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Description

[0001] The invention relates to a vertical screw conveyor, comprising an elevating screw for conveying chopped and lumpy material with a screw blade rotating spirally around a screw core.

5 **[0002]** In the field of conveyors for lumpy material, which conveyors overcome a level difference, vertical screw conveyors are known (DE 1086625 B), which have a housing with screws rotating around the longitudinal axis of the conveyor for conveying lumpy material. GB913163A describes a vertical screw conveyor according to
10 the preamble of claim 1.

[0003] If such screws are used in a discontinuous conveying process, as is regularly the case, for example, in the feeding of furnaces for heating systems with lumpy fuel, wherein the fuel quantity is controlled at a constant screw speed via a clocked operation, the
15 problem arises that in the event of an interruption of the conveying operation, the chopped or lumpy material slides back in the screw conveyor due to gravity, so that when the conveying operation is restarted, lead times have to be taken into account until the material is available again at the outlet of the screw conveyor.

20 **[0004]** The invention is thus based on the object of designing an elevating screw of the type described above in such a way that a constant material flow is made possible in a discontinuous conveying process with varying cycle times.

[0005] The invention solves the given object with a vertical screw
25 conveyor according to claim 1 as well as with a method according to claim 4.

[0006] The invention is based on the observation that the majority of the dead weight of the chopped or lumpy material to be conveyed is absorbed by the spirally rotating screw blade and that the force

component acting along the rotating screw blade, which is decisive for the material to be conveyed sliding back, is relatively low. As a result of the measures according to the invention, a stop for the conveyed material can be formed by a retaining step which rises towards the conveying direction and which compensates for this force component. Depending on the dimensions of the screw and the chopped or lumpy material to be conveyed, the height of the retaining step can be considerably less than the height of the conveyed material resting on the screw blade because, due to the low force component acting along the conveying flank, the frictional forces acting within the conveyed material flow are sufficient to brake the conveyed material flow as a whole and prevent it from sliding back. Since the retaining step slopes downward in the conveying direction, it does not impede the conveyed material during operation of the screw conveyor; instead, when the retaining step is overcome, there is only a short-term loss of lift height for the conveyed material. As a result of the elimination of lead times for continuous conveying, not only are energy savings achieved, but the noise generated by the conveyor drive can also be reduced. This is particularly advantageous in connection with charging processes of furnaces for domestic heating systems. The measures according to the invention enable particularly favorable operating conditions in the case of vertical conveying of the chopped or lumpy material, but the elevating screw according to the invention can also be used advantageously at different elevating angles of the screw conveyor.

[0007] With regard to the retaining effect and the lift height losses occurring during conveying, advantageous conditions arise if the retaining step has a height corresponding to the thickness of the screw blade. As already explained above, such a low height of the retaining step is sufficient to effectively prevent backsliding of the conveyed material flow.

[0008] In order to enable not only low power consumption but also structurally simple manufacture of a screw conveyor according to the invention, it is proposed that the screw blade has at least two blade segments, each of which is arranged offset to one another in the longitudinal direction of the elevating screw to form the retaining step. Consequently, the lift height of the screw blade remains constant over the conveying height and is only interrupted at the transition between two blade segments by the retaining steps that are formed. Compared to an elevating screw without the retaining steps according to the invention, the speed can therefore remain the same.

[0009] The subject matter of the invention is shown in the drawings by way of example, wherein:

Fig. 1 shows a partially exposed side view of a vertical screw conveyor having an elevating screw, and

Fig. 2 shows a detailed perspective view of the elevating screw on a larger scale.

[0010] An elevating screw 1 is arranged within a vertical screw conveyor 2 and is driven by a drive 3 shown schematically. The elevating screw 1 has a screw core 4 with a screw blade 5 rotating spirally around it. The screw blade 5 forms a conveying flank 6 in conveying direction 7, which has a retaining step 8 which slopes in the conveying direction 7.

[0011] In conveying mode, the elevating screw rotates about its longitudinal axis so that chopped or lumpy material 9, such as wood chips, wood pellets or miscanthus, is conveyed in a vertical conveying direction 7 along the screw blade 5 to an ejector 10. Particularly favorable design conditions result when the drive 3 is not arranged near the floor, but on the ejector side 10 of the screw conveyor 2, so that its

horizontal feeder screw conveyor 11 can be placed as close to the floor as possible.

[0012] In the event of an interruption of the conveying operation, i.e. when the drive 3 is stopped, the chopped or lumpy material 9 would slide back along the screw blade 5 against the conveying direction 7 due to the force of gravity, if the retaining step 8 did not form a stop for the chopped or lumpy material 9. Since the screw blade 5 already absorbs a large part of the weight force components 7 of the chopped or lumpy material 9 running counter to the conveying direction 7, only a small force component remains acting along the screw blade 5, so that a retaining step 8, the height of which corresponds approximately to the thickness of the screw blade 5, is sufficient to prevent the flow of goods 9 from sliding back altogether, because the internal frictional forces of the flow of goods 9 already cause an additional braking effect.

[0013] In this context, in order to enable a simple production of an elevating screw 1, the screw blade 5 according to the invention has at least two blade segments 12, 13, each of which is offset relative to the other in the longitudinal direction of the elevating screw 1, forming the retaining step 8. The offset arrangement is understood to mean that the blade segment 12 preceding in conveying direction 7 is set back in relation to the blade segment 13 following in conveying direction 7 in the opposite direction to conveying direction 7, so that the resulting spacing of the blade segments 12, 13 from one another forms the retaining step 8.

[0014] If, as can be seen in particular from Fig. 2, several blade segments 12, 13 are arranged offset to each other, the retaining step 8 can be provided without changing the pitch of the screw blade 5, so that constant power ratios result with regard to the drive 3.

