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(54) **Berendezés tetszőleges típusú elemek aprításához**

DEVICE FOR GRINDING PARTS OF ANY KIND

The invention relates to a device for comminuting parts of any kind, in particular plastics, preferably plastics hollow bodies such as, for example, plastics bottles, having a charging device and a comminuting device, wherein the charging device comprises at least one conveyor unit and the comminuting device comprises a rotor which is equipped with a tool and rotates within a housing, wherein the conveyor unit conveys at an angle in the range of from 45° to 90° to the rotor axis at least in the region immediately in front of the rotor, and the conveyor unit is in the form of a conveyor screw.

Such a device has become known from DE 296 10 848 U1 and from US 4,932,595. GB 2 390 043 A discloses a device for burning packaging materials which comprises a bale feed device, a bale comminuting device, a transport belt for comminuted material and a corresponding feed device, and a heating device for burning the comminuted material.

Devices of the generic type have been known in practice for many years in very different forms. Merely by way of example, reference is also made to DE 38 13 879. The device known therein is specifically a comminuting machine for thermoplastic waste. The material for grinding is delivered *via* a hopper and passes directly from the hopper *via* a conveyor unit into the actual mill, which comprises a rotor which rotates in a housing. The charging device, or the conveyor unit, is in the form of a screw. The axes of rotation of the screw and the rotor run parallel to one another, so that the material for grinding reaches the rotor *via* the screw at the head end and must there be grasped by the rotor. This is problematical in particular at higher speeds, because lightweight material for grinding, in particular material for grinding that consists of plastics hollow bodies, tends to be pushed back by the rotary movement of the rotor. Conveying the material for grinding into the rotor is therefore extremely problematical. In addition, it has been found that, in the case of the known manner of conveying material for grinding into the region of the rotor, very considerable noise emissions occur, which always have to be reduced.

The object underlying the present invention is, therefore, to configure and further develop a device for comminuting parts of any kind, in particular plastics, preferably plastics hollow bodies such as, for example, plastics bottles, in such a manner that the intake of material in the region of the rotor is sufficiently good that the material for grinding can be conveyed into the region of the rotor without difficulty. Working noise is to be reduced.

According to the invention, the above object is achieved by the features of patent claim 1. According to that claim, the device in question is characterised in that the conveyor unit conveys at an angle in the range of from 45° to 90° to the rotor axis at least in the region immediately in front of the rotor.

According to the invention, it has first been found that the problems described above can be alleviated by departing from the proven parallel arrangement of the conveyor axis and the axis of rotation of the rotor, namely as a result of the fact that the conveyor unit conveys at an angle of from 45° to 90° to the rotor axis at least in the region immediately in front of the rotor. This has the advantage that the material for grinding is not conveyed into the region of the rotor parallel to the rotation of the rotor, which has the result that the material for grinding is regularly pushed back and considerable noise emission occurs. In complete contrast, a

completely different method of conveying is chosen here, namely at an angle in the range of from 45° to 90° to the rotor axis, preferably at an angle of approximately 90° to the rotor axis. Preferably, therefore, the material for grinding is conveyed orthogonally to the axis of rotation of the rotor, so that the material for grinding can be picked up in an ideal manner according to the configuration of the rotor and the configuration of the housing arranged around it, namely according to the disposition and arrangement of the blades and/or cutting teeth.

A plurality of conveyor units is advantageously provided, so that the material for grinding can be conveyed parallel to the rotor, namely according to the width of the comminuting device. The material for grinding can thereby be conveyed and fed to the comminuting device over the entire width of the comminuting device. This effects a very considerable throughput.

Also advantageously, the conveyor units are arranged equidistantly from one another. Further advantageously, the distances between the individual conveyor units can be varied. A special adjusting mechanism can be provided for this purpose.

In principle, it is conceivable for the conveyor units to extend parallel to one another. However, it is likewise conceivable to configure the path of the conveyor units at an angle to one another, preferably at an acute angle to one another. It would thereby be possible, when conveying bulky material for grinding, for example when conveying PET bottles, for these to be at least partially compressed or deformed or even broken up.

The conveyor units can be arranged substantially in one plane. If the material for grinding is to be subjected to forces even during conveying, it can further be advantageous to arrange the conveyor units in different planes relative to one another, where possible extending at an angle to one another.

With regard to the conveying of the material for grinding, it is possible to arrange the conveyor units substantially horizontally. It is likewise conceivable to feed the material for grinding to the comminuting device vertically or at any desired angle between 0° and 180° to the horizontal, as required. It must thereby be ensured that the conveyor unit has the required angle in the range of from 45° to 90° to the rotor axis at least in the region immediately in front of the rotor.

