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(54) **CONVEYOR DEVICE FOR COMBUSTION BOILERS**

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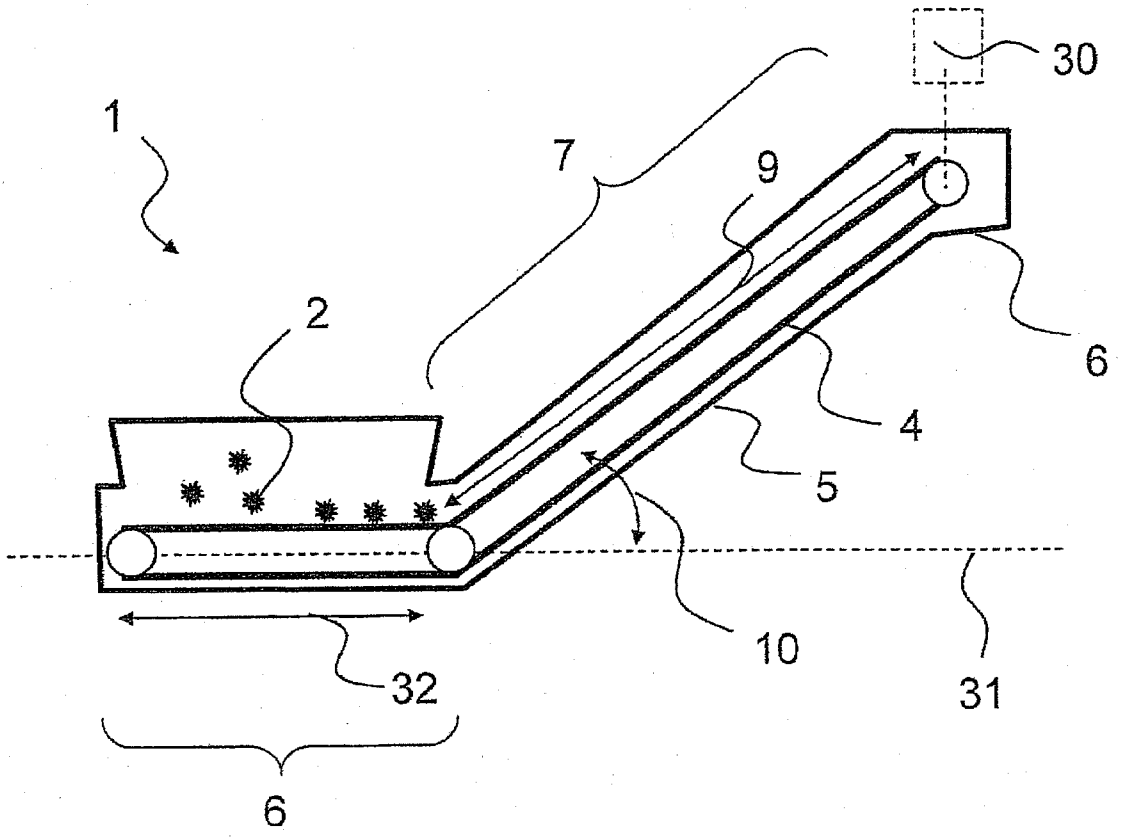
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(57) **ABSTRACT**

A device, which conveys and handles material from a combustion boiler, includes at least one conveyor belt and a housing surrounding the conveyor belt. The conveyor belt includes at least one horizontal collection area and a handling area. The housing includes at least one outlet for the material. Furthermore, the handling area has a first length of at least 10 m and an inclination of at least 38°. Some arrangements relate to a corresponding combustion plant and to a method for handling hot ash.



