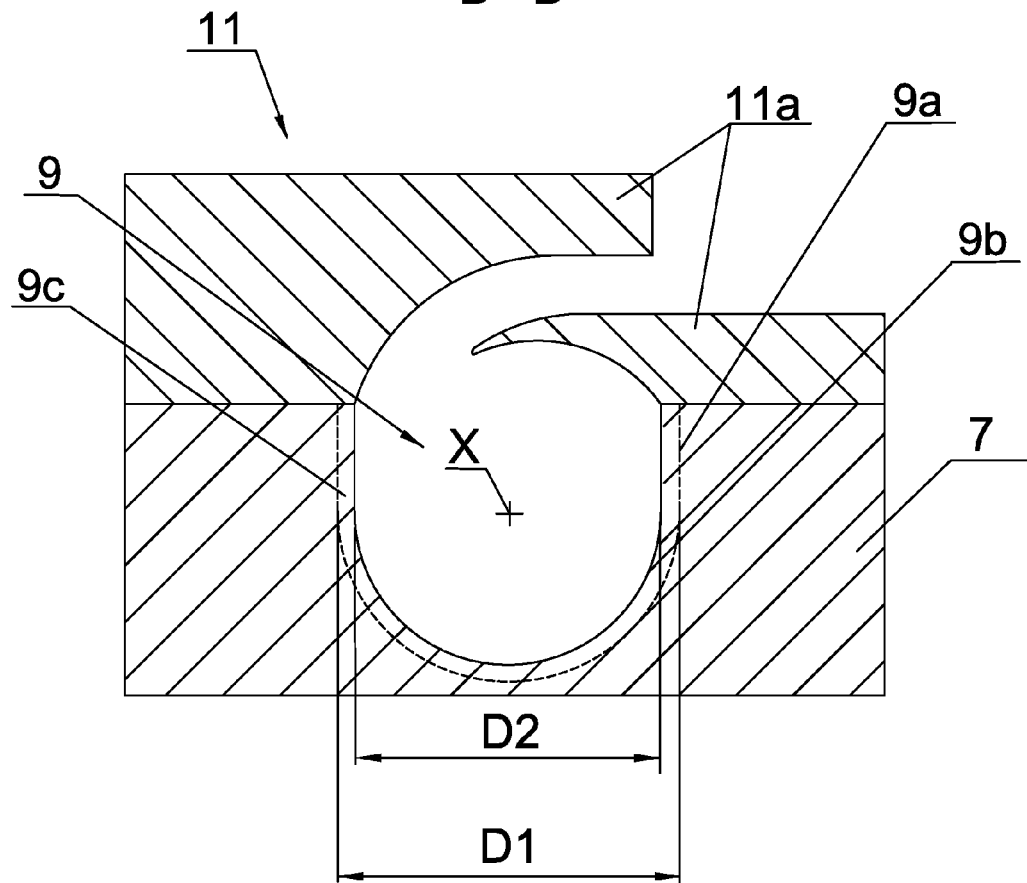


Fig. 6

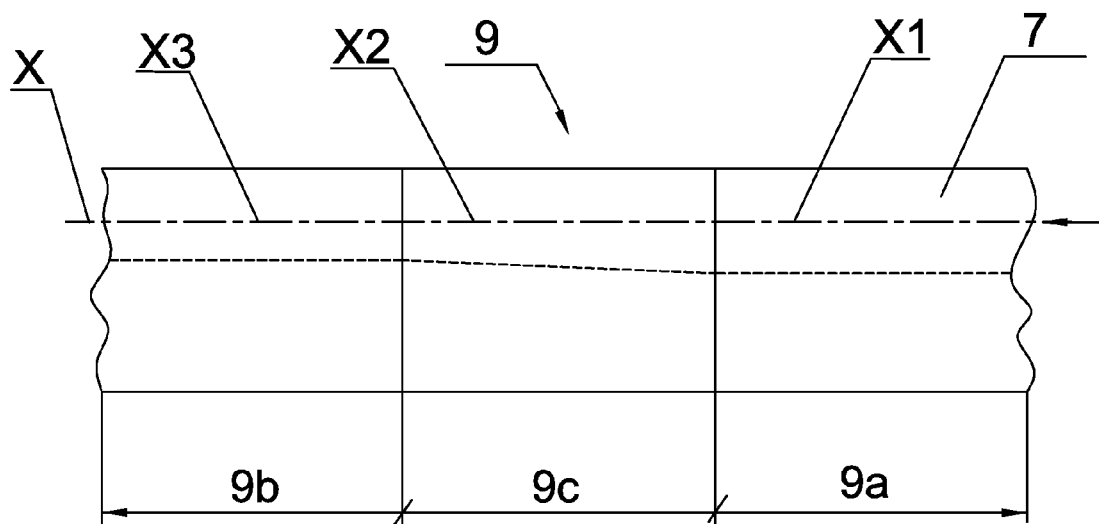


Fig. 7

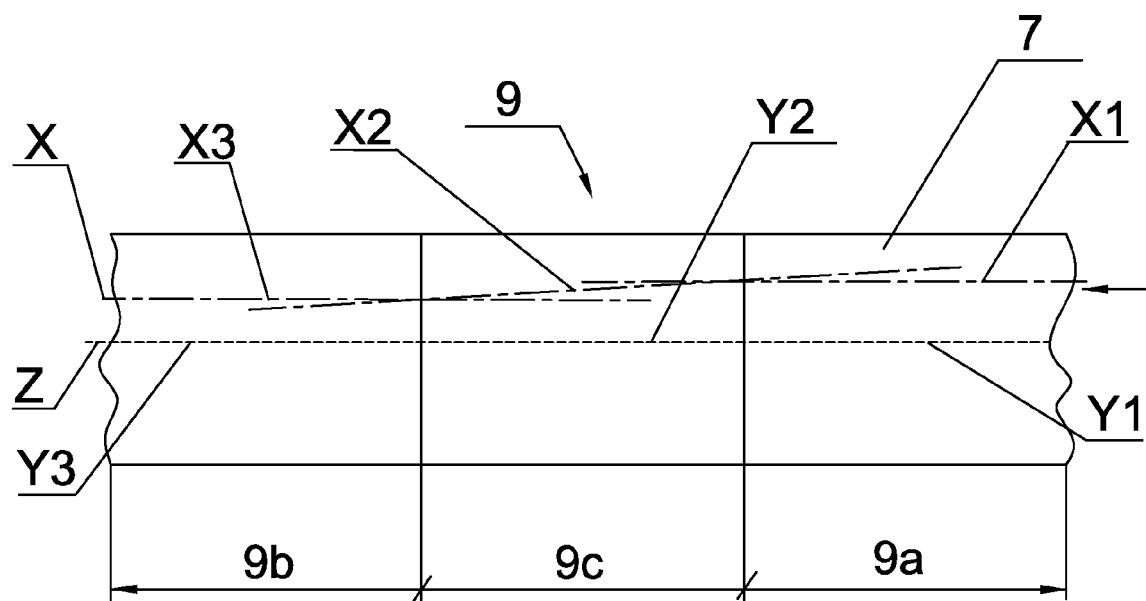


