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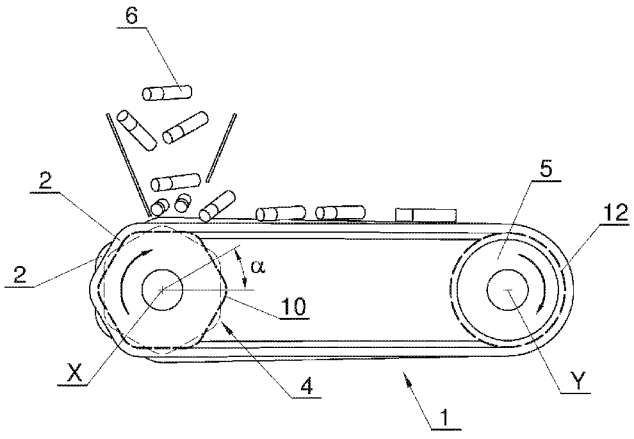


Fig. 7

(57) Abstract: Conveyor device for linearly arranging rod-like elements, in particular cigarettes, comprising a multi-belt conveyor, the endless belt of the conveyor being extended between an input roller and an output roller, in which the belt (1) of the conveyor comprises a plurality of separate adjoining belts (2, 2', 2", 2'"), the input roller (4, 4') having a circumferential surface (3) of a shape forcing the adjoining belts (2, 2', 2'',2'") to go up and down alternately on the said roller during its rotation, and the output roller (5) having a circumferential surface (7) of a shape enforcing the up and down movement of the adjoining belts to cease on said roller during its rotation. Method of linearly arranging rod-like elements, in particular cigarettes, and the use of the conveyor device according to the invention in a device for reclaiming tobacco from the cigarette waste.

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CONVEYOR DEVICE AND METHOD FOR ALIGNING ROD-LIKE ELEMENTS AND THE USE OF THE CONVEYOR DEVICE

The invention relates to a conveyor device and a method for linearly arranging rod-like elements, in particular cigarettes.

The invention also relates to the use of the conveyor device for linearly arranging rod-like elements.

The invention may be applied for example to cigarettes constituting cigarette waste which are conveniently aligned while being conveyed for technological reasons in a machine for reclaiming tobacco. A known method of preparing cigarettes for tobacco reclamation consists in incising the cigarette paper cover by means of disc blades along the cigarette axis, the cigarettes being linearly moved along their axis under the rotating blades. This method requires the conveyed cigarettes to be linearly arranged.

Document DE 15 32 219 presents a device for reclaiming tobacco, in which the lower part of the cigarette chute is a grooved plate. The plates of a vibratory transporter located under the chute for feeding cigarettes towards the opening unit are also grooved. Elements for directing the cigarettes which are slanted against the grooves are provided on said plates above the grooves and on the ribs separating the grooves the in order to arrange them along the grooves.

Document US 3,665,931 also discloses a grooved chute, on which waste cigarettes are dropped and from which the cigarettes are transferred to further units of the machine. The ribs limiting the grooves are made in two heights; every other rib is of the same height, that is, each groove is limited by two ribs of different heights. Such design of the

chute ensures arranging the cigarettes along the grooves of the chute.

The disadvantages of the known solutions include complicated design, the fact that they are bulky, and the accumulation of dirt in the form of tobacco particles on the working surfaces of the grooves.

The conveyor device according to the invention is used for linearly arranging the conveyed rod-like elements, in particular cigarettes and it comprises a multi-belt conveyor the endless belt of which is extended between an input roller and an output roller.

The device according to the invention is characterised in that the belt of the multi-belt conveyor comprises a plurality of separate adjoining belts, the input roller having a circumferential surface of a shape forcing the adjoining belt to go up and down alternately on said roller during its rotation, and the output roller having a circumferential surface of a shape enforcing the up and down movement of the adjoining belts to cease on said roller during its rotation.

The cross section of each belt preferably has a polygon-like shape, most preferably a pentagon shape, its lower side contacting the circumferential surface of the rollers.

The cross section of each belt may also have a rounded shape, preferably a circular shape.

In an embodiment of the invention, the cross section of each belt comprises an inverted "V" constituting the upper working part of that cross section, the remaining lower part of the cross section of each belt being in contact with the circumferential surface of the rollers.

Preferably, the circumferential surface of the input roller comprises a plurality of circumferential adjoining grooves, in which the separate belts forming the multi-belt of the conveyor are located. The periphery of each groove, as projected onto a surface perpendicular to the input roller axis, has a shape of a polygon with rounded apexes, the apexes of peripheries of the adjoining grooves being offset with respect to one another by a certain angle. The circumferential surface of the output roller comprises a plurality of circumferential adjoining grooves, in which separate belts forming the multi-belt conveyor are located. The peripheries of all the grooves, as projected onto a surface perpendicular to the output roller axis, have identical circular shapes.

