(19) Europäisches Patentamt
European Patent Office
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(11) **EP 4 480 328 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**25.12.2024 Bulletin 2024/52**

(21) Application number: **23181215.7**

(22) Date of filing: **23.06.2023**

(51) International Patent Classification (IPC):
***A24C 5/32*** *(2006.01)* ***A24C 5/47*** *(2006.01)*
***A24D 3/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
**A24C 5/327; A24C 5/478; A24D 3/0287**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA**
Designated Validation States:
**KH MA MD TN**

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(54) **PUSHING DRUM FOR THE TOBACCO-PROCESSING INDUSTRY AND METHOD FOR OPERATING SAME**

(57) The object of the invention is a conveying method and a conveying apparatus **(1, 1', 1")** for tobacco industry segments **(4)** and for forming at least one stream **(5)** of the segments **(4),** comprising a drum conveyor **(8)** which is provided with slides **(10)** slidably mounted parallel to the axis of rotation **(k)** of the drum conveyor **(8)** and a mechanism for shifting the slides **(10)** during the rotational movement of the drum conveyor **(8),** the slide **(10)** being provided with at least two conveying flutes **(7)** for conveying the segments **(4),** the conveying apparatus **(1)** further comprises at least one axial limiter **(16, 18)** for stopping the segment **(4)** and shifting the segment **(4)** along the flute **(7)** during the movement of the slide **(10)** in the direction opposite to the direction of movement of the slide **(10), characterised in that** the conveying apparatus **(1)** is provided with at least one lateral limiter **(17, 19)** for holding the segment **(4)** in the conveying flute **(7)** from the outside when the segment **(4)** is not held by the underpressure provided by underpressure openings **(22)** in the conveying flute **(7).**

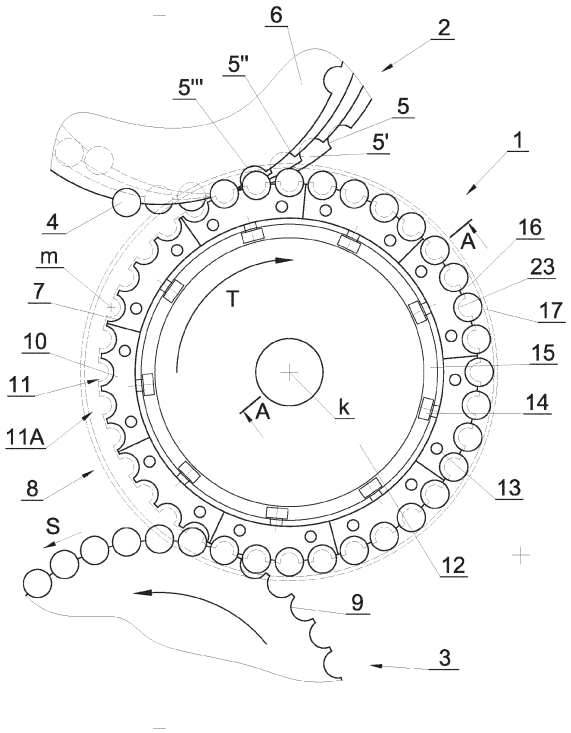


Fig. 1

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## Description

**[0001]** The object of the invention is a conveying apparatus and a method of conveying tobacco industry segments.

**[0002]** Currently, in the tobacco industry, rod-like articles which comprise a plurality of various segments put next to one another usually without gaps are manufactured, and rod-like articles with gaps between the segments are also manufactured. In this description, rod-like articles of this type will be referred to as multi-segment rods. Multi-segment rods can be manufactured by cutting a continuous rod formed by wrapping a sequence of segments on a web of wrapping material, with forming of the continuous rod taking place in a forming unit. Multi-segment rods can also be manufactured by putting segments together on drum conveyors, with streams of segments of other types being added to streams of segments of one type. The axes of symmetry of the segments are situated transversely to the direction of conveying the segments in the stream, with the stream moving along a circular path on the circumferential surface of the drum conveyor. One method of forming a stream of segments comprises cutting the rod into several segments, shifting the segments transversely to the segment axes and then axially moving the segments, the resulting stream being fed to a unit for forming sets of multiple segments. From the prior art, documents that disclose apparatuses for forming a stream of segments whose length is at least twice the diameter of the segments are known. Unfortunately, such known solutions do not work well for short segments whose length is close to their diameter. Segment alignment requires axial movement of the segments in the flutes of the drum conveyor, which is a difficult task in the case of short segments as they are unstable due to their dimensions and may rotate during movement in the flute.

**[0003]** Document US7296579B2 discloses a drum conveyor provided with slides having flutes into which rod-like articles (partial rods according to the description) are placed. When the drum conveyor is rotated, the slides move in a direction parallel to the axis of rotation, and an apparatus for aligning the rod-like articles provided with push pins causes the articles to be retained in the conveying flutes, the push pins pressing on the front surfaces of the rod-like articles.

**[0004]** In the tobacco industry, there is a well-known problem related to segment alignment, namely the tilting of short segments when they are moved along a flute of a drum conveyor when pressure is applied from the face. Short segments, i.e. segments whose diameter is close to the length, do not move stably and tend to rotate inside the flute, especially when the force applied to the segment is directed non-centrally at the segment face. A non-centrally directed force acting on the segment can lead to deformation, rotation and damage of the segment. Short segments should be understood as segments with a diameter of 5 to 9 mm and a length of 5 to 9 mm.

**[0005]** The object of the invention is an apparatus for conveying tobacco industry segments and for forming at least one stream of the segments, comprising a drum conveyor which is provided with slides slidably mounted parallel to the axis of rotation of the drum conveyor and a mechanism for shifting the slides during the rotational movement of the drum conveyor. The slide is provided with at least two conveying flutes for conveying the segments. The conveying apparatus comprises at least one axial limiter for stopping the segment and shifting the segment along the flute during the movement of the slide in the direction opposite to the direction of movement of the slide. The apparatus according to the invention is characterised by being provided with at least one lateral limiter for holding the segment in the conveying flute from the outside when the segment is not held by the underpressure provided by underpressure openings in the conveying flute.