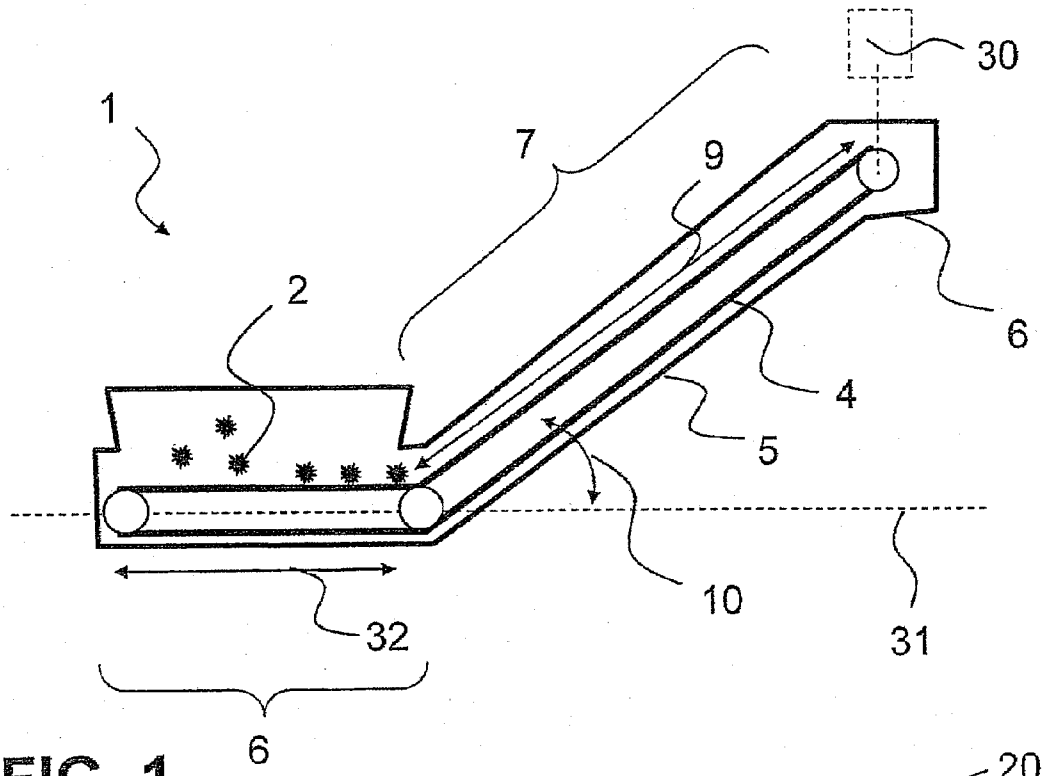


FIG. 1

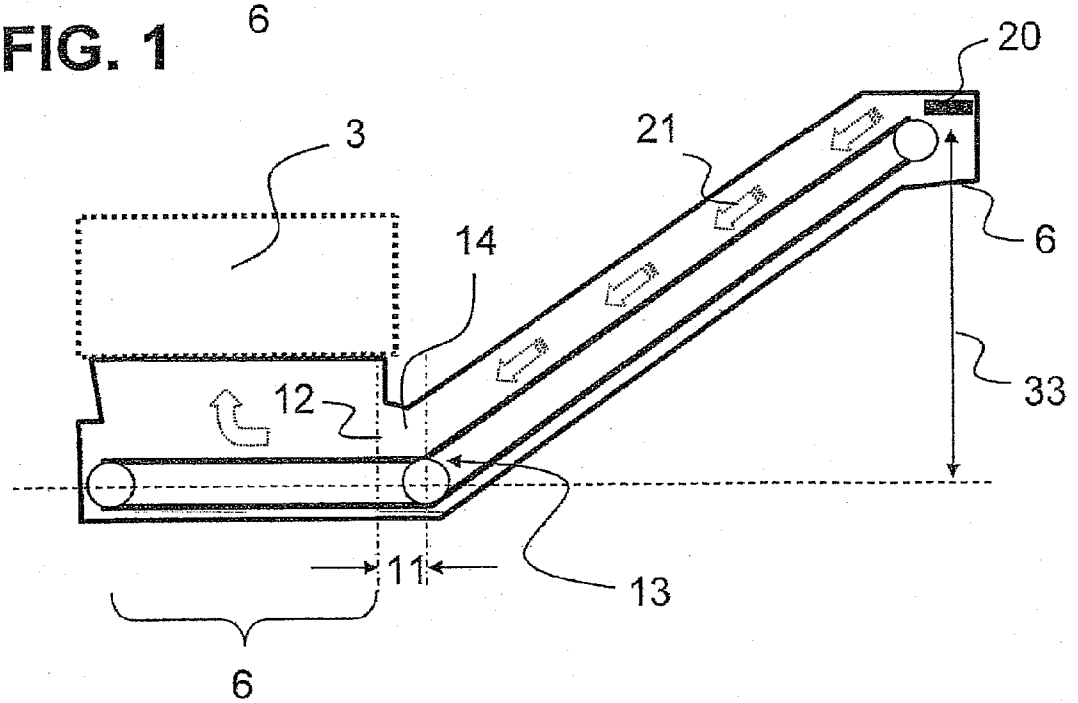


FIG. 2

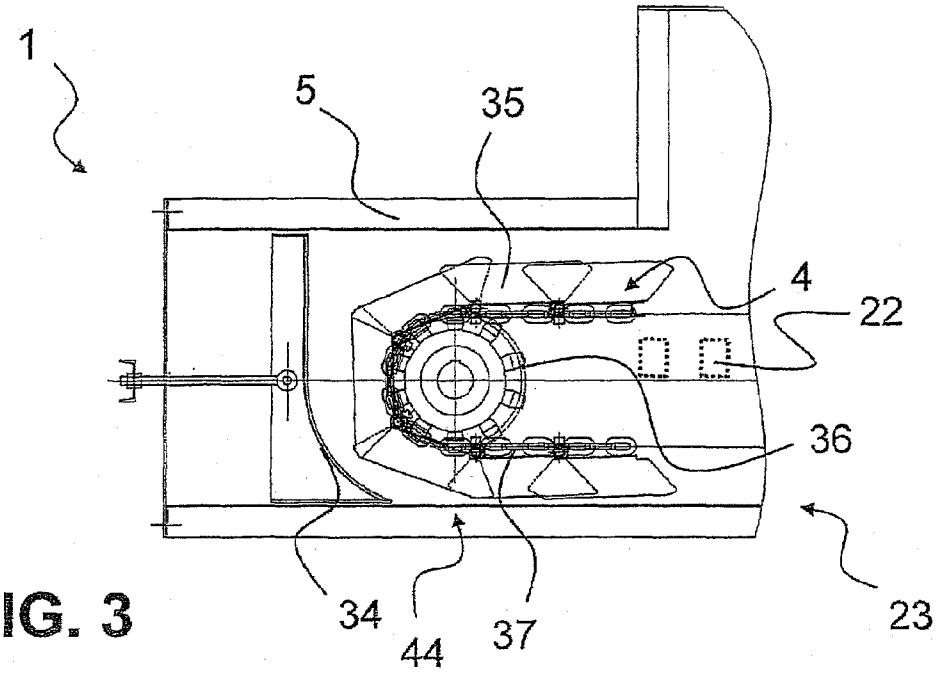


FIG. 3

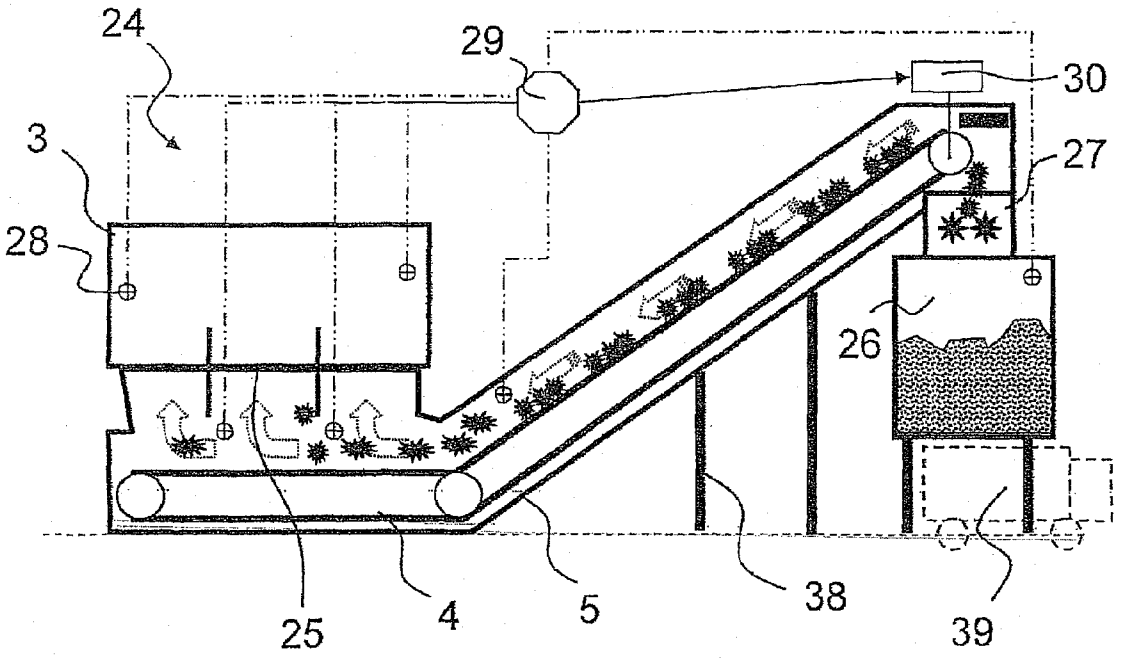


FIG. 4

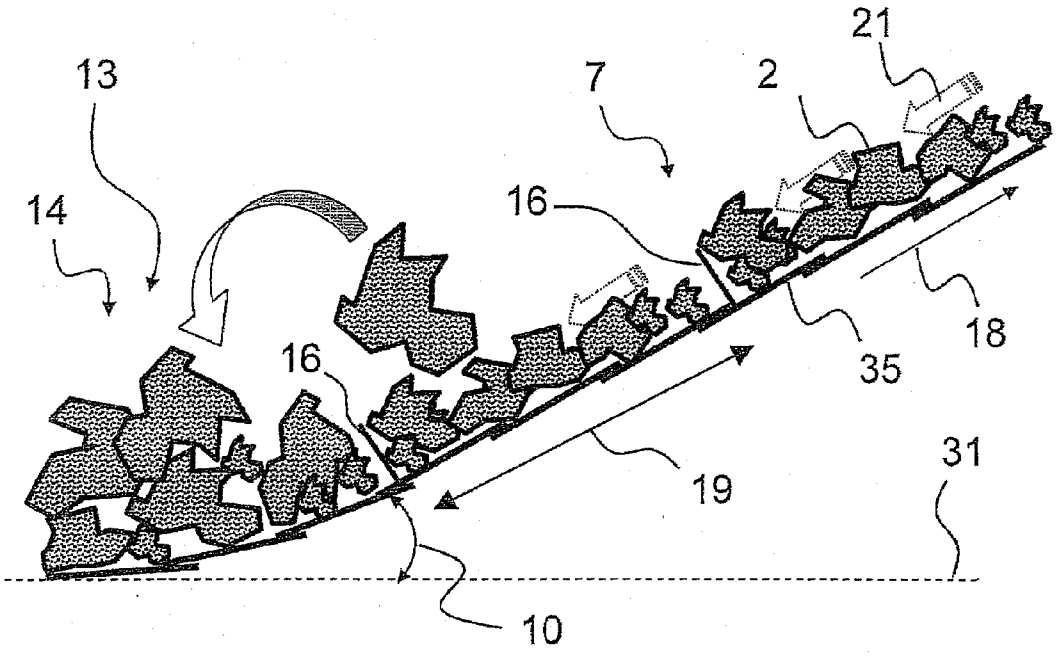


FIG. 5

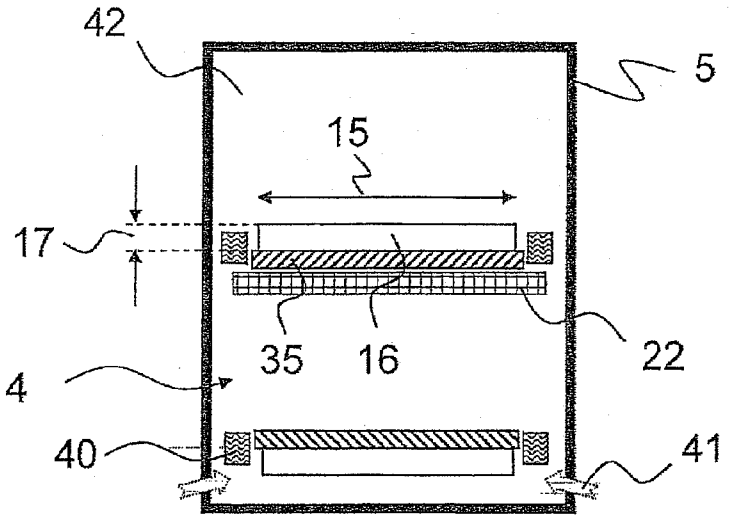


FIG. 6

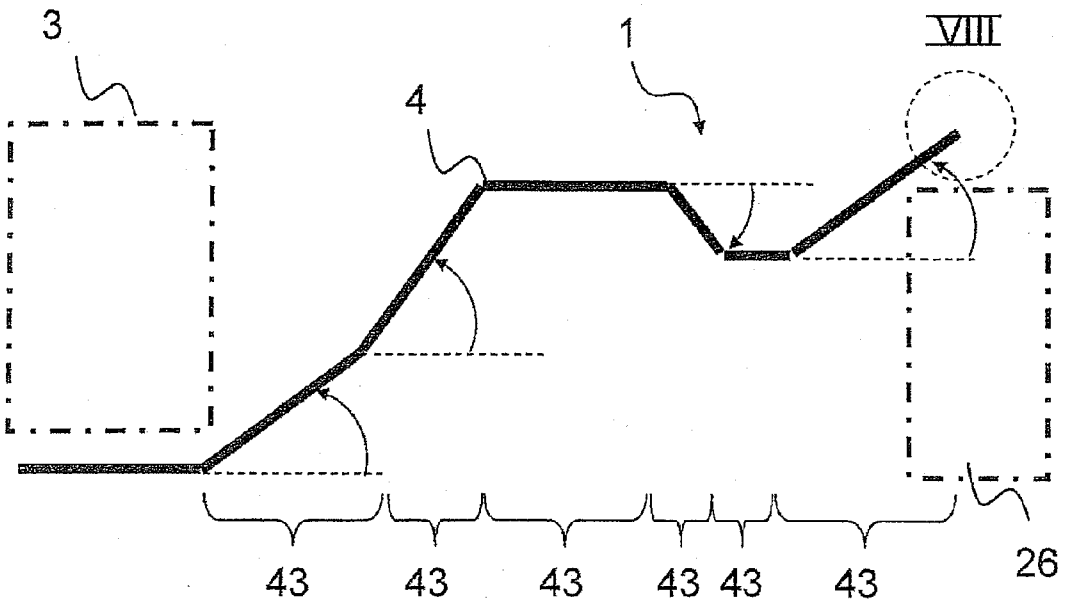


FIG. 7

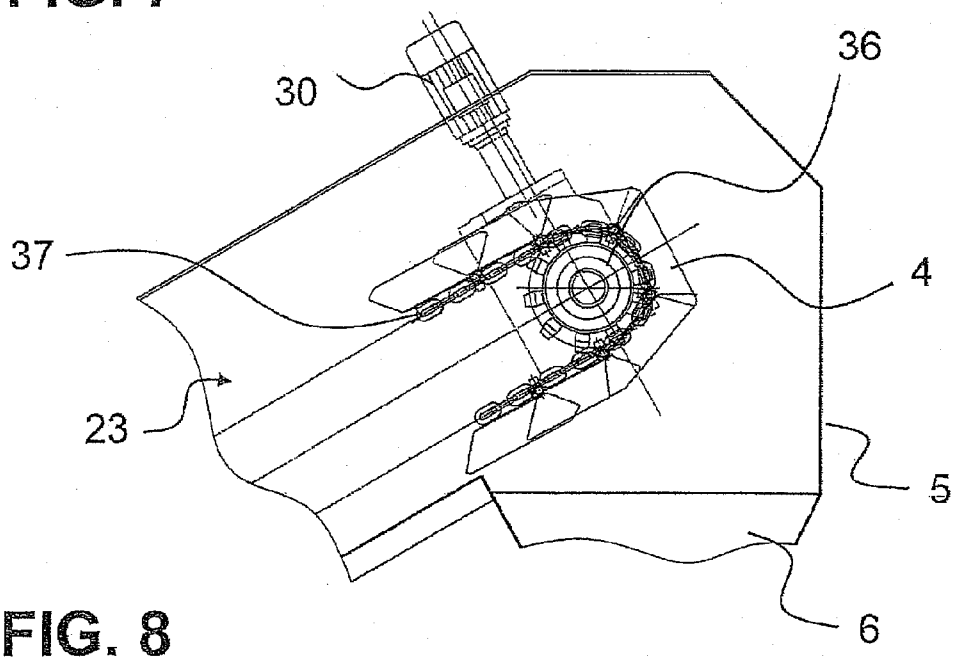


FIG. 8

CONVEYOR DEVICE FOR COMBUSTION BOILERS

[0001] The present invention relates to a device for conveying and treating material from a combustion boiler, having at least one conveyor belt and a housing surrounding the conveyor belt. The invention is used in particular in plants having at least one combustion boiler, for example plants for burning fossil fuels and/or waste combustion plants. In addition, the invention also relates to a corresponding plant and to a method for conveying and treating hot ash of a combustion boiler.

[0002] During the transport of slag, ash or combustion residues, designated below as "material", it is especially important to firstly achieve specific solidification or consolidation of the hot, partly still molten materials, such that, in particular, conveying or further processing of these materials is made possible after extraction from the combustion boiler. In addition, it is also desirable to utilize the energy still present in the hot material and thus improve the overall efficiency of the plant or of the combustion boiler.

[0003] After it was first assumed that quenching in a water bath ("wet discharge") is necessary for conveying the hot materials, "dry extraction systems" have also gained acceptance since the nineteen nineties. In this case, the hot material is put onto conveyor