Conveyor drum, machine, and process of the tobacco-processing industry. The conveyor drum includes seats structured and arranged for rod-shaped articles of the tobacco-processing industry, displacement devices, composed of mechanically operable and moveable pushers, structured and arranged for longitudinal axial displacement of the rod-shaped articles in the seats, and a region structured and arranged to receive a cutting device. The instant abstract is neither intended to define the invention disclosed in this specification nor intended to limit the scope of the invention in any way.
PUSHER/CUTTER DRUM

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority under 35 U.S.C. §119 of German Patent Application No. 10 2005 011 543.8, filed on Mar. 10, 2005, the disclosure of which is expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a conveyor drum of the tobacco-processing industry with seats for rod-shaped articles of the tobacco-processing industry and displacement devices for the longitudinally axial displacement of the rod-shaped articles in the seats. The conveyor drum is used in combination with a cutting device for cutting the rod-shaped articles, and the cutting device is arranged on the conveyor drum.

2. Discussion of Background Information

Conveyor drums of the type mentioned at the outset are also called "pusher/cutter drums," which comprise a combination of a transport drum and at least one cutting device or a cutting knife for the transported articles. These drums are commonly used in the course of finishing filter rods and filter cigarettes, whereby filter rod components of multiple unit length are prepared for being subsequently combined with further filter components or smokers' product components in a so-called "transverse process," i.e., transverse to their longitudinal axes, by being subdivided once or several times, staggered and lined up one behind the other. To this end, a plurality of conveyor drums is necessary to carry out the processing steps. In the course of these processing and handling steps, in particular a defined longitudinally axial positioning or mutual alignment of the filter rod components in their receiving troughs necessary for a separation cut on consecutive filter rod components is important for the number of drums determining the length of the conveyor path.

EP A 1 013 181 discloses a pusher/cutter drum, whereby the smokers' product components or filter pieces are displaced pneumatically in the receiving troughs against stops of adjustable length by the application of suction air to suction bores of the seats.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a pusher/cutter drum so that even very short rod-shaped articles, i.e., in particular where their length is shorter than their diameter, or hollow rod-shaped articles of the tobacco-processing industry can be reliably transported and finished.

The invention provides a conveyor drum of the tobacco-processing industry with seats for rod-shaped articles of the tobacco-processing industry and displacing devices for the longitudinally axial displacement of the rod-shaped articles in the seats. Further, a cutting device for cutting the rod-shaped articles, in combination with the conveyor drum, is arranged on the conveyor drum. The displacing devices are embodied or formed as mechanically operable and moveable pushers.

A conveyor drum according to the invention is used in particular in the finishing of filter rod components that are removed from a magazine in multiple unit lengths and cut. In order to sever the cut filter rod components again, it is necessary to transfer them in a transverse axial row formation. To this end, a longitudinally axial displacement of sequentially staggered articles in a transverse axial row cutting formation is carried out. In this manner, the rod-shaped articles according to the invention are aligned by mechanically operable and moveable pushers. It is thus possible to longitudinally axially displace or align reliably in the receiving troughs, for example, even small filter pieces or hollow filter pieces and subsequently to cut them on the conveyor drum.

Handling small or very short filter pieces or rod-shaped articles, i.e., in particular where their length is shorter than their diameter, or hollow filter pieces, is difficult or sometimes impossible with conveyor drums or pusher/cutter drums in which the articles are displaced longitudinally axially in a pneumatic manner, since short filter pieces tend to fall over. An additional disadvantage of pneumatic displacement is the very deep embodiment of the receiving troughs. The deeper a trough, the more complicated the transfer of the rod-shaped articles to a following drum. In contrast, when using the mechanical pusher according to the invention, a receiving trough on the conveyor drum can be embodied flatter in order to ensure a reliable transfer to the following drum. Moreover, a great deal of suction air is saved through the mechanical pusher, since the articles are no longer moved pneumatically, but mechanically, and therefore fewer suction bores are necessary on the transport drum. The available suction bores have primarily the function of holding the conveyed articles in the troughs.