The said polygons are preferably identical regular polygons with rounded apexes.

The input roller can consist of a plurality of disc elements mounted on a common axis in such a way that they co-operate tightly with one another forming the input roller, the circumferential surface of the input roller comprising a plurality of circumferential adjoining grooves, the periphery of each disc element having the shape of a polygon with rounded apexes, the apexes of peripheries of the adjoining grooves being offset with respect to one another by a certain angle. The circumferential surface of the output roller comprises a plurality of circumferential adjoining grooves in which the separate belts forming the multi-belt of the conveyor are located. The peripheries of all the grooves, as projected onto a surface perpendicular to the output roller axis, have identical circular shapes.

The method according to the invention of linearly arranging rod-like elements, in particular cigarettes, in

which the rod-like elements are conveyed on a multi-belt conveyor, the endless belt of the conveyor being extended between an input roller and an output roller, is characterised in that the rod-like elements are conveyed on the belt of the conveyor comprising a plurality of separate adjoining belts, the adjoining belts being forced to go up and down alternately on the input roller during its rotation, and the adjoining belts being forced to cease the up and down movement on the output roller during its rotation.

Preferably, the rod-like elements are conveyed on the belts having a cross section similar to a polygon, preferably a pentagon, the lower side of which contacting the circumferential surface of the rollers.

Optionally, the rod-like elements are conveyed on the belts having a rounded cross section, preferably a circular shape cross section.

In an embodiment of the method according to the invention, the rod-like elements are conveyed on the belts having a cross section comprising an inverted "V" constituting the upper working part of that cross section, the remaining lower part of the cross section of each belt contacting the circumferential surface of the rollers.

Preferably an input roller is used having a circumferential surface comprising a plurality of circumferential adjoining grooves, in which the separate belts forming the multi-belt of the conveyor are located. The periphery of each groove, as projected onto a surface perpendicular to the input roller axis, has a shape of a polygon with rounded apexes, the apexes of peripheries of the adjoining grooves being offset with respect to one another by a certain angle. The circumferential surface of

the output roller comprises a plurality of circumferential adjoining grooves, in which separate belts forming the multi-belt conveyor are located. The peripheries of all the grooves, as projected onto a surface perpendicular to the output roller axis, have identical circular shapes.

The invention also relates to the use of a conveyor device for linearly arranging rod-like elements, in particular cigarettes, in a device for reclaiming tobacco from the cigarette waste.

The advantage of the invention lies in the fact that it enables to linearly arrange the rod-like elements on a small area and that no dirt e.g. in form of tobacco particles accumulates on the belt working surfaces.

The subject of the invention is shown in the embodiments in a drawing, in which:

Figs. 1-5 schematically show subsequent positions of an exemplary cigarette with respect to the belts of the multi-belt conveyor;

Fig. 6 shows alternative cross sections of the belts of the multi-belt conveyor;

Fig. 7 shows a side view of the multi-belt conveyor of the device according to the invention in the first embodiment, with the belts in an exemplary position with respect to one another on the input roller;

Fig. 8 shows a side view of the multi-belt conveyor of the device according to the invention in the first embodiment, where the belts are in another exemplary position with respect to one another on the input roller;

Fig. 9 shows a side view of the multi-belt conveyor of the device according to the invention in the second embodiment, where the belts are in an exemplary position with respect to one another on the input roller;

Fig. 10 shows a side view of the multi-belt conveyor of the device according to the invention in the second embodiment with the belts in another exemplary position with respect to one another on the input roller;

Fig. 11a shows a cross section along the axis of the input roller of the device according to the invention in the first embodiment;

Fig. 11b shows a cross section along the axis of the input roller of the device according to the invention in the first embodiment with an alternative shape of the belts cross section;

Fig. 12a shows a cross section along the axis of the input roller of the device according to the invention in the second embodiment;

Fig. 12b shows a cross section along the axis of the input roller of the device according to the invention in the second embodiment with another alternative shape of the belts cross section;

Fig. 13a shows a cross section along the axis of the output roller of the device according to the invention;

Fig. 13b shows a cross section along the axis of the output roller of the device according to the invention with another alternative shape of the belts cross section.