**[0006]** Preferably, the apparatus according to the invention is characterised in that the slide is provided with a receiving row of the underpressure openings and a releasing row of the underpressure openings.

**[0007]** Preferably, the apparatus according to the invention is characterised in that the receiving row of the underpressure openings and the releasing row of the underpressure openings have a common underpressure opening.

**[0008]** Preferably, the apparatus according to the invention is characterised in that the receiving row of the underpressure openings is arranged spirally on the circumferential surface of the slide drum conveyor, and the releasing row of the underpressure openings is arranged circularly on the circumferential surface of the slide drum conveyor.

**[0009]** Preferably, the apparatus according to the invention is characterised in that the axial limiter comprises protrusions inserted into the space of the conveying flutes of the slides.

**[0010]** Preferably, the apparatus according to the invention is characterised by comprising slides arranged in pairs so that the conveying flutes of one slide in the pair are situated coaxially with the conveying flutes of the other slide.

**[0011]** Preferably, the apparatus according to the invention is characterised in that the lateral limiter comprises a ring, arranged above the conveying flutes of the slides.

**[0012]** Preferably, the apparatus according to the invention is characterised in that the lateral limiter has a width in the range between 0.4 and 1.6 of the length of the segment.

**[0013]** Preferably, the apparatus according to the invention is characterised in that the lateral limiter has a width in the range between 4 and 15 mm, preferably between 5 and 10 mm.

**[0014]** Preferably, the apparatus according to the invention is characterised in that the axial limiter comprises a cylindrical section, arranged above the conveying flutes

of the slides.

**[0015]** Preferably, the apparatus according to the invention is characterised in that the conveying apparatus comprises a feeding conveyor provided with discs having feeding flutes, whereas the synchronisation of the feeding flutes and the conveying flutes is provided.

**[0016]** Preferably, the apparatus according to the invention is characterised in that the conveying apparatus comprises a receiving drum conveyor for receiving the stream of the segments.

**[0017]** The object of the invention is also a method of conveying the segments and forming the stream of the segments in the conveying apparatus, comprising steps wherein: a group of the segments is placed on the drum conveyor by placing the segments of the group in the successive conveying flutes of the slide drum conveyor so that the segments in the adjacent conveying flutes of the slide are shifted axially to each other, the segments being held in the conveying flutes by means of the underpressure supplied to the underpressure openings. Subsequently, the slide is shifted in a direction parallel to the axis of rotation of the slide drum conveyor towards the axial limiter so that the segments in the conveying flutes successively abut with their front surface against the axial limiter. During further movement of the slide, the segments move along the conveying flute, the underpressure supplied to the underpressure openings in the conveying flutes is cut off, the segment is held in the conveying flute from the outside by the lateral limiter when the underpressure supplied to the underpressure openings is cut off. After changing the spiral configuration of all segments in the group to a circular configuration on the circumferential surface of the drum conveyor, the slide is shifted in the opposite direction, then the stream of the segments from successive groups is formed on the circumferential surface of the drum conveyor. An advantage of the invention is achieving full control over the position of the short segments during the alignment, which results in reduced downtime related to the removal of stuck segments and increased efficiency of the production line. The apparatus according to the invention does not reduce the quality of the segments.

**[0018]** The object of the invention is illustrated with reference to an embodiment shown in the drawing wherein

Fig. 1 shows a conveying apparatus in the first embodiment,

Figs. 2a, 2b, 2c show the stages of segment shifting,

Fig. 3 shows a developed view of a lateral surface of a slide drum conveyor,

Fig. 4 shows a developed view of the lateral surface of the slide drum conveyor of the conveying apparatus in the second embodiment, and

Fig. 5 shows a developed view of the lateral surface of the slide drum conveyor of the conveying apparatus in the third embodiment.

**[0019]** The conveying apparatus **1** for conveying tobacco industry segments and forming a stream of segments shown in **Fig. 1** is situated between a feeding conveyor **2** and a receiving conveyor **3**. The feeding conveyor **2** is provided with feeding flutes **5**, whereas the feeding conveyor **2** is adapted to deliver individual segments **4** in successive feeding flutes **5**. The segments **4** are preferably cylindrical in shape, where a front surface **4A** (cylinder base) and a lateral surface **4B** can be distinguished. In the embodiment shown, the feeding conveyor **2** comprises a plurality of discs **6**, with a plurality of feeding flutes **5** situated on a circumference of each disc **6**. The segment **4** is held in the feeding flute **5** by means of underpressure. The segment **4** is conveyed in the conveying apparatus **1** in a conveying flute **7** on the drum conveyor **8** and can be held in this flute by means of the underpressure supplied through underpressure channels to underpressure openings at the bottom of the flute. The segment **4** is transferred to a receiving flute **9** on the receiving conveyor **3**.

**[0020]** The conveying flutes **7** are spaced at equal distances from one another on the circumference of the drum conveyor **8** (in the description, the equivalent name of "slide drum conveyor" may be used instead of the name of "drum conveyor"). The slide drum conveyor **8** is provided with a plurality of slides **10**, the slide **10** having on its outer surface **11** at least two conveying flutes **7**, preferably several conveying flutes **7**. The outer surfaces **11** of the slides **10** form jointly a circumferential surface **11A** of the slide drum conveyor **8**. The slide **10** is mounted linearly slidably relative to the body **12**. The body **12** is rotatably mounted and has a rotation axis **k**, and the conveying flutes **7** are situated such that the axis **m** of the conveying flute **7** is situated parallel to the rotation axis **k** of the body **12**. In the embodiment shown, the slide **10** is mounted on guides **13**. The slide **10** is capable of performing linear movement in a direction parallel to the rotation axis **k**, the slide **10** being provided with a roller **14** that works with a cam **15.** The cam **15** is a cylidrical cam situated next to or within the drum conveyor **8**. The movement of the slides **10** can be performed by any other mechanism. The conveying apparatus **1** also comprises limiters **16**, **17** situated at the circumferential surface of the drum conveyor **8** which are used to stop the segments **4** in the conveying flutes **7** or to hold the segments in the conveying flutes **7**, these limiters are discussed below.