In a preferred embodiment, the pushers are longitudinally displaceable with respect to the seats so that the pushers align and position exactly the rod-shaped articles taken up with respect to the cutting plane of the cutting device. To cut the aligned articles, one or more cutting knives are provided as a cutting device on the conveyor drum.

In particular, the pushers are arranged mutually alternating in the transverse axial direction of the seats, so that the pushers are aligned with respect to the plane of the cutting knives or the cutting device alternately with respect to the cutting plane.

A simplification of the sequence of motions is achieved when several pushers can be moved with one another simultaneously. To this end, several pushers are arranged, for example, on a holder, so that the pushers reliably align the articles with respect to the cutting plane by a movement of the holder.

To this end, it is provided that the pushers execute a predetermined longitudinally axial stroke.

Furthermore, it is preferred if, with respect to the cutting plane of the cutting device, the seats respectively have a different number of suction bores that can be acted on with a vacuum on the two sides of the cutting plane. Through this, in the receiving troughs a low and sufficient number of suction bores are acted on with a vacuum in an efficient manner, which suction bores ensure a secure reception and longitudinally axial guiding of the conveyed or cut articles.
In particular, the conveyor drum is embodied in combination with the cutting device as a so-called pusher/cutter drum.

Furthermore, the invention relates to a machine of the tobacco-processing industry, in particular filter manufacturing machine or filter tipping machine, which is equipped with an above-mentioned conveyor drum according to the invention. To avoid repetition, reference is expressly made to the above statements.

The present invention is directed to a conveyor drum of the tobacco-processing industry. The conveyor drum includes seats structured and arranged for rod-shaped articles of the tobacco-processing industry, displacement devices, composed of mechanically operable and moveable pushers, structured and arranged for longitudinal axial displacement of the rod-shaped articles in the seats, and a region structured and arranged to receive a cutting device.

According to a feature of the invention, the above-noted conveyor drum is combined with the cutting device. The cutting device is structured and arranged for cutting the rod-shaped articles, and the cutting device is arranged on the conveyor drum.

In accordance with another feature of the instant invention, the pushers may be longitudinally displaceable with respect to the seats.

Further, the pushers can be arranged mutually alternatingly in a transverse axial direction of the seats.

According to still another feature, a plurality of the pushers may be simultaneously moveable.

According to another feature of the invention, the pushers can be structured and arranged to achieve a predetermined longitudinally axial lift.

Moreover, the combination conveyor drum and cutting device may further include suction bores formed in the seats and a cutting plane for the cutting device formed through the seats. A different number of suction bores are formed on opposite sides of the cutting plane for each seat. The suction bores may be arranged to act on the rod shaped articles. Further, the combination can be structured and arranged as a pusher/cutter drum.

The present invention is directed to a machine of the tobacco-processing industry including the above-discussed conveyor drum. The machine can be formed as one of a filter manufacturing machine or a filter tipping machine.

The present invention is directed to a machine of the tobacco-processing industry including the above-noted combination conveyor drum and cutting device. The machine may be formed as one of a filter manufacturing machine or a filter tipping machine.

The present invention is directed to a process for transporting rod shaped articles of the tobacco-processing industry. The process includes conveying the rod shaped articles in seats, aligning, with a mechanically operable and moveable pusher, the rod shaped articles in the seats, and cutting the aligned rod shaped articles in the seats.

In accordance with a feature of the invention, the aligning may include longitudinally axially displacing the rod shaped articles in the seats. The rod shaped articles in successive seats can be longitudinally axially displaced in opposite directions.

According to another feature of instant invention, a plurality of rod shaped articles can be simultaneously aligned.

The cutting occurs along a cutting plane formed through the seats, and the process can further include holding cut portions of the rod shaped articles on opposite sides of the cutting plane with a different number of suction bores.

According to still another feature of the invention, the rod shaped articles may have a length smaller than a rod diameter.

In accordance with still yet another feature of the present invention, the rod shaped articles can be hollow.