The cigarettes constituting production waste are fed into the device according to the invention and put on the multi-belt conveyor having and endless belt 1 formed of a plurality of belts 2, 2′ or 2″. The belts may have various cross sections, for example polygonal, rounded, circular. The belts, positioned next to one another, form together the grooves for cigarettes, i.e. a groove is formed by the upper surfaces of two adjoining belts. In the input zone of the multi-belt conveyor, where the waste is fed, the adjoining

belts are alternately lifted and lowered on the input roller 4, 4′, which results in positioning the upper surfaces of the belts so as to enforce the downward movement of the cigarettes starting from the upper surfaces of the lifted belts. While falling down, the cigarettes position themselves aligned in the cavities formed by the surfaces of the adjoining belts moving in the grooves 8, 8′. All the belts 2, 2′ or 2″, forming the multi-belt conveyor 1 are driven by the output roller 5, situated in the output zone of the conveyor 1, in which the cigarettes can be perforated or transferred to a perforating unit.

Figs.1-5 schematically show how a cigarette 6 is being positioned on the multi-belt conveyor consisting of, for example, a plurality of polygonal belts 2 as it travels between the input roller 4, 4′ - fig. 1 and the output roller 5 - fig. 5. It can be seen that the cigarette, being tossed in a disordered way on the input roller 4, 4′, positions itself along the belts on the output roller 5.

Fig. 6 shows alternative cross sections of the belts, for example rounded, having a shape of a drop or a circular shape.

Fig. 7 shows a side view of the multi-belt conveyor 1 in the first embodiment, where the belts are in the first position with respect to one another on the input roller. This figure shows the input roller 4, the output roller 5 and the belt of the conveyor 1 extending between them and consisting of many belts 2. Peripheries 10 of the subsequent grooves formed on the circumferential surface of the input roller 4 and the peripheries 12 of grooves formed on the circumferential surface of the output roller are visible. The peripheries 10 have a shape of polygons with rounded apexes, the apexes of the peripheries of the subsequent

grooves being offset by one another by the angle α. The bold dotted line on fig. 7 shows the periphery of the first visible groove and the thin dotted line shows the periphery of one of the subsequent grooves 8 on the input roller 4. The peripheries 12 are circles.

Fig. 8 shows a view of the embodiment of the conveyor shown in fig. 7, but in a different moment, i.e., when the rollers have rotated by a certain angle, resulting of which the subsequent belts 2 have reached respective different positions (the belts have been lifted or lowered).

Fig. 9 and 10 show views similar to those in fig. 7 and fig. 8, but in case of the device according to the second embodiment of the invention. In the second embodiment, the input roller 4′ consists of a plurality of disc elements 9 mounted on a common axis X′.

A cross section of the roller 4 is shown in fig. 11a and fig. 11b. As it can be seen, the periphery of the roller 4 comprises a plurality of adjoining circumferential grooves 8, in which the separate belts 2 or belts 2′ are respectively located, forming the multi-belt conveyor 1.

On the other hand, in fig. 12a and fig. 12b a cross section of the input roller 4′ is shown, consisting of a plurality of co-operating disc elements 9 which form the input roller. Therefore, the circumferential surface 3 of the input roller 4′ is the same as it is in case of the roller 4 in the first embodiment, that is, it also comprises a plurality of adjoining grooves 8′, whereas the periphery 10′ of each of the disc elements 9, as in the first embodiment, has a shape of a polygon with rounded apexes, and the apexes of the periphery 10′ of the adjoining grooves are offset with respect to one another by the angle α.

In fig. 13a and fig.13b a cross section is shown of the output roller 5, identical in both embodiments, the periphery of which being indicated by number 7.

As it can be seen in figs. 11a, 11b, 12a, 12b as well as 13a and 13b, the shapes of the cross sections of the respective grooves 8, 8′ forming the circumferential surface 3 of the input roller 4 or 4′ have been adjusted to match the shape of the cross section of the belts 2, 2′ or 2″.

The device according to the invention is applicable, for example, in the device for reclaiming tobacco from the cigarette waste.

Patent claims

1. Conveyor device for linearly arranging rod-like elements, in particular cigarettes, comprising a multi-belt conveyor, the endless belt of which is extended between an input roller and an output roller, characterized in that the belt (1) of the conveyor comprises a plurality of separate adjoining belts (2, 2', 2", 2'"), the input roller (4, 4') having a circumferential surface (3) of a shape forcing the adjoining belts (2, 2', 2'',2"') to go up and down alternately on the said roller during its rotation, and the output roller (5) having a circumferential surface (7) of a shape enforcing the up and down movement of the adjoining belts to cease on said roller during its rotation.
2. Conveyor device according to claim 1, in which the cross section of each belt (2) has a polygon-like shape, most preferably a pentagon shape, the lower side of the polygon contacting the circumferential surface of the rollers.
3. Conveyor device according to claim 1, in which the cross section of each belt may also have a rounded shape (2'), preferably a circular shape (2").
4. Conveyor device according to claim 1 or 2, in which the cross section of each belt (2) comprises an inverted "V" constituting the upper working part of that cross section, the remaining lower part of the cross section of each belt contacting the circumferential surface of the rollers.
5. Conveyor device according to claim 1, in which the circumferential surface (3) of the input roller (4)