**[0021]** **Figs. 2a**, **2b**, **2c** show in cross-section the position of the slide **10** relative to the body **12** during the rotation of the slide drum conveyor **8**. The segment **4** is held in the flute **7** of the slide **10** by means of the underpressure supplied by underpressure channels **20** in the slide **10** from a feed channel **21** in the body **12** (the unit

supplying the underpressure to the feed channel **21** is not shown). In **Fig. 2a**, the segment **4** is held by means of the underpressure supplied by two underpressure channels **20**, the segments can be held by means of more underpressure channels **20**, whereas very short segments can be held by a single underpressure channel **20**. The underpressure openings in the conveying flutes **7** are marked as **22**. In **Fig. 2b**, the slide **10** together with the segment **4** moves towards the axial limiter **16**, the segment **4** being held by the underpressure supplied by the underpressure channels **20** or one underpressure channel **20**. In **Fig. 2c**, the segment **4** is held by the axial limiter **16** and abuts against the axial limiter **16**, i.e. the axial limiter **16** acts on the front surface of the segment **4** (cylinder base surface), the segment **4** is no longer held by the underpressure, the segment **4** is held by the lateral limiter **17** acting on the lateral surface of the segment **4**. The axial limiter **16** and the lateral limiter **17** may be integrated, however, the limiters **16**, **17** may be separate elements. The axial limiter **16** may be in the form of an arc having a flat surface. The axial limiter **16** may be in the form of a ring, the lateral limiter **17** may be in the form of a cylindrical section. The axial limiter **16** may have protrusions **23** inserted into the space of the conveying flutes **7**. By using the protrusions **23**, the pressure exerted on the segments **4** when the segment **4** abuts and stops is distributed over a larger portion of the front surface **4A** of the segment **4** than in the case of a limiter without protrusions so that the segment **4** is not damaged. The lateral limiter **17** may have a width **d** in the range between 0.4 of the length **L** of the segment **4** and 1.6 of the length **L** of the segment **4**. Preferably, the width **d** is equal to the length **L** of the segment **4.** Preferably, the width d is equal to the length **L** of the segment **4**. The lateral limiter **17** may have a width **d** in the range between 4 and 15 mm. Preferably, the width **d** of the lateral limiter is in the range between 5 and 10 mm. The underpressure channels **20** may have any shape, for example they may be arc-shaped. The supply of underpressure to the conveying flute **7** may be carried out by means of a conduit with a valve which cuts off the underpressure immediately before the segment **4** is stopped by the axial limiter **16**. Each conveying flute **7** may be provided with a separate valve.

**[0022]** **Fig. 3**, in a simplified developed view of lateral surface of the drum conveyor **8**, shows several slides **10**, with the guides **13** and the roller **14** being shown for only one slide **10**.

**[0023]** The operation of the conveying apparatus **1** will be discussed with reference to a group **G** of the segments **4** which are placed in the conveying flutes **7** of one slide **10** (**Fig. 3**). The first segment **4** is transferred from the first feeding flute **5** to the first conveying flute **7**, the second segment **4'** from the second feeding flute **5'** is transferred to the second conveying flute **7'**, the second segment **4'** being axially shifted relative to the first segment **4**. The next segment **4"** in the next flute **5"** is axially shifted relative to the second segment **4'**, the next segment **4"** is shifted in a similar way. With this method of positioning, the segments **4**, **4'**, **4"**, **4‴** placed in the successive conveying flutes **7**, **7'**, **7"**, **7‴** are positioned spirally on the circumferential surface **11A** of the slide drum conveyor **8**. After the segments **4**, **4'**, **4"**, **4‴** of the group **G** have been placed in the conveying flutes **7**, the slide **10** moves in such a way that the successive segments **4**, **4"**, **4"**, **4‴** move towards the axial limiter **16** and successively stop at the limiter **16** and are moved along the conveying flute **7**, then, as a result of further rotational movement of the drum conveyor **8** and the action of the cam **15** on the roller **14**, the slide **10** is withdrawn so that the groups **G** of the successive slides **10** line up one behind another and form a stream **S** of the segments **4**. In the position **a** on the drum conveyor **8**, the segments **4**, **4'**, **4"**, **4"** are positioned in a slanting configuration in a developed view, i.e. spirally on the circumferential surface **11A**. In the position **b**, the segment **4‴** abuts against the axial limiter **16**, in the position **c**, all the segments **4**, **4'**, **4"**, **4"** are stopped by the axial limiter **16** and are held by the lateral limiter **17**, whereas the segments 4, **4"**, **4"**, **4‴** are arranged in a linear configuration in developed view, i.e. in a circular configuration on the circumferential surface **11A** of the slide drum conveyor **8**, in the position **d** the slide **10** has started a return movement, in the positions **e** and **f** the segments **4** form a stream **S** of the successive groups **G**. Two rows **K1** and **K2** of the underpressure openings **22** can be distinguished on the slide **10**. The receiving row **K1** comprises the underpressure openings **22**, which are used to hold the segments **4** immediately after receiving the segments **4** from the feeding conveyor **2**. The releasing row **K2** comprises the underpressure openings **22**, which are used to hold the segments before transferring them to the receiving conveyor **3**. The receiving row **K1** of the underpressure openings **22** intersects with the releasing row **K2** within the first conveying flute **7** of the slide **10**. The receiving row **K1** and the releasing row **K2** may have a common underpressure opening **22** in one of the conveying flutes **7**.