belts and transported further there, wherein, if need be, post-combustion or specific cooling of the hot material is also partly carried out on the conveyor belt. In this case, it will immediately become obvious that the materials used here, in particular the conveyor belt, have to withstand the high temperatures, the corrosive environment and/or the high mechanical loading. These conveyor belts are usually constructed to be encapsulated relative to the external environment and therefore have a housing which prevents the combustion gases which are still produced during the treatment of the material from being able to easily escape into the environment. In addition, the combustion boilers are mainly operated with a slight vacuum, and so the combustion gases produced by the material are drawn off toward the combustion boiler by a corresponding suction.

[0004] For an extraction device which is useful from the energy point of view and is specifically set up with regard to the cooling behavior, reference may be made to EP 0 471 055 B1. In this document, it is explained that it is useful to cool the hot material in two separate cooling stages with an interposed comminuting step for the hot material. In the process, in particular a cooling air flow according to the counterflow principle is to be realized, said cooling air flow being provided at the end of the second cooling stage and at the end of the first cooling stage. Special effects are explained in this document with regard to the comminution of the hot material and the rearranging, such that a more effective operation of the combustion boiler overall is to be made possible.

[0005] In this construction, however, allowance is to be made for the fact that a considerable construction space regularly has to be made available for this purpose. In addition, the fact that an increased cost in terms of apparatus is necessary, especially as a result of the provision of the comminuting stage, and, with regard to the coupling of the systems, special requirements are imposed on the tightness of these systems, also at the high thermal and/or dynamic alternating stresses, must not be ignored.

[0006] Proceeding therefrom, an object of the present invention is to at least partly solve the problems described with respect to the prior art. In particular, a device for conveying and treating material from a combustion boiler is to be specified, said device being of simple construction and making possible effective conversion of fuels in the material in terms of energy. In addition, a plant is also to be specified with which combustion of the material is achieved with high efficiency, wherein in particular specific post-combustion of the material on the device for conveying and treating material is to be effected. Finally, a method for conveying and treating hot ash of a combustion boiler is also to be specified, with which method the abovementioned aims can likewise be at least partly achieved.

[0007] These objects are achieved with a device according to the features of claim **1** or with a plant having such a device according to the features of claim **9**. Furthermore, these objects are achieved by a method for conveying and treating hot ash of a combustion boiler comprising the steps according claim **12**. Advantageous configurations of the invention are specified in the respective dependent claims. It should be noted that features stated individually in the claims can be combined in any desired, technologically appropriate manner and show further configurations of the invention. The description, in particular in connection with the figures, explains the invention and indicates additional exemplary embodiments.

[0008] The device according to the invention for conveying and treating material from a combustion boiler has at least one conveyor belt and a housing surrounding the conveyor belt, wherein the conveyor belt has at least one horizontal collecting region and a treatment region, and the housing has at least one outlet for the material. Furthermore, the treatment region has a first length of at least 10 m (meters) and a slope of at least 38° (degrees).

[0009] The device constitutes in particular an "extractor" or an encapsulated plate conveyor or the like. In any case, the device is one which realizes "dry" conveying of the material from the combustion boiler. The term "material" means in particular combustion residues, in particular ash, which is delivered (directly) from the combustion boiler onto the conveyor belt. In the process, the material has, for instance, a temperature within the range of 600° to 1000° C., in particular within the region around 800° C. The "combustion boiler" may be, for example, a boiler embodied as follows: lignite combustion boiler, coal combustion boiler, garbage combustion boiler.

[0010] The conveyor belt is preferably embodied like a steel plate conveyor in which a multiplicity of steel plates are arranged in a row in an articulated overlapping (minimum overlap) manner and are moved via drives or deflecting rollers. Suitable materials for the conveyor belt are therefore in particular impact-resistant, corrosion-resistant, high-temperature steels.