comprises a plurality of circumferential adjoining grooves (8), in which the separate belts (2, 2', 2'',2"') forming the multi-belt conveyor (1) are located, the periphery (10) of each groove, as projected onto a surface perpendicular to the input roller axis (X), having a shape of a polygon with rounded apexes, the apexes of peripheries (10) of the adjoining grooves being offset with respect to one another by an angle (α), the circumferential surface (7) of the output roller (5) comprising a plurality of circumferential adjoining grooves (11), in which separate strips (2, 2', 2'',2"') forming the multi-belt conveyor (1) are located, the peripheries (12) of all the grooves, as projected onto a surface perpendicular to the output roller axis (Y) have identical circular shapes.

6. Conveyor device according to claim 5, in which the said polygons are identical regular polygons with rounded apexes.

7. Conveyor device according to claim 1, in which the input roller (4') consists of a plurality of disc elements (9) mounted on a common axis (X')in such a way, that they co-operate tightly with one another forming the input roller, the circumferential surface (3) of the input roller comprising a plurality of circumferential adjoining grooves (8'), the periphery (10') of each disc element (9) having the shape of a polygon with rounded apexes and the apexes of the peripheries (10') of the adjoining grooves being offset with respect to one another by an angle (α), the circumferential surface (7) of the output roller (5) comprising a plurality of circumferential adjoining grooves (11), in which the separate belts (2, 2', 2'') forming the multi-belt

conveyor (1) are located, the peripheries (12) of all the grooves, as projected onto a surface perpendicular to the output roller axis (Y), having identical circular shapes.

8. Method of linearly arranging rod-like elements, in particular cigarettes, in which the rod-like elements are conveyed on a multi-belt conveyor, the endless belt of the multi-belt conveyor being extended between an input roller and an output roller, characterised in that the rod-like elements are conveyed on the belt of the conveyor (1) comprising a plurality of separate adjoining belts (2, 2', 2'',2"') the adjoining belts (2, 2', 2'',2"') being forced to go up and down alternately on the input roller (4, 4') during its rotation, and the adjoining belts (2, 2', 2'',2"') being forced, on the output roller (5) during its rotation, to cease the up and down movement.
9. Method according to claim 8, in which the rod-like elements are conveyed on the belts (2) having a cross section similar to a polygon, preferably a pentagon, the lower side of which contacts the circumferential surface of the rollers.
10. Method according to claim 8, in which the rod-like elements are conveyed on the belts (2') having a rounded cross section, preferably a circular shape cross section (2").
11. Method according to claim 8, in which the rod-like elements are conveyed on the belts (2) having a cross section comprising an inverted "V" constituting the upper working part of that cross section, the remaining lower part of the cross section of each belt contacting the circumferential surface of the rollers.

12. Method according to claim 8, in which an input roller (4, 4') is used having a circumferential surface (3) comprising a plurality of circumferential adjoining grooves (8), in which the separate belts (2, 2', 2'',2"') forming the multi-belt conveyor (1) are located, the periphery (10, 10') of each groove, as projected onto a surface perpendicular to the input roller axis (X, X'), having a shape of a polygon with rounded apexes, the apexes of the peripheries (10, 10') of the adjoining grooves being offset with respect to one another by an angle (α), the circumferential surface (7) of the output roller (5) comprising a plurality of circumferential adjoining grooves (11), in which separate strips (2) forming the multi-belt conveyor (1) are located, the peripheries (12) of all the grooves as projected onto a surface perpendicular to the output roller axis (Y) have identical circular shapes.
13. Use of a conveyor device according to any of claims 1-7, for linearly arranging rod-like elements, in particular cigarettes, in a device for reclaiming tobacco from the cigarette waste.