**[0024]** **Fig. 4** shows in a developed view the lateral surface of the drum conveyor **8** of the conveying apparatus **1'** in the second embodiment which is adapted to form two streams **S**, **S'** of the segments **4**. The drum conveyor **8** comprises pairs of slides **10**, **10'** which are shifted by means of separate mechanisms and move in opposite directions. The conveying apparatus **1'** comprises the axial limiter **16** for the left-hand slides **10** and the axial limiter **16'** for the right-hand slides **10'**. The apparatus comprises internal axial limiters **18**, **18'** for additional aligning of the streams **S**, **S'** prior to transferring the streams **S**, **S'** to the receiving conveyor **3**. The conveying apparatus **1'** can be provided with lateral limiters **19**,19' so that the underpressure supplied through the underpressure openings **22** can be cut off prior to transferring the segments **4** to the receiving conveyor **3**. The receiving row **K1** of the left-hand slide **10** and the receiving row **K1'** of the right-hand slide **10'** are situated at an angle and convergent with the conveying direction of the segments **4**. The receiving row **K1** of the left-hand slide

**10** and the receiving row **K1'** of the right-hand slide **10'** may be situated parallel to each other. The releasing row **K2** and the releasing row **K2'** are situated parallel to each other.

**[0025]** **Fig. 5** shows in a developed view the lateral surface of the drum conveyor **8** of the conveying apparatus **1"** in the third embodiment. The apparatus **1"** is adapted to form a single stream **S** of the segments **4**. The slide **10** is provided with six conveying flutes **7**, whereas there can be distinguished two rows **K1**, **K2** of the underpressure openings **22** on the slide, with the receiving row **K1** intersecting with the releasing row **K2** within the third conveying flute **7-3**. In order to form the stream **S**, the slide **10** is shifted in the direction from right to left in the figure so that the segments **4** in the conveying flutes **7-3**, **7-4**, **7-5**, **7-6** abut against the axial limiter **16**, then the slide **10** is shifted in the direction from left to right in the drawing so that the segments **4** in the conveying flutes **7-1**, **7-2** abut against the axial limiter **18**. The operation of the lateral limiter **17**, **19** is the same as in the previous embodiments.

## Claims

1. An apparatus (**1**, **1'**, **1"**) for conveying tobacco industry segments (**4**) and for forming at least one stream (**S**) of the segments (**4**), comprising a drum conveyor (**8**) which is provided with slides (**10**) slidably mounted parallel to the axis of rotation (**k**) of the drum conveyor (**8**) and a mechanism for shifting the slides (**10**) during the rotational movement of the drum conveyor (**8**), the slide (**10**) being provided with at least two conveying flutes (**7**) for conveying the segments (**4**), the conveying apparatus (**1**) further comprises at least one axial limiter (**16**, **18**) for stopping the segment (**4**) and shifting the segment (**4**) along the flute (**7**) during the movement of the slide (**10**) in the direction opposite to the direction of movement of the slide (**10**), **characterized in that** the conveying apparatus (**1**) is provided with at least one lateral limiter (**17**, **19**) for holding the segment (**4**) in the conveying flute (**7**) from the outside when the segment (**4**) is not held by the underpressure provided by underpressure openings (**22**) in the conveying flute (**7**).

2. The apparatus as in claim 1, **characterised in that** the slide (**10**) is provided with a receiving row (**K1**) of the underpressure openings (**22**) and a releasing row (**K2**) of the underpressure openings (**22**).

3. The apparatus as in claim 2, **characterised in that** the receiving row (**K1**) of the underpressure openings (**22**) and the releasing row (**K2**) of the underpressure openings (**22**) have a common underpressure opening (**22**).

4. The apparatus as in claim 2 or 3, **characterised in that** the receiving row (**K1**) of the underpressure openings (**22**) is arranged spirally on the circumferential surface (**11A**) of the slide drum conveyor (**8**), and the releasing row (**K2**) of the underpressure openings (**22**) is arranged circularly on the circumferential surface (**11A**) of the slide drum conveyor (**8**).

5. The apparatus as in any of claims 1 to 4, **characterised in that** the axial limiter (**16**, **18**) comprises protrusions (**23**) inserted into the space of the conveying flutes (**7**) of the slides (**10**).

6. The apparatus as in any of claims 1 to 5, **characterised by** comprising slides (**10**, **10**') arranged in pairs so that the conveying flutes (**7**) of one slide (**10**) in a pair are situated coaxially with the conveying flutes (**7**) of the other slide (**10'**).

7. The apparatus as in any of claims 1 to 3, **characterised in that** the lateral limiter (**17**, **19**) comprises a ring, arranged above the conveying flutes (**7**) of the slides (**10**).

8. The apparatus as in any of claims 1 to 7, **characterised in that** the lateral limiter (**17**, **19**) has a width in the range between 0.4 and 1.6 of the length (**L**) of the segment (**4**).

9. The apparatus as in any of claims 1 to 7, **characterised in that** the lateral limiter (**17**, **19**) has a width in the range between 4 and 15 mm, preferably between 5 and 10 mm.

10. The apparatus as in any of claims 1 to 9, **characterised in that** the axial limiter (**16**, **18**) comprises a cylindrical section, arranged above the conveying flutes (**7**) of the slides (**10**).

11. The apparatus as in any of claims 1 to 10, **characterised in that** the conveying apparatus (**1**) comprises a feeding conveyor (**2**) provided with discs (**6**) having feeding flutes (**5**), whereas the synchronisation of the feeding flutes (**5**) and the conveying flutes (**7**) is provided.

12. The apparatus as in claim 1, **characterised in that** the conveying apparatus (**1**, **1'**, **1"**) comprises a receiving drum conveyor (**3**) for receiving the stream (**S**) of the segments (**4**).