Fig. 8

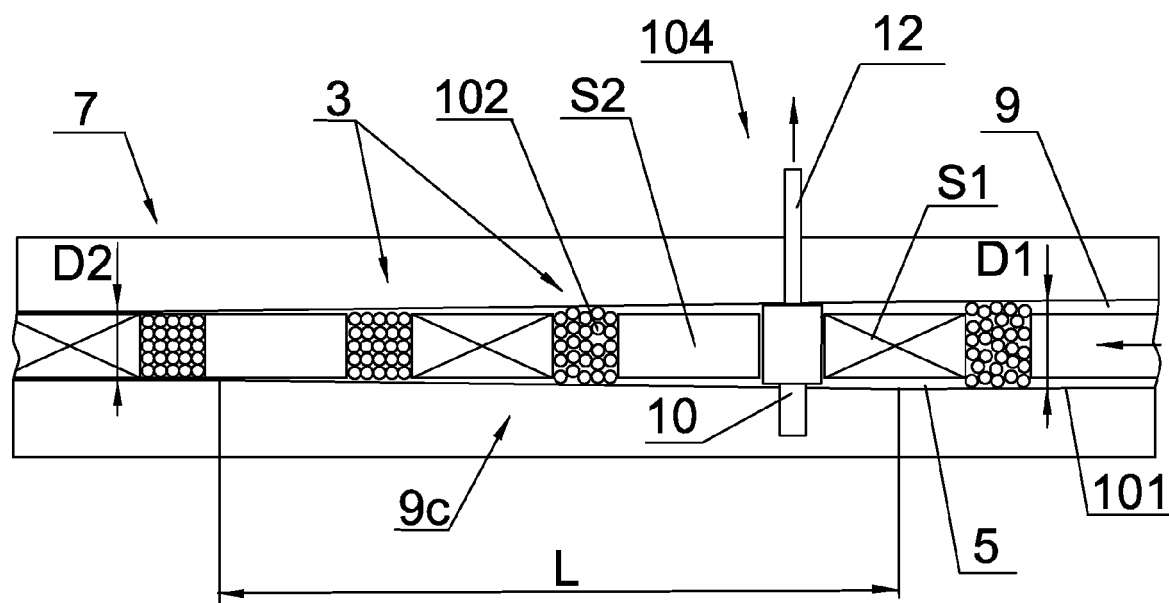


Fig. 9

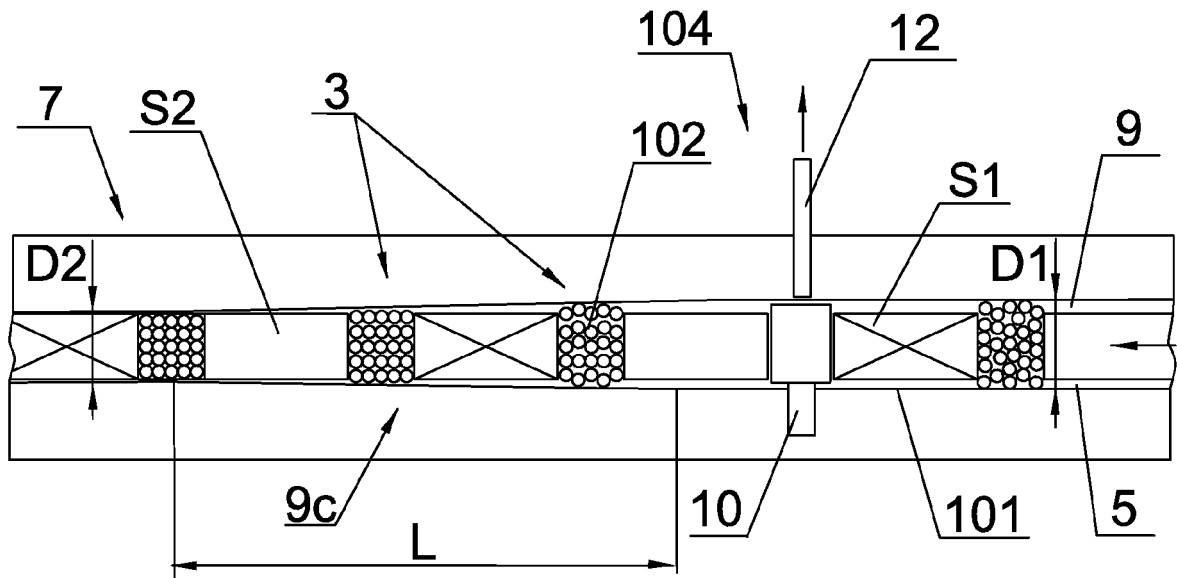


Fig. 10

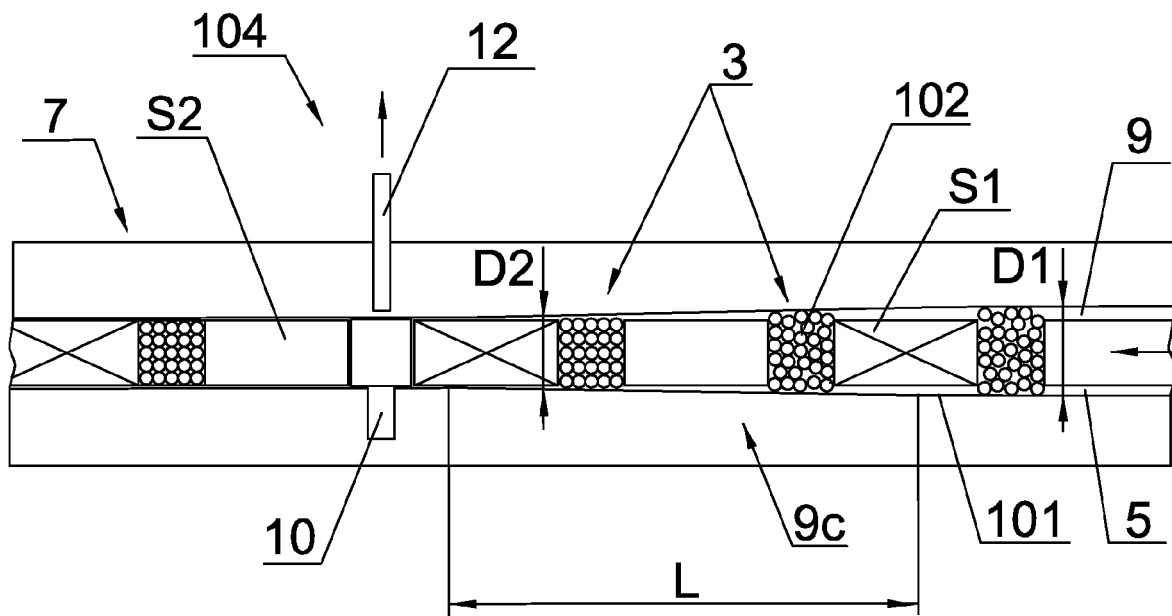