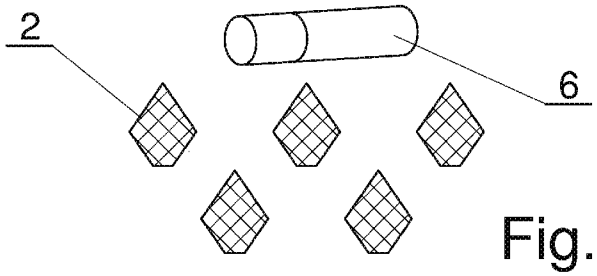


Fig. 1

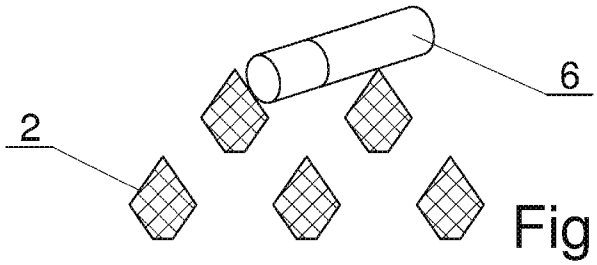


Fig. 2

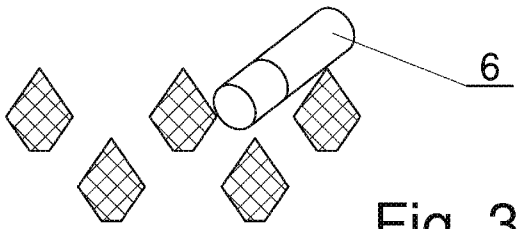


Fig. 3

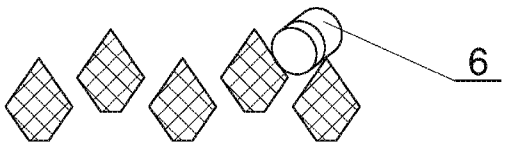


Fig. 4

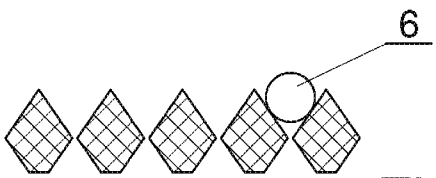


Fig. 5

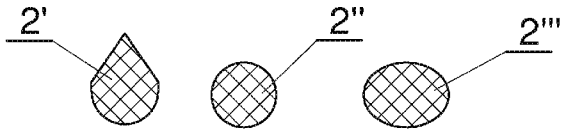


Fig. 6

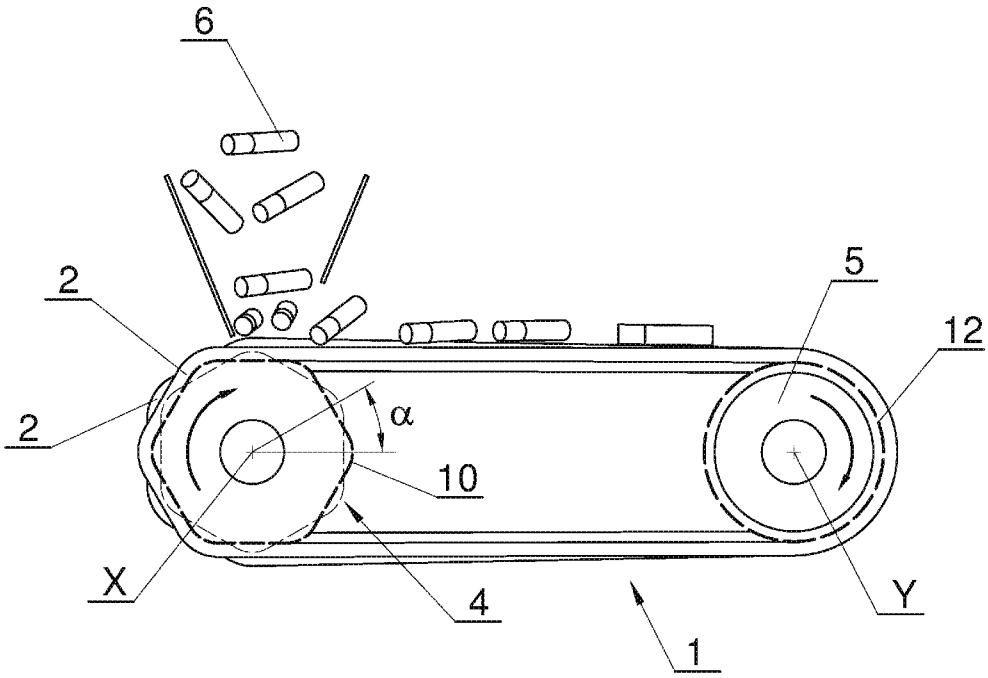


Fig. 7

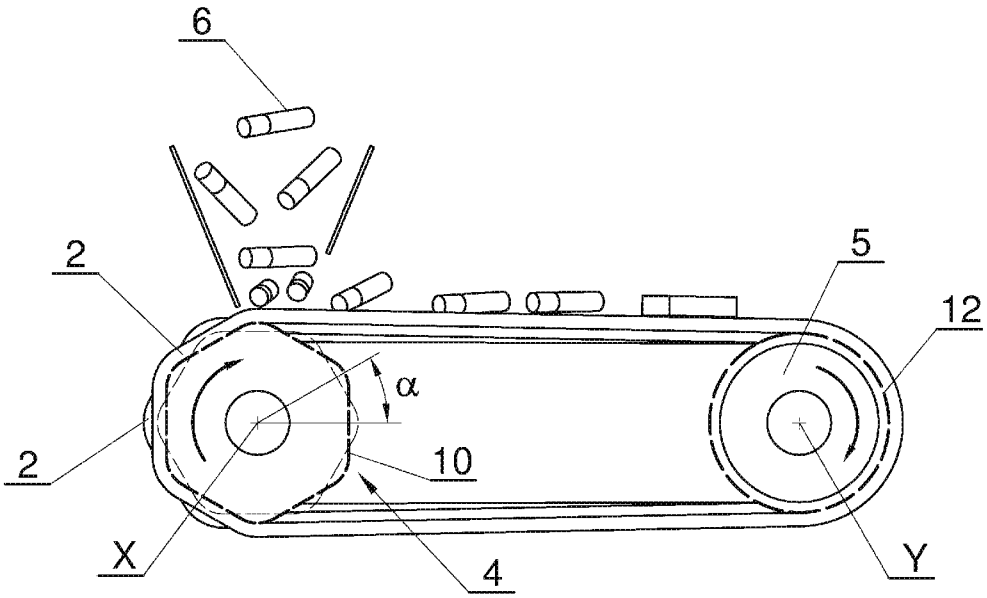