It has been found that the intake of material in the region of the comminuting device is particularly good if the longitudinal axes of the conveyor units are in direct alignment with the rotor axis or extend at most offset slightly relative to the rotor axis. The conveyor path can thereby be divided into different conveyor sections, so that the material for grinding can change directions along the conveyor path.

The conveyor unit is in the form of a conveyor screw. A plurality of conveyor screws can be provided as conveyor units. The conveyor screws are to act against one another in such a manner that they have a behaviour that draws in the material for conveying. The direction of rotation and the configuration of the conveyor screws are to be correspondingly matched to one another.

According to the specific configuration of the conveyor screws, they can rotate in the same direction or in opposite directions. The conveyor screws can be mounted in different ways, for example floating or with a counter-bearing on each side.

In particular with regard to a trouble-free comminution process with optimum throughput, it is advantageous if the speed of the conveyor screws is regulated preferably in consideration of the load bearing

capacity of the drive. In addition, a comprehensive sensor system could be provided, which influences the speed in consideration of other factors.

The conveyor screws can be equipped at least in part with tools, wherein the tools of the conveyor screws can be in the form of blades and/or ripper teeth. The provision of ripper teeth serves to separate connected parts and assists with breaking up entire bales of material.

With regard to trouble-free operation, it is further advantageous if the conveyor screws can be rotated backwards *via* a reversing control system. Accumulations of material or blockages can thereby be removed without difficulty.

It should further be mentioned that the material for grinding can be fed to the conveyor unit in any desired manner. With regard to a particularly simple configuration, a hopper for delivering the material for grinding is installed upstream of the conveyor unit. Any desired other configurations for the purpose of delivering the material for grinding can be implemented.

The comminuting unit can in principle be of very different constructions, for example in the form of a cutting mill, hammer mill, shredder, etc. Further different configurations, in particular in detail, are conceivable.

In light of the above comments, it can be concluded that the device according to the invention is especially suitable in particular for comminuting lightweight materials, preferably for comminuting plastics hollow bodies. This is due not least to the improved intake of material in the region of the comminuting device. Owing to the particular arrangement of the charging device relative to the direction of rotation of the rotor, not only is the intake of material assisted, but noise emissions especially are reduced. A further advantage is that the delivery height in the device according to the invention is lower than in conventional comminutors, which results in a better possibility of addition or installation in the field of manufacture.

There are various possibilities for configuring and developing further the teaching of the present invention in an advantageous manner. Reference is to be made in this connection on the one hand to the patent claims subordinate to patent claim 1 and on the other hand to the following description of a preferred embodiment of the invention with reference to the drawing. In conjunction with the description of the preferred embodiment of the invention with reference to the drawing, preferred configurations and further developments of the teaching will also be described generally.

In the drawing

Fig. 1 shows, in a schematic side view, an embodiment of a device according to the invention,

Fig. 2 shows the subject matter of Fig. 1 in cross-section through the charging device, and

Fig. 3 shows the subject matter of Fig. 1 in a schematic top view.

Figures 1 to 3 show an embodiment of a device according to the invention for comminuting parts of any kind, the device here specifically being a device for comminuting plastics hollow bodies, which are not shown in the figures. Plastics bottles, for example PET bottles, are regularly comminuted with such a device. The device comprises a charging device 1 and a comminuting device 2. In the embodiment shown here, the charging device 1 comprises a total of three conveyor units 3. The comminuting device 2 comprises a rotor 4 which is equipped with a tool and rotates within a housing 5. The housing 5, which is often also referred to as a stator, is likewise equipped with tools 6.

Figures 1 to 3 show, in common, that the conveyor unit 3 conveys orthogonally to the rotor axis 7, an arrangement in the range of from 45° to 90° to the rotor axis 7 being possible according to the invention.

The figures further show a drive 8 for the rotor and drives 9 for the conveyor units 3. The drives 8, 9 are independent of one another, it being advantageous to synchronise the drives 9 of the conveyor units 3.

The material for grinding is delivered *via* a hopper 10 and is picked up in the lower region of the hopper 10 by the conveyor units 3, which extend parallel to and equidistantly from one another in a plane, or extend to the comminuting device 2. The conveyor units 3 are in the form of conveyor screws 11.

Over the full width of the three conveyor screws 11 working side by side, the material for grinding is conveyed to the rotor 4 extending orthogonally to the conveyor screws 11 and is picked up by the tools 12 thereof and ground. The bulk material has already been compressed and/or separated by means of the tools 6 of the housing 5, so that it passes with a reduced volume into the region of the rotor 4, where it can be comminuted or shredded by the tools 12.