[0015] As a result of the fact that, according to the above explanations, a backsliding of the chopped or lumpy material 9 to be

conveyed can be prevented in the case of an elevating screw 1, and that no modifications of the drive 3 are therefore required for this purpose, the drive 3 has to be put into operation for a significantly shorter period of time in a typical conveying situation, such as that encountered in domestic heating systems, because a start-up phase, during which the chopped or lumpy material 9 has to be conveyed from the base of the vertical screw conveyor 2 to the ejector 10, can be omitted.

Patentkrav

1. Vertikal skruetransportør med en løfteskruer (1) med et skrueblad (5), der roterer spiralformet omkring en skruekerne (4), hvor skruebladets transport-
5 flanker (6) omfatter mindst et tilbageholdelsestrin (8), som skråner nedad i transportretningen (7), **kendetegnet ved, at** skruebladet (5) omfatter mindst to bladsegmenter (12, 13), der hver er arrangeret forskudt i forhold til hinanden i længderetningen for løfteskruen (1) under dannelse af tilbageholdelsestrinnet (8), hvorved det i transportretningen (7) forangående bladsegment (12), er tilbageholdt i forhold til det i transportretningen (7) efterfølgende bladsegment (13),
10 **kendetegnet ved, at** afstanden mellem bladsegmenterne (12, 13) i forhold til hinanden ved tilbageholdelsen udgør tilbageholdelsestrinnet (8).
2. Vertikal skruetransportør (2) ifølge krav 1,
15 **kendetegnet ved, at** tilbageholdelsestrinnet (8) har en højde, som svarer til tykkelsen af skruebladet (5).
3. Vertikal skruetransportør (2) ifølge krav 1 eller 2,
kendetegnet ved, at et drev (3) er arrangeret på ejektorsiden (10) af den vertikale skruetransportør (2).
20
4. Fremgangsmåde for indførsel af stykvist brændstof til ovne i varmesystemer, hvorved brændstofsmængden styres ved konstant skrueomdrejningstal via intervalstyret drift, og afhakket eller stykdelt materiale (9), som for eksempel træflis, træpiller eller Miscanthus, ved hjælp af en vertikal skruetransportør (2)
25 ifølge et af de foregående krav transporteres i en vertikal transportretning (7) langs et skrueblad (5) til en ejektor (10).

FIG. 1

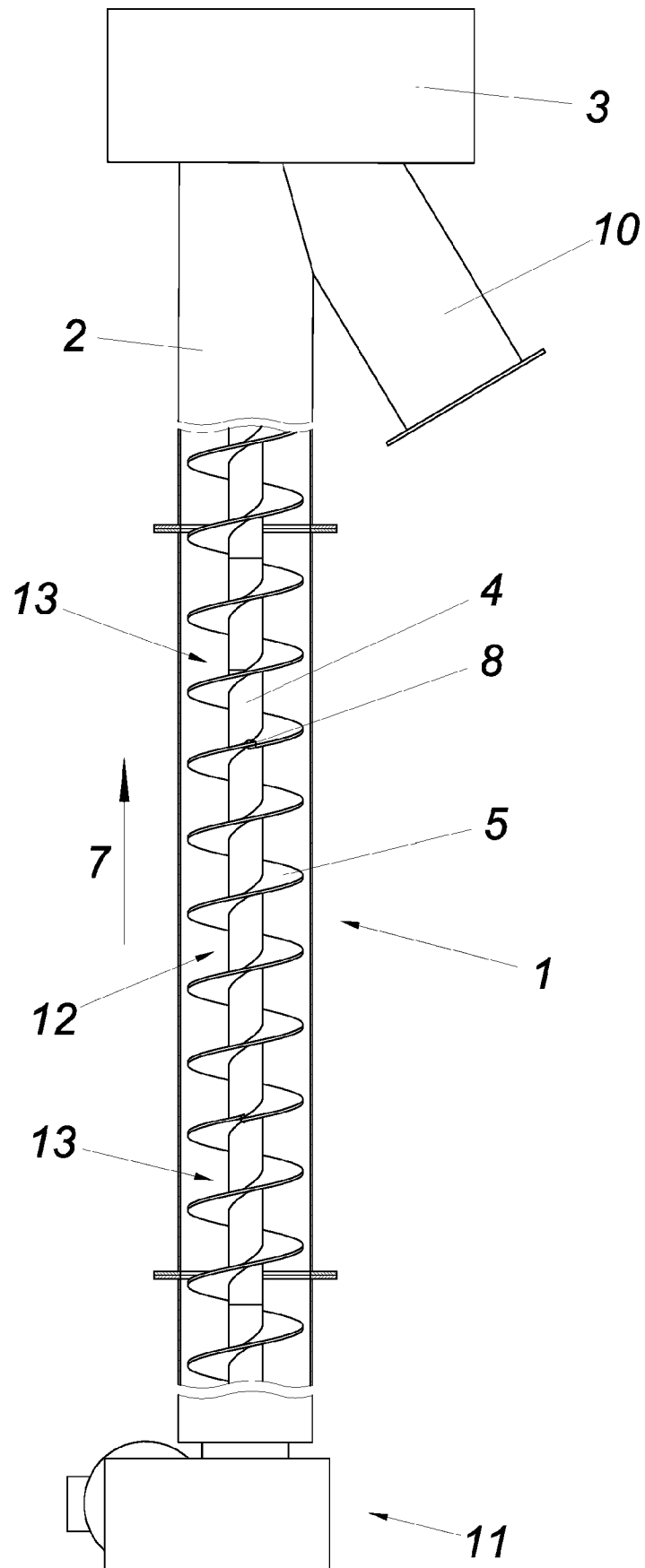


FIG.2