Fig. 8

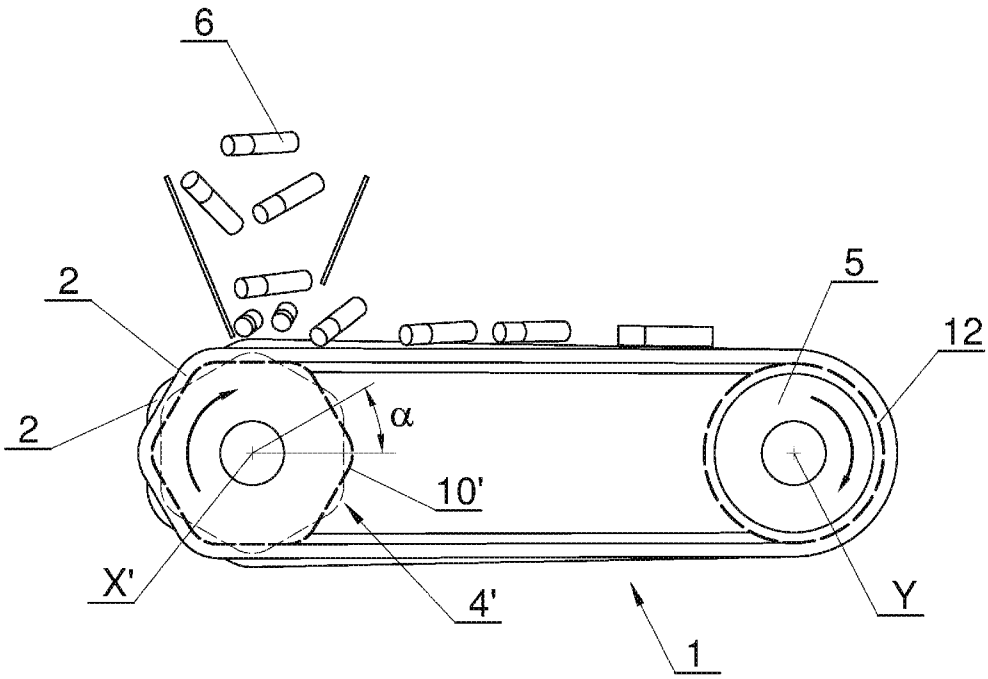


Fig. 9

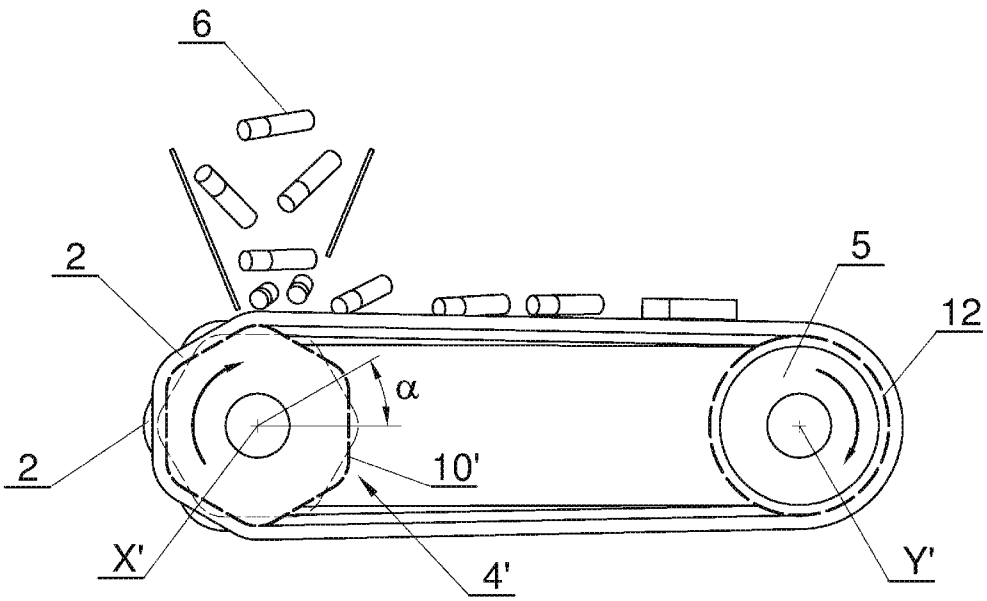


Fig. 10

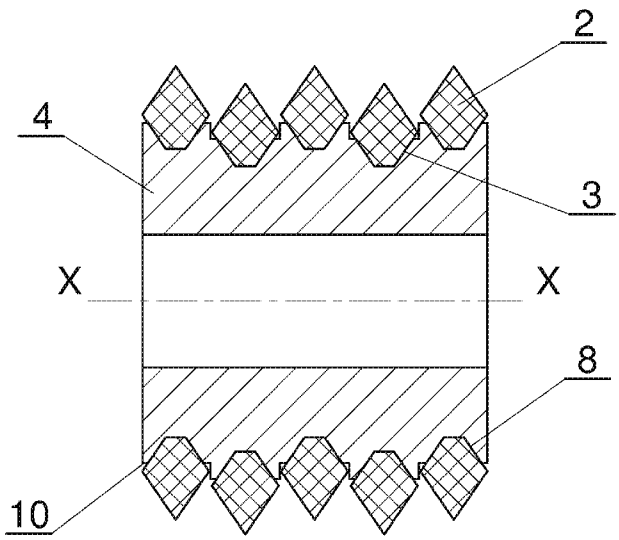


Fig. 11a

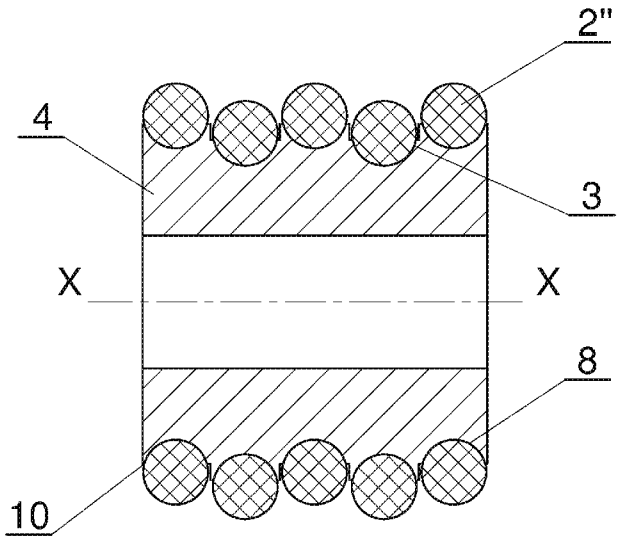


Fig. 11b

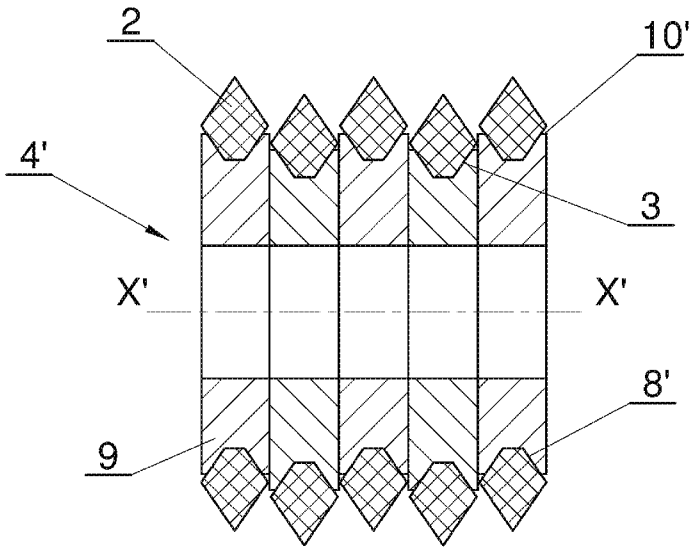


Fig. 12a

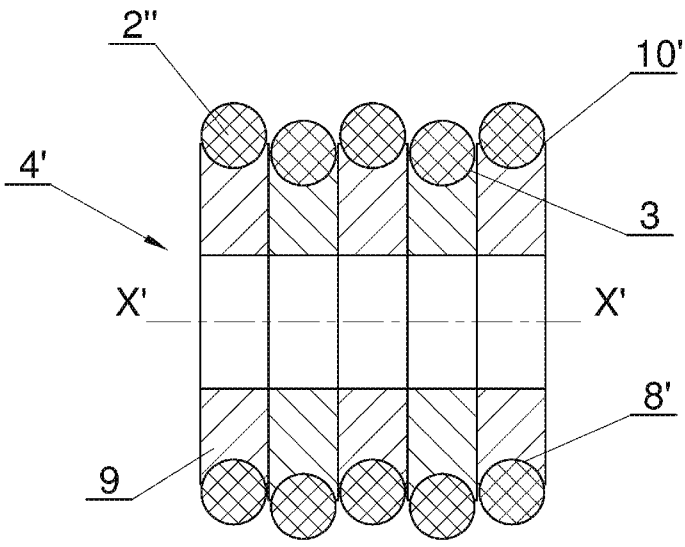


Fig. 12b

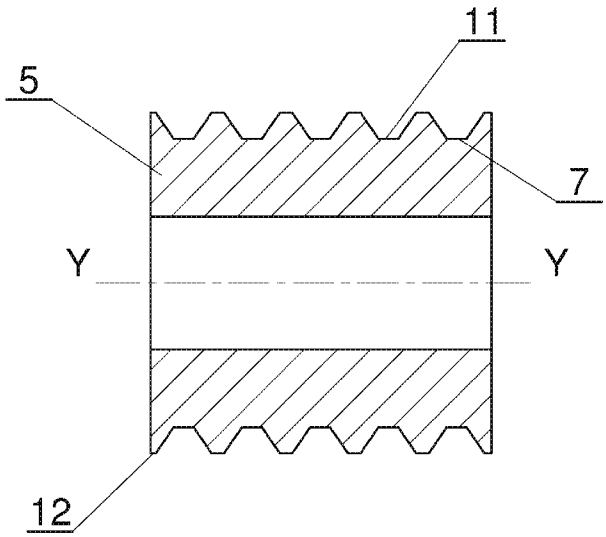


Fig. 13a