Fig. 11

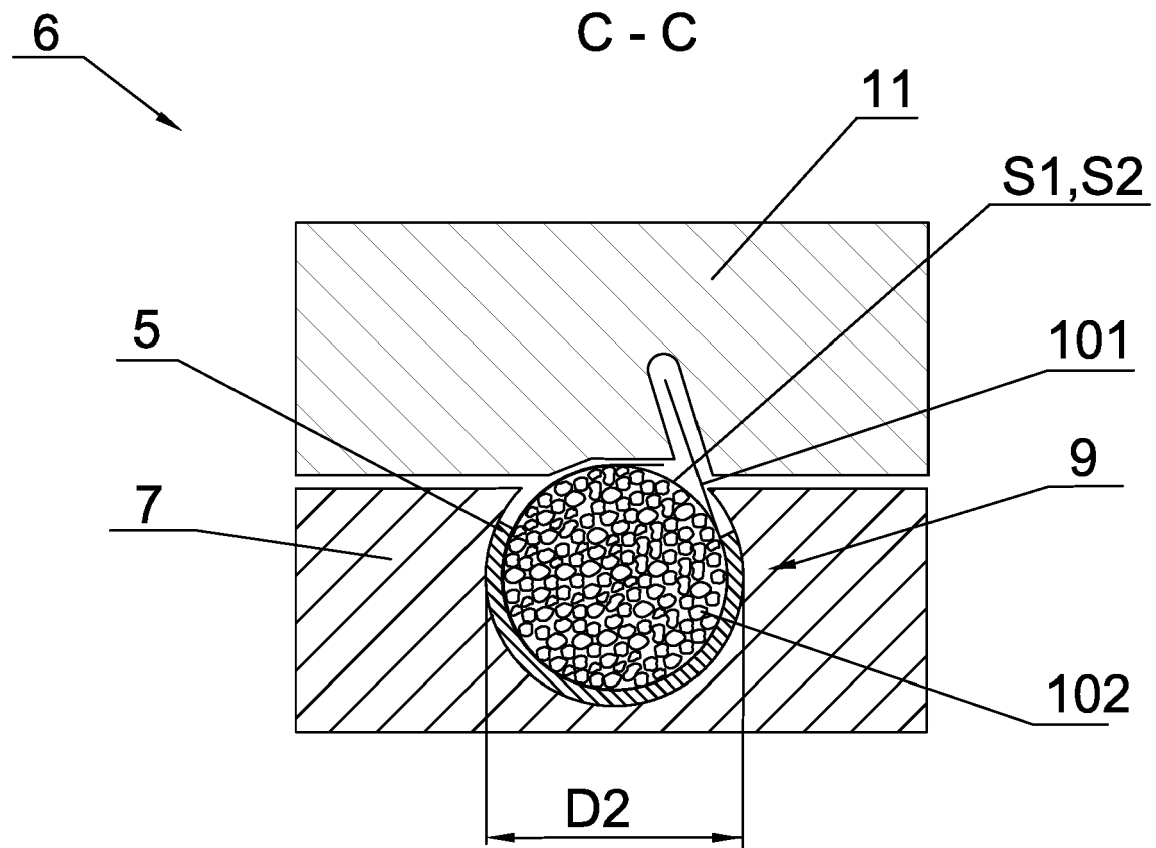


Fig. 12



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Place of search Munich		Date of completion of the search 26 April 2017	Examiner Schwertfeger, C
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