13. A method of conveying segments (**4**) and forming the stream (**S**) of the segments (**4**) in the conveying apparatus (**1**), comprising steps wherein:

    a group (**G**) of the segments (**4**) is placed on a drum conveyor (**8**) by placing the segments (**4**)

of the group (**G**) in successive conveying flutes (**7**) of the slide drum conveyor (**8**) so that the segments (**4**) in the adjacent conveying flutes (**7**) of a slide (**10**) are shifted axially to each other,
the segments (**4**) being held in the conveying flutes (**7**) by means of the underpressure supplied to the underpressure openings (**22**),
the slide (**10**) is shifted in a direction parallel to the axis of rotation (**k**) of the slide drum conveyor (**8**) towards the axial limiter (**16**, **18**) so that the segments (**4**) in the conveying flutes (**7**) successively abut with their front surface (**4A**) against the axial limiter (**16**, **18**), and then, during further movement of the slide (**10**), the segments (**4**) move along the conveying flute (**7**),
the underpressure supplied to the underpressure openings (**22**) in the conveying flutes (**7**) is cut off,
the segment (**4**) is held in the conveying flute (**7**) from the outside by the lateral limiter (**17**, **19**) when the underpressure supplied to the underpressure openings (**22**) is cut off,
after changing the spiral configuration of all segments (**4**) in the group (**G**) to a circular configuration on the circumferential surface (**11A**) of the drum conveyor (**8**), the slide (**10**) is shifted in the opposite direction,
the stream (**S**) of the segments (**4**) from successive groups (**G**) is formed on the circumferential surface of the drum conveyor (**8**).