[0011] This conveyor belt is surrounded by a housing. The housing is mostly constructed in such a way that it can be positioned and, if need be, fastened directly on a corresponding platform. The conveyor belt is oriented, positioned and fastened in the housing. The housing regularly has connecting hatches, for example toward the combustion boiler. In addition, at least one outlet for the material is provided. In addition, still smaller passages for inspection, cooling and/or setting the conveyor belt can be provided. This housing is also usually produced from steel and is suitable for permanently withstanding the environmental conditions described above.

[0012] For the construction of the conveyor belt, it is now further proposed that said conveyor belt be divided into two different regions, namely a horizontal collecting region and an inclined treatment region. The horizontal collecting region is regularly arranged below the hatch for the combustion boiler and serves to receive the material falling onto the conveyor belt from above. So as not to cause any unidirectional rebounding of the material from the conveyor belt, a substantially horizontal orientation of the conveyer belt is proposed. In these large plants, it is of course the case that the horizontal position cannot always be exactly maintained, and therefore in particular certain tolerance ranges, for example with a deviating angle of up to +/−5° (degrees) are acceptable here.

[0013] Whereas the (possibly still burning) material is also primarily collected on the conveyor belt in this collecting region, the cooling process or post-combustion process is now primarily carried out in the treatment region. The latter is first of all to be embodied with a first length which is at least 10 m. It is especially preferred that the first length is greater than 30 m or even at least 50 m. In this connection, a larger length is also to be preferred in the case of smaller slopes specified here, and vice versa. The first length of the treatment region is determined in particular in the extension direction of the conveyor belt. The first length of the treatment region has in particular an effect on the cooling distance which can be achieved and on the length over which the material is transported, without complete reorientation of the material on the conveyor belt itself. In this respect, the aim here is to realize an especially large first length.

[0014] Furthermore, it is also proposed that the treatment region have a slope of at least 38°, preferably a slope of at least 42° or even up to 45° relative to the horizontal. In addition, it is also recommended that the slope selected should not be greater than 60° or should even be at most 50° in order to limit the proportion of material slipping down and therefore in order to protect the device and achieve a desired transport quantity at normal speeds of the conveyor belt. The slope proposed here ensures, for example, that especially large and/or elongated material lumps are brought into an unstable position during the conveying and therefore, in particular in a specific manner, these large material lumps slip down again and possibly burst in the process or can also be cooled or treated from another side. In addition, the slope also has the advantage that hotter material can specifically be separated from colder material upon entering the treatment region and/or specific portioning of the material to be treated or a uniform distribution of the material over the conveyor belt can be achieved. The last-mentioned effects are explained in detail in particular with reference to developments of the invention below. In effect, however, it should be noted that the preconditions for a compact device having especially good properties with regard to the post-combustion of the material are specified by these simple construction measures.

[0015] According to a development of the invention, it is proposed that the treatment region be arranged at a maximum distance of 5 m (meters) from the end of the collecting region.

[0016] The collecting region normally has an extent of, for example, 5, 8 or at most 10 m, ash being delivered from the entire bottom of the combustion boiler. In the case of especially large combustion boilers, however, this collecting region can also have a length of, for example, up to 20 m or even 30 m. This now means that material that is already hot is delivered onto the conveyor belt from one side and said conveyor belt is repeatedly covered with new, hot material on its way along the collecting region until it has finally reached the end of the collecting region, that is to say the location from which new material is no longer delivered onto the conveyor belt from above. In the process, the lowermost layers are regularly substantially solidified more quickly due to their direct contact with the conveyor belt, in which case it now has to be feared that the hot material lying above the lowermost layers will disturb this process. For this reason, rapid transition to the treatment region at this location is now proposed, wherein in particular a uniform distribution or rearranging of the hot material is effected. It is therefore especially preferred that the treatment region begins, if need be, at an even smaller distance from the end of the collecting region, for example at a maximum distance of at most 3 m or even at most 1.5 m.

[0017] Furthermore, it is considered to be advantageous that the collecting region and the treatment region are connected via a deflecting region, the housing forming a reservoir for material in the deflecting region above the conveyor belt. As a rule, the "deflecting region" constitutes the transition section of the conveyor belt from the horizontal orientation to the inclined orientation. The deflecting region is characterized, for example, by corresponding deflecting rollers at the conveyor belt. In the deflecting region there is in particular a radius of curvature for the conveyor belt, whereas a substantially straight running direction for the conveyor belt can be found in the collecting region and/or in the treatment region. While the material passes through the deflecting region, in particular large material and/or material piled up high is brought into an unstable position, in the course of which in particular the large materials lying in an unstable position and/or the hot materials delivered last tend to slip or roll down again toward the collecting region on account of the effect of gravitation. This now means that these material portions collect or knock against one another or rub against one another in the area of the deflecting region. In order to make possible or assist this material accumulation, it is proposed that the housing permits sufficient space for such a material accumulation on or above the conveyor belt. The term "reservoir" therefore means in particular a section of the housing which is substantially free of built-in components and/or even forms a relatively large clearance width above the conveyor belt. If need be, the reservoir can also be embodied with reinforced side walls of the housing and/or with a protective layer and/or a separate cage in order to guide the material accumulations arising there.