Other exemplary embodiments and advantages of the present invention may be ascertained by reviewing the present disclosure and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is further described in the detailed description which follows, in reference to the noted plurality of drawings by way of non-limiting examples of exemplary embodiments of the present invention, in which like reference numerals represent similar parts throughout the several views of the drawings, and wherein:

FIG. 1 illustrates a sectional view of a pusher/cutter drum; and

FIG. 2 illustrates a perspective view of the pusher/cutter drum according to the invention in section.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the fundamental understanding of the present invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the present invention may be embodied in practice.

FIG. 1 shows in section an arrangement of conveyor drums that in drum rotation has a pusher/cutter drum 10 according to the invention, which comprises a transport drum 20 and a cutting knife 30 arranged thereon.

Rod-shaped articles are transferred from a conveyor drum 50 to the pusher/cutter drum 10. After the transfer, the rod-shaped articles are displaced in a longitudinally axial manner on the pusher/cutter drum 10 during their conveyance to the cutting knife 30 and aligned and positioned with respect to the cutting plane of the cutting knife 30. After the transported articles are cut by the cutting knife 30, the articles are transferred from the transport drum 20 to a subsequent conveyor drum 60.
Following the removal of the cut articles from the transport drum 20, the pushers (see FIG. 2, reference number 25) on the transport drum 20 are brought into a working position or starting position with a continuous rotation of the drum in order to receive the articles in the receiving troughs at the transfer point of the articles from the conveyor drum 50 to the pusher/cutter drum 10 and then to move the articles in a longitudinally axial manner.

In FIG. 2 the transport drum 20 is shown in a perspective representation. For reasons of improved clarity, a drawing of the cutting knife 30 (cf. FIG. 1) provided on the transport drum 20 was omitted in FIG. 2.

The rotary driven transport drum 20 has seats 21, 22. The seats 21, 22 have flat or low side walls 23 so that even small or very short rod-shaped or hollow articles are safely transported in the seats 21, 22. Furthermore, the seats 21, 22 have suction bores 24 in the base of the trough, which bores are acted on with a vacuum from the interior of the drum body 20 in order to safely receive the conveyed articles in the receiving trough.

One pusher 25 each is arranged laterally on each seat 21, 22, two pushers 25 respectively on each side being held on a holder 26 or 27. The pushers 25 are arranged alternately reciprocally on the opposite ends of the seats 21, 22, so that respectively two pushers 25 of the seat 21 are attached to a holder 27 and respectively two pushers 25 of the seat 22 are attached to a holder 26.

Each holder 26, 27 or each pusher 25 is displaceable in a longitudinally axial manner with respect to the seats 21, 22, in order to align the received articles with respect to the cutting plane of the cutting device or the cutting knife (cf. FIG. 1, reference number 30).

The cutting plane of the cutting knife 30 (cf. FIG. 1) results from the groove-shaped transsection of the seats 21, 22 in the transverse axial direction into which the cutting knife 30 projects. The cutting plane or the groove-shaped recess of the seats 21, 22 is shown in FIG. 2 by reference number 31.

Moreover, it is discernible in FIG. 2 that the seats 21, 22 with respect to the cutting plane 31 have a different number of suction bores on the two sides of the cutting plane 31. More suction bores are provided on the side on which respectively one pusher 25 is arranged, than on the side of the seat 21, 22 facing away from the pusher 25.

According to the invention, the pushers together with the holders 26, 27 are moveable or displacable in a longitudinally axial manner in order to align the received articles with respect to the cutting plane 31 or the cutting knife. In order to be able to move the holders 26, 27 or the pushers 25, corresponding control cams to carry out a predetermined longitudinally axial lift are provided in the interior of the drum body 20. For example, a longitudinally axial lift is carried out by a corresponding control body for the moveable holders 26, 27 or pushers 25.

The pusher/cutter drum 10 according to the invention is used in machines of the tobacco-processing industry, in particular filter manufacturing machines or filter tipping machines, preferably in the filter run of the machines.

It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.