It is further apparent from the figures that the rotor axis 7 is situated approximately in the same plane as the axis of rotation 13 of the conveyor screws 11. This results in an extremely small overall height, it being possible, owing to the structural features, to generate a considerable mass throughput, with a substantially smaller delivery height into the comminutor than in the case of conventional devices of the generic type.

In relation to features which are not apparent from the figures, reference is made to the general part of the description in order to avoid repetition.

Finally, it should be noted that the embodiment described above serves merely to describe the claimed teaching by way of example but does not limit it to the embodiment.

BERENDEZÉS TETSZŐLEGES TÍPUSÚ ELEMEK APRÍTÁSÁHOZ

Szabadalmi igénypontok

1. Berendezés műanyagok, különösen üreges műanyagtestek, mint például műanyagpalackok felaprításához, amely adagolószerkezetet (1) és aprítószerkezetet (2) tartalmaz, ahol az adagolószerkezetnek (1) legalább egy továbbító egysége (3) és az apritószerkezetnek (2) házon (5) belül forgó, szerszámokkal felszerelt forgórésze (4) van, továbbá ahol a továbbító egység (3) legalább közvetlenül a forgórész (4) előtti tartományban a forgórész tengelyéhez (7) képest 45° és 90° közötti szögtartományban szállít, valamint a továbbító egység (3) szállítócsigaként (11) van kialakítva, **azzal jellemezve**, hogy a szállítócsiga (11) fordulatszáma szabályozva van.

2. Az 1. igénypont szerinti berendezés, **azzal jellemezve**, hogy a szállítócsiga (11) fordulatszáma a meghajtás teljesítményfelvételének figyelembevételével van szabályozva.

3. Az 1-2. igénypontok bármelyike szerinti berendezés, **azzal jellemezve**, hogy a szállítócsiga (11) irányváltó vezérlés útján visszafelé forgatható.