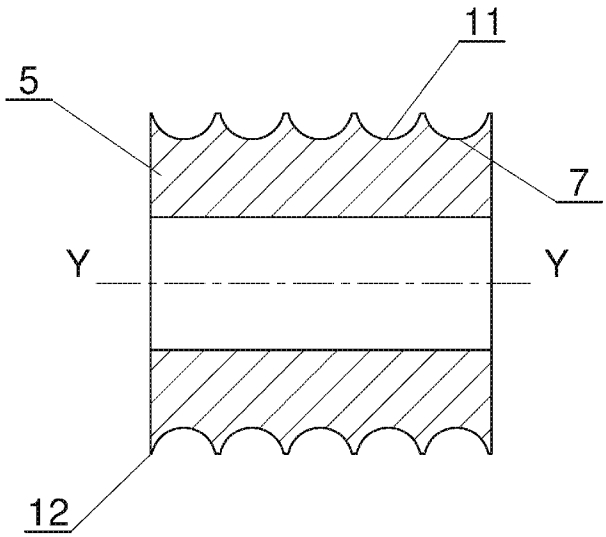


Fig. 13b

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2012/050010

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24C5/36 B65G47/24
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)
A24C B65G

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/078294 A1 (BASTASCH PAUL M [US] ET AL) 1 April 2010 (2010-04-01) paragraph [0174] - paragraph [0040]	1,8
A	US 3 366 125 A (JACKSON JOHN L) 30 January 1968 (1968-01-30) column 2, line 36 - column 5, line 6	1,8,13
A	DE 30 31 130 A1 (HOESCH ESTEL WERKE AG [DE]) 4 March 1982 (1982-03-04) page 7, line 21 - page 11, line 9	5

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

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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