[0018] The device can now also be developed in such a way that the conveyor belt is embodied with at least one of the following properties:

[0019] a width of the conveyor belt of at least 0.80 m (meters),

[0020] webs running along the width and having a web height of at most 200 mm (millimeters),

[0021] webs which are arranged along the extent of the conveyor belt at a distance apart of at least 0.65 m (meters) and which run along the width.

[0022] The width of the conveyor belt, which is regularly determined perpendicularly to the extension direction of the conveyor belt, is thus greater than in current configurations of the conveyor belt. In particular, a width of at least 1.20 m or even 2.40 m is to be realized. The width specified here has special advantages during the distribution of the material on the conveyor belt, to be precise during the delivery of the material from the combustion boiler on the one hand and

during the rearranging of the material in the treatment region and/or in the deflecting region on the other hand. In particular, the ranges of the width are also preferably between 0.80 m to 1.20 m or 1.20 m to 2.40 m. The aim here is to distribute the material in particular over the width of the conveyor belt and thus also achieve, in addition to good contact with the (cooler) conveyor belt, a large surface for the contact with the cooling air flow.

[0023] In addition, webs which extend substantially over the width of the conveyor belt can be provided. The webs limit the movement of the material on account of the gravitational force in the treatment region and can therefore help in particular to portion the material in a certain segment of the conveyor belt. The webs can be embodied, for example, in the form of perpendicular and/or oblique metal plates which are attached (in particular rigidly) to the conveyor belt, for example welded to plates of the conveyor belt. In order to direct preferably smaller pieces of material in a predetermined quantity through the treatment region, the web height should not be too high. It is therefore proposed here that the web height be limited to 200 mm (millimeters), and it should preferably not drop below a minimum web height of about 100 mm. Here, the distance between the webs is advantageously to be selected in such a way that there is a sufficiently large area for the material to be treated, in which case the distance can possibly also be at least 0.80 m or even at least 1.20 m. In any case, surface segments of the conveyor belt are thus limited, a relatively large area being provided for the material to be treated, although the layer height of the material is very limited. Excess material is then rolled over the webs into the next segment on account of the slope of the treatment region if sufficient surface is still available here or the material has burst during the rolling movement. It should be noted with respect to the webs that said webs, if need be, can be embodied with a varying web height and/or distance apart, in particular if at least one web has an additional function and/or another function, such as, for example, as a driver for large material lumps, as cleaning scraper below the conveyor belt, etc.

[0024] As a result of a development of the device, an air supply for an air flow toward the treatment region of the device is provided in the region of the at least one outlet. The air supply is therefore to be set up or positioned in such a way that an air flow like a counterflow with respect to the transported material can be realized. The air supply can comprise one or more nozzles, slots, openings or the like, wherein an active (with positive pressure) and/or passive (with ambient pressure) provision of air is generally possible. It is preferred that the air supply comprises one or more openings in the housing, such that air can be drawn in (passively) from the environment in particular on account of the vacuum in the combustion boiler. In this case, it is furthermore preferred that this air flow is used for the surface treatment or cooling of the material. In particular, the aim should be for the air supply in the region of the outlet to constitute the predominant air supply for the air flow, that is to say that there are no additional air supplies for an air flow above the material in particular in the area of the treatment region. This is intended to ensure that a finally high temperature of the air flow is achieved over the relatively long treatment region and the large surface, provided there, of the material, for example a temperature of above 200° C., for example about 250° C., upon entry to the combustion boiler. In addition, this relatively pronounced heating of the air flow over the material distributed over a large area leads to comprehensive combustion of the residual constituents of the material, and equally the energy obtained in the process can be used again via the combustion boiler or the downstream heat exchangers of the combustion boiler. In this case, the ratio of air quantity to material quantity should preferably be within the range of 1.6 to 2.3; in particular, the ratio of the air quantity entering the combustion boiler to the conveyed material quantity is about 2 (e.g. air quantity about 6 t/h and ash quantity about 3 t/h [tonnes per hour]).

[0025] In addition, it is also considered to be advantageous that cross members are arranged below the conveyor belt in the horizontal collecting region of the conveyor belt. The cross members run substantially in the width direction of the conveyor belt, to be precise below the top section of the conveyor belt, onto which the material falls. The cross members have in particular a supporting function, such that an undesirable deformation of the conveyor belt is avoided even during the delivery of large material lumps. The cross members can be embodied like beams and/or plates.

[0026] It is also considered to be especially advantageous that the conveyor belt is connected to a chain drive. Here, a chain drive means that the conveyor belt is connected, in particular on both sides, to a circulating chain. The chain runs, for example, over a sprocket, which is driven by a corresponding motor. In particular a rigid and direct drive of the conveyor belt is thus realized. In particular, the chain drive has the advantage that there is no slip between the drive movement and the movement of the conveyor belt. The chain can be constructed with a considerable tensile strength and is therefore especially suitable for driving high loads. This drive is therefore especially suitable for the long treatment regions. In addition, it should be taken into account that such a chain drive is also relatively robust in the face of the fluctuating temperature effects. In particular, it is proposed that the chain drive be embodied with a motor or with a controller at which a simple and stepless variation of the drive speed or of the speed of the conveyor belt can be set. In addition, the conveyor belt itself can also be guided, for example in guides of the housing, in which case, for example, lateral supporting rollers can be provided.