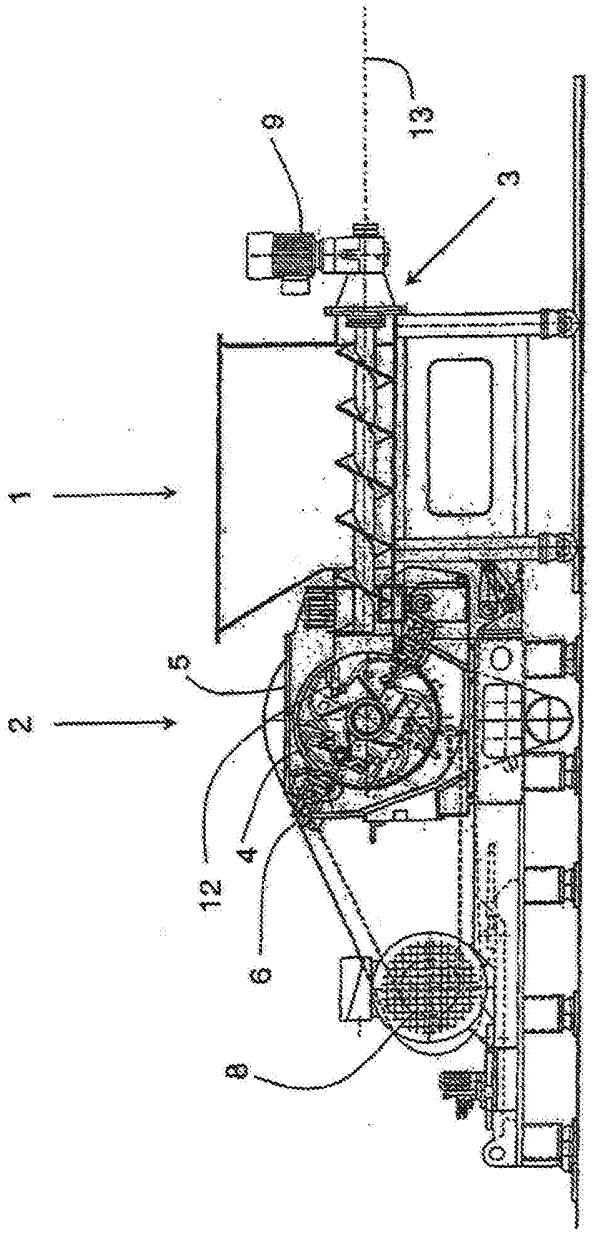

Fig. 1

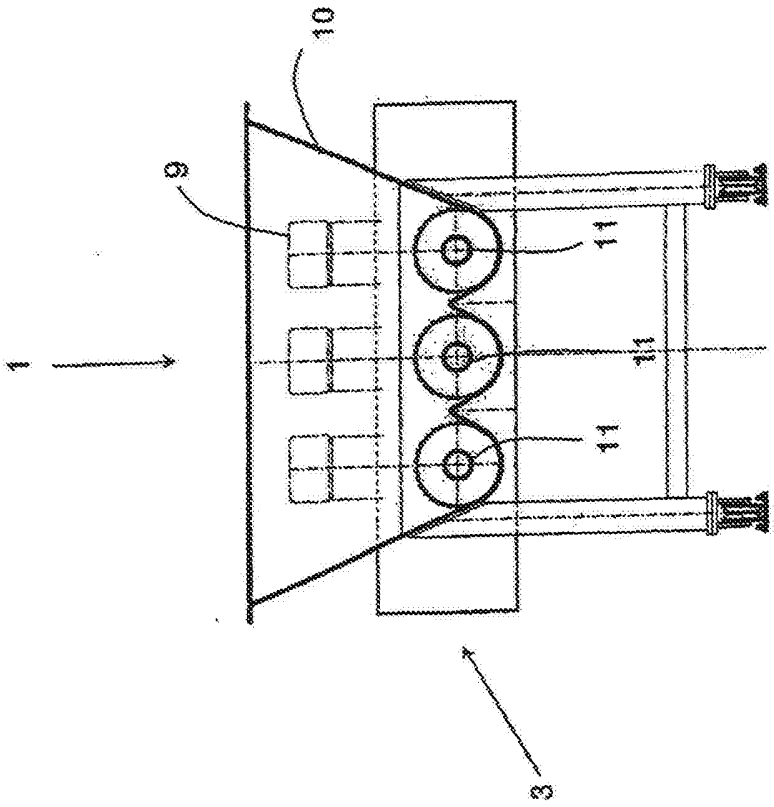

Fig. 2

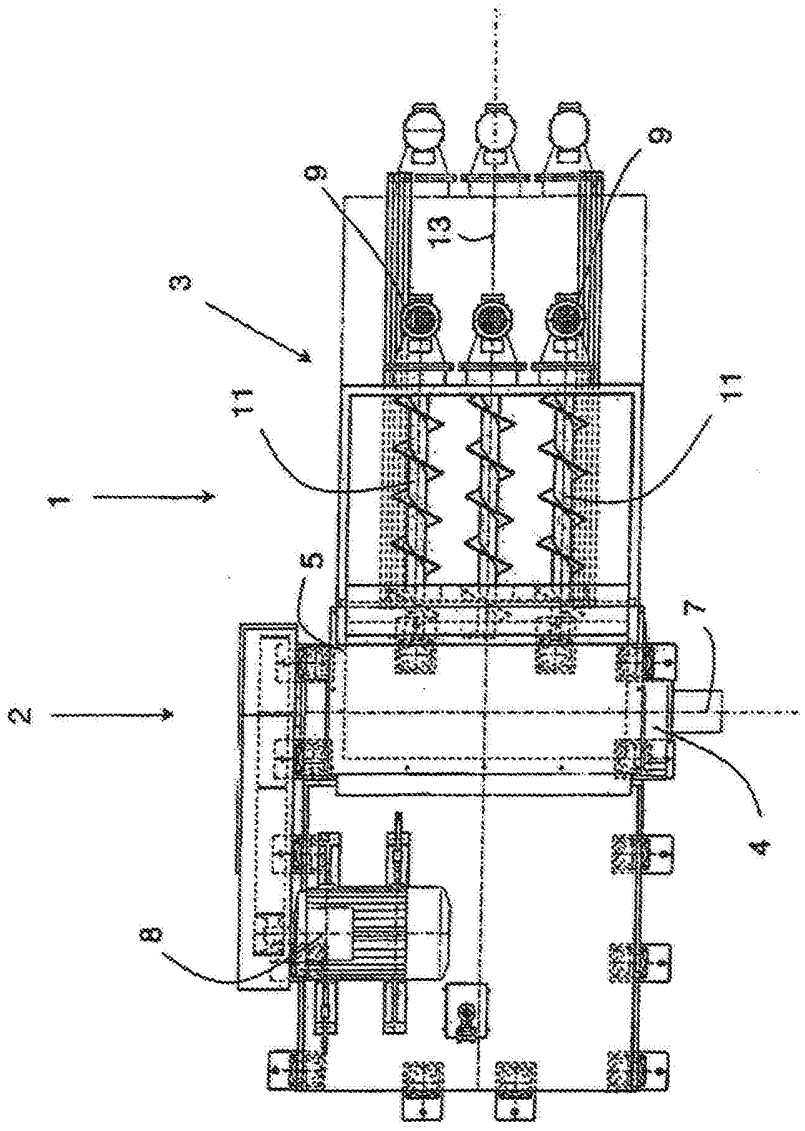

Fig. 3