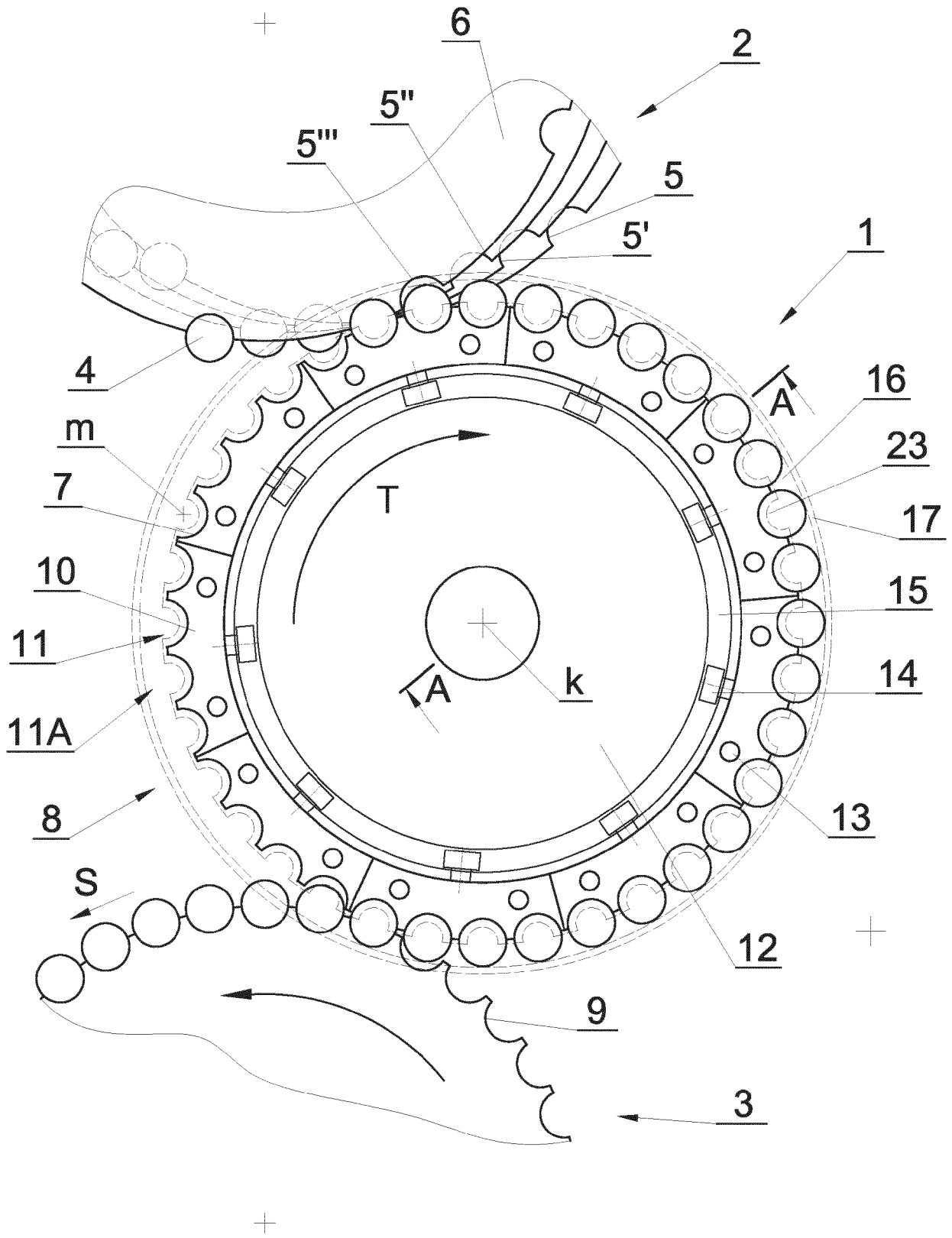


Fig. 1

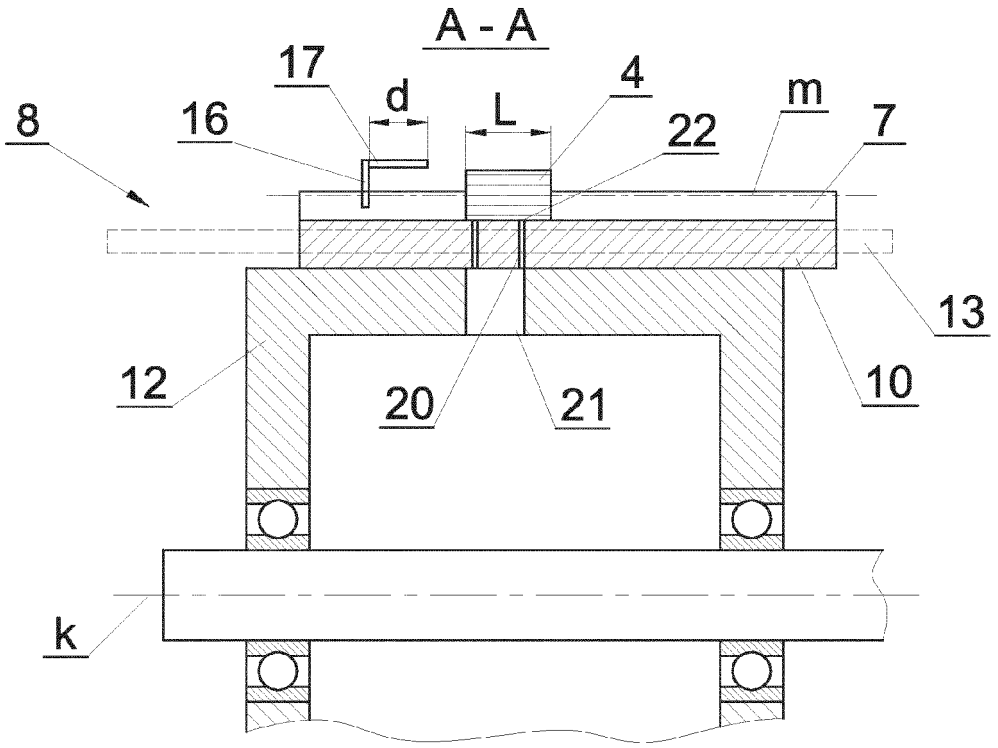


Fig. 2a

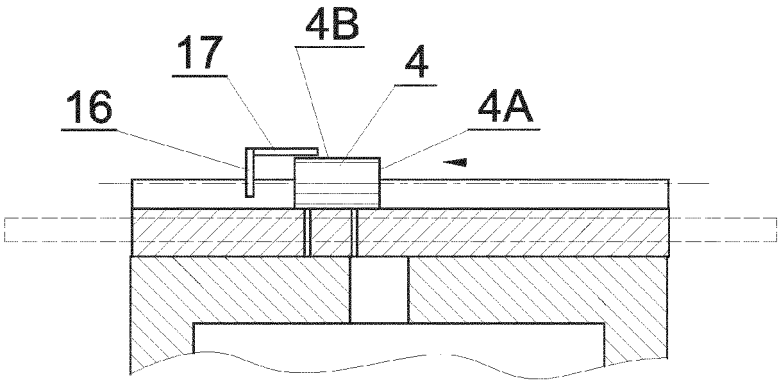


Fig. 2b

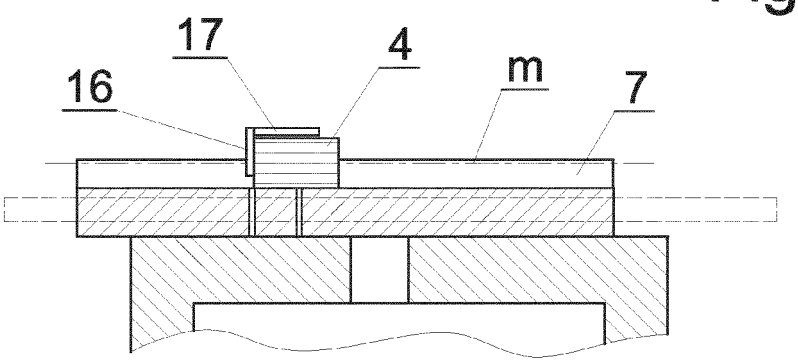


Fig. 2c

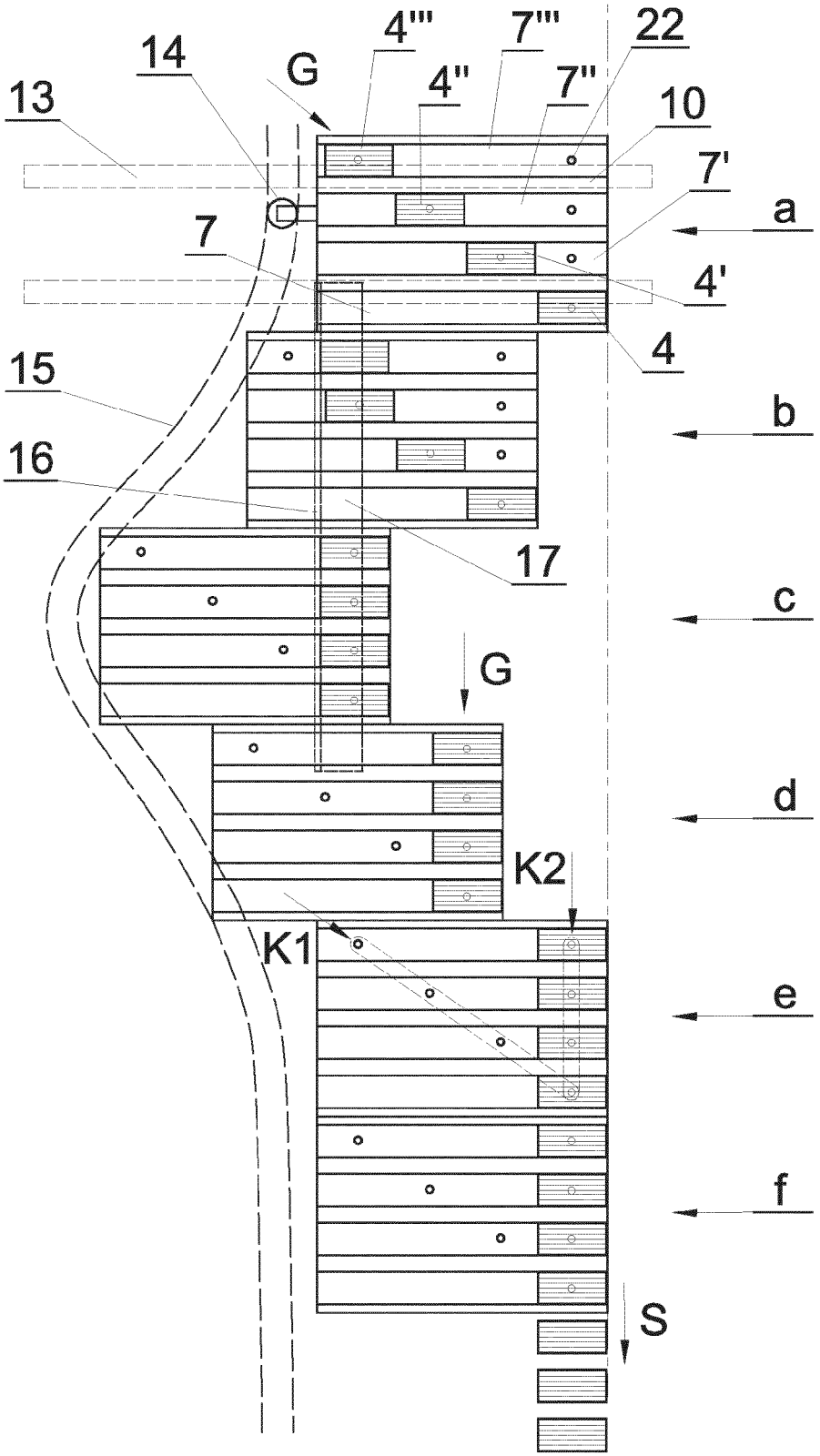


Fig. 3

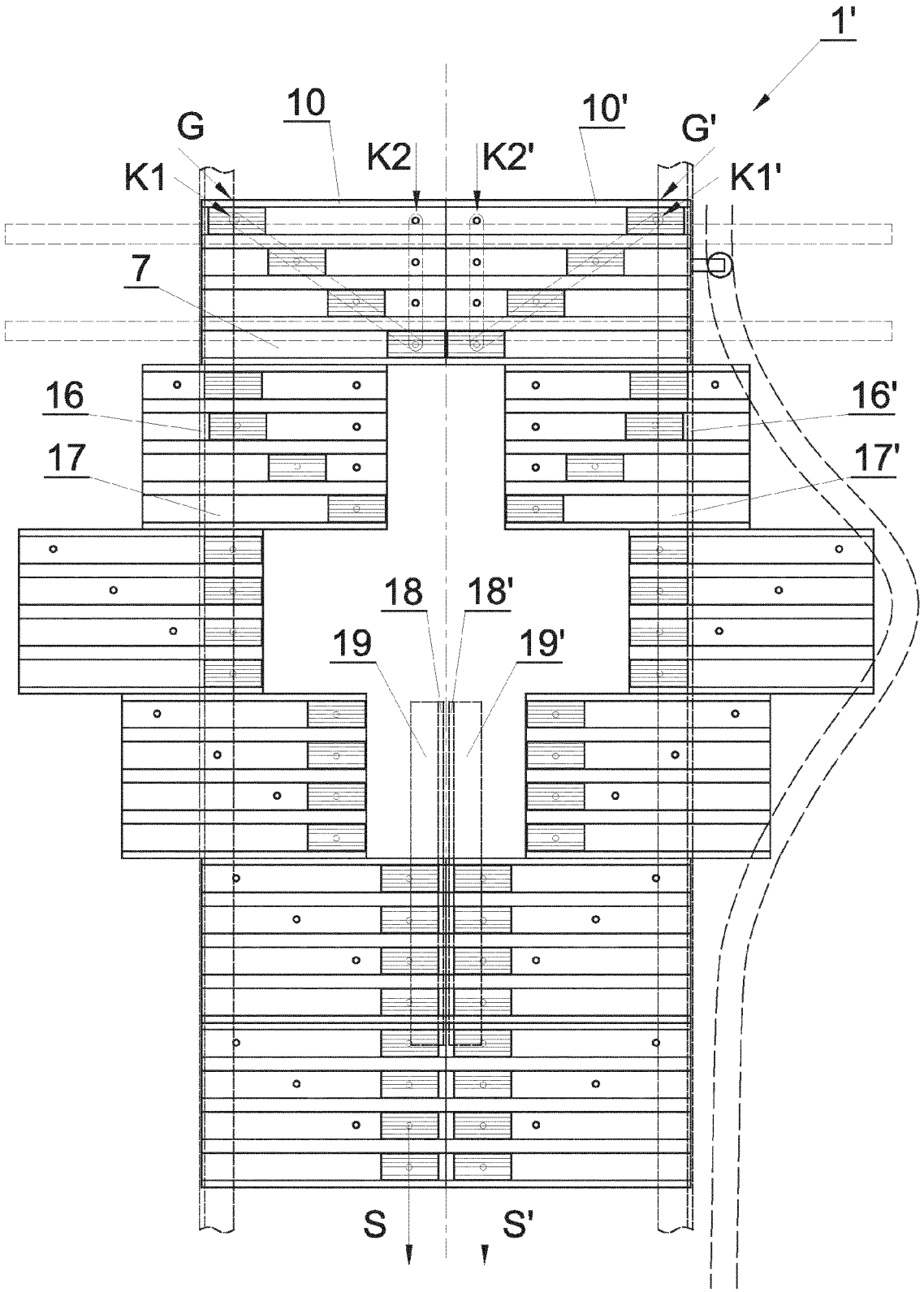


Fig. 4

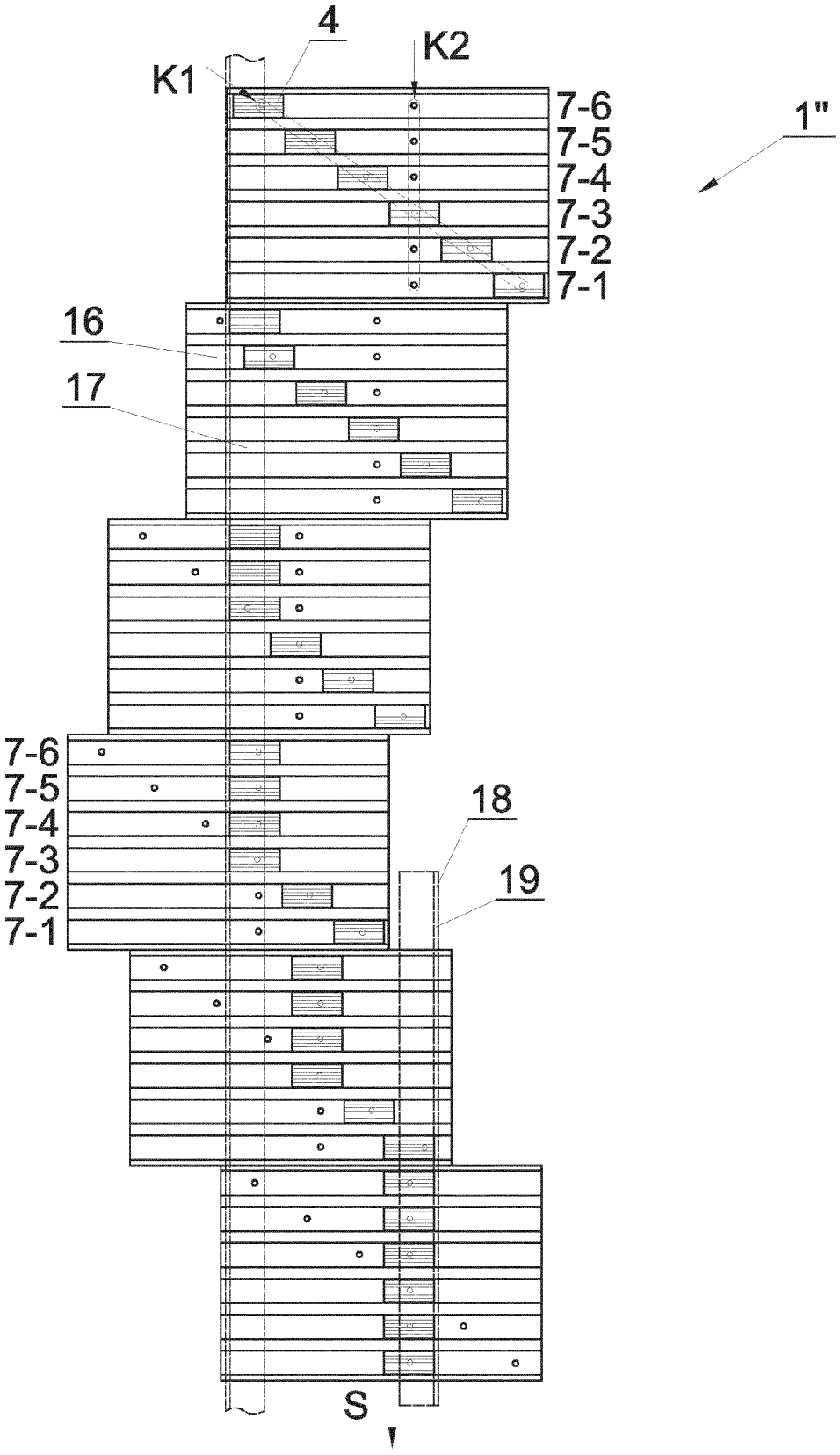


Fig. 5

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# EUROPEAN SEARCH REPORT

Application Number
EP 23 18 1215

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br>Y<br>A | DE 10 2017 127593 A1 (HAUNI MASCHINENBAU GMBH [DE]) 23 May 2019 (2019-05-23)<br>* figures 1-4 *<br>* paragraph [0040] - paragraph [0046] *<br>* paragraphs [0001], [0007] - [0010], [0037], [0040], [0041] * | 1,5-12<br>13<br>2-4 | INV.<br>A24C5/32<br>A24C5/47<br>A24D3/02 |