[0027] As a preferred development of the invention, it is also stated that the treatment region of the device has various slopes. Even though this is explained here in the context of other features of the invention described here, the provision of a conveyor belt with a treatment region of varying slope can also be used independently thereof. Thus, it is in particular stated that a first slope is realized to begin with, but this first slope is then varied in at least one following section, that is to say increased and/or reduced. It may also be possible for a further section having a horizontal position and/or a negative slope (declivity) to follow a section having a slope. It is especially preferred that at least two of the elements—slope, horizontal, declivity—alternate repeatedly. An (additional) movement is thus induced in the material, thereby permitting an improved aftertreatment.

[0028] According to a further aspect of the invention, a plant is proposed which has at least one combustion boiler, having at least one bottom hatch for delivering material, and at least one device of the type described here according to the invention, wherein the collecting region is arranged below the at least one bottom opening, and at least one silo for the material is provided below the outlet. In this form of the plant, it immediately becomes obvious that an especially compact plant for the aftertreatment of the material from the combus-

tion boiler can be achieved. In this case, the material is specifically and effectively treated directly by an individual device; at the same time, the slope, specified here, of the treatment region enables a silo to be accommodated directly below the outlet of the device. The term "silo" refers in particular to a store for the material, for example having a capacity of at least 400 m^3 of the material, in particular 900 m^3. It is especially preferred that the silo is arranged above the collecting region of the conveyor belt.

[0029] Furthermore, it is preferred in the case of the proposed plant that at least one comminutor for the material is provided between the outlet of the housing and the at least one silo. It may be appropriate, in particular with the aim of utilizing the capacity of the silo as effectively as possible, for material falling from the conveyor belt in the direction of the silo to be comminuted to begin with. Known mills and/or disintegrators can be provided for this purpose, and if need be they should be constructed to be relatively small since the conveyed and cooled material usually already has a relatively small size on account of the treatment described above.

[0030] In addition, it is also considered to be advantageous that, in the plant, data acquisition means are provided at least in the combustion boiler or in the device, said data acquisition means being connected to a controller which is connected to a drive of the conveyor belt. The term "data acquisition means" means in particular sensors, for example, for determining the constituents of the combustion gases in the combustion boiler and/or in the device, temperature sensors or the like. With these data acquisition means, therefore, information on the current state of the combustion boiler and/or of the device or of the material accumulating or being treated there can be obtained. In particular, the quantity of the material per unit of time, the residual content of combustible material and/or the distribution of the material on the conveyor belt can be determined. Depending on this information, the controller can regulate the drive with due regard to the information obtained and can therefore cause said drive to move the conveyor belt more quickly or more slowly. It can therefore also be ensured, for example, that extensively distributed material having a low layer height is discharged at different speeds of the conveyor belt, even at a high load of the combustion boiler, in the course of which the requisite discharge capacity is maintained.

[0031] Following a further aspect of the invention, a method for conveying and treating hot ash of a combustion boiler is proposed. This method comprises at least the following steps:

[0032] a) delivery of the hot ash from a combustion boiler onto a horizontal collecting region of a conveyor belt arranged in a housing, such that the ash is transported with varying dwell time in the collecting region,

[0033] b) rearranging the hot ash, such that at least some of the ash is held back with a shorter dwell time in the collecting region,

[0034] c) transporting the ash in an inclined treatment region having a first length of at least 10 m (meters) and having a slope of at least 38° (degrees), an opposed air flow for cooling the ash being generated,

[0035] d) discharging the ash from the housing.

[0036] The method can be carried out in particular with the device and/or the plant described here.

[0037] Step a) signifies in particular the fact that the hot ash is not delivered on a narrowly restricted, local area of the collecting region but rather over a wide section of the collecting region. As a result, the hot ash is delivered onto the collecting region and then passes through the entire collecting region in the direction of movement of the conveyor belt and is subsequently covered by further hot ash which finally remains with a shorter dwell time in the collecting region until it has reached the end of the collecting region. Consequently, the ash which is transported only with a short dwell time in the collecting region is positioned at the top on the ash which has already been delivered beforehand onto the conveyor belt and in particular is thus cooled directly by the cool conveyor belt.

[0038] According to step b), the hot ash is now rearranged. The ash delivered last, which has therefore remained with a shorter dwell time in the collecting region and accordingly lies at the top, is now at least partly rearranged, such that in particular entry to the inclined treatment region is delayed. This rearranging occurs in particular in the deflecting region of the conveyor belt by the hot ash being brought into an unstable position and by the ash lumps which lie at the top or the large ash lumps slipping down on account of gravitation or rolling over the webs. The aim of this rearranging is to firstly achieve stable positioning of the ash lumps as well as a uniform distribution of the ash over the conveyor belt or comminution of the ash lumps as a result of these movements (impingement, rubbing, etc.).

[0039] The ash is then transported upward in the inclined treatment region (step c)), an opposed air flow for cooling the ash being generated. This air flow therefore flows against the transport direction of the ash and is in particular brought into contact with the surface of the hot ash. On account of the small layer height of the ash, e.g. at most 200 mm (millimeters) or even only 100 mm (millimeters), the air flow can cool, in an especially effective manner, the ash and/or if need be also exposed regions of the conveyor belt, in the course of which the air flow assumes the temperature and, heated to a relatively high degree, can finally enter the