LIST OF REFERENCE NUMBERS

<table>
<thead>
<tr>
<th>Reference Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Pusher/cutter drum</td>
</tr>
<tr>
<td>20</td>
<td>Transport drum</td>
</tr>
<tr>
<td>21</td>
<td>Seat</td>
</tr>
<tr>
<td>22</td>
<td>Seat</td>
</tr>
<tr>
<td>23</td>
<td>Side wall</td>
</tr>
<tr>
<td>24</td>
<td>Suction bore</td>
</tr>
<tr>
<td>25</td>
<td>Pusher</td>
</tr>
<tr>
<td>26</td>
<td>Holder</td>
</tr>
<tr>
<td>27</td>
<td>Holder</td>
</tr>
<tr>
<td>30</td>
<td>Cutting knife</td>
</tr>
<tr>
<td>31</td>
<td>Cutting plane</td>
</tr>
<tr>
<td>50</td>
<td>Conveyor drum</td>
</tr>
<tr>
<td>60</td>
<td>Conveyor drum</td>
</tr>
</tbody>
</table>

What is claimed:

1. A conveyor drum of the tobacco-processing industry comprising:
   - seats structured and arranged for rod-shaped articles of the tobacco-processing industry;
   - displacement devices, composed of mechanically operable and moveable pushers, structured and arranged for longitudinal axial displacement of the rod-shaped articles in the seats; and
   - a region structured and arranged to receive a cutting device.

2. The conveyor drum in accordance with claim 1 in combination with the cutting device, wherein the cutting device is structured and arranged for cutting the rod-shaped articles, and the cutting device is arranged on the conveyor drum.

3. The conveyor drum in accordance with claim 1, wherein the pushers are longitudinally displaceable with respect to the seats.

4. The conveyor drum in accordance with claim 1, wherein the pushers are arranged mutually alternatingly in a transverse axial direction of the seats.

5. The conveyor drum in accordance with claim 1, wherein a plurality of the pushers are simultaneously moveable.
6. The conveyor drum in accordance with claim 1, wherein the pushers are structured and arranged to achieve a predetermined longitudinally axial lift.

7. The conveyor drum in combination with the cutting device in accordance with claim 2, further comprising suction bores formed in the seats and a cutting plane for the cutting device formed through the seats,

   wherein, a different number of suction bores are formed on opposite sides of the cutting plane for each seat.

8. The conveyor drum in accordance with claim 7, wherein the suction bores are arranged to act on the rod shaped articles.

9. The conveyor drum in combination with the cutting device in accordance with claim 2, wherein the combination is structured and arranged as a pusher/cutter drum.

10. A machine of the tobacco-processing industry comprising a conveyor drum in accordance with claim 1.

11. The machine in accordance with claim 10, wherein the machine is formed as one of a filter manufacturing machine or a filter tipping machine.

12. A machine of the tobacco-processing industry comprising a conveyor drum in combination with a cutting device in accordance with claim 2.

13. The machine in accordance with claim 12, wherein the machine is formed one of a filter manufacturing machine or a filter tipping machine.

14. A process for transporting rod shaped articles of the tobacco-processing industry, comprising:

   conveying the rod shaped articles in seats;

   aligning, with a mechanically operable and moveable pusher, the rod shaped articles in the seats; and

   cutting the aligned rod shaped articles in the seats.

15. The process in accordance with claim 14, wherein the aligning comprises longitudinally axially displacing the rod shaped articles in the seats.

16. The process in accordance with claim 15, wherein the rod shaped articles in successive seats are longitudinally axially displaced in opposite directions.

17. The process in accordance with claim 14, wherein a plurality of rod shaped articles are simultaneously aligned.

18. The process in accordance with claim 14, wherein the cutting occurs along a cutting plane formed through the seats, and the process further comprises holding cut portions of the rod shaped article on opposite sides of the cutting plane with a different number of suction bores.

19. The process in accordance with claim 14, wherein the rod shaped articles have a length smaller than a rod diameter.

20. The process in accordance with claim 14, wherein the rod shaped articles are hollow.

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