| Y | US 2006/201525 A1 (MEINS THOMAS [DE] ET AL) 14 September 2006 (2006-09-14)<br>* figure 2 *<br>* paragraph [0016] * | 13 | |
| A | EP 1 447 016 A1 (HAUNI MASCHINENBAU AG [DE]) 18 August 2004 (2004-08-18)<br>* figure 1 *<br>* paragraph [0025] - paragraph [0027] * | 1-13 | |
| A | US 2023/010804 A1 (CAMPITELLI GENNARO [CH] ET AL) 12 January 2023 (2023-01-12)<br>* figure 3 *<br>* paragraph [0074] * | 1-13 | |

TECHNICAL FIELDS SEARCHED (IPC)

A24C
A24D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 15 November 2023 | Schwertfeger, C |

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15-11-2023

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| DE 102017127593 A1 | 23-05-2019 | NONE | |
| US 2006201525 A1 | 14-09-2006 | AT E487393 T1 | 15-11-2010 |
| | | CN 1830339 A | 13-09-2006 |
| | | DE 102005011543 A1 | 14-09-2006 |
| | | EP 1700528 A1 | 13-09-2006 |
| | | JP 4891633 B2 | 07-03-2012 |
| | | JP 2006246887 A | 21-09-2006 |
| | | PL 1700528 T3 | 29-04-2011 |
| | | US 2006201525 A1 | 14-09-2006 |
| EP 1447016 A1 | 18-08-2004 | NONE | |
| US 2023010804 A1 | 12-01-2023 | BR 112022011308 A2 | 06-09-2022 |
| | | CN 114745976 A | 12-07-2022 |
| | | EP 4076044 A1 | 26-10-2022 |
| | | JP 2023505903 A | 13-02-2023 |
| | | KR 20220116482 A | 23-08-2022 |
| | | US 2023010804 A1 | 12-01-2023 |
| | | WO 2021122796 A1 | 24-06-2021 |

EPO FORM P0459

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## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- US 7296579 B2 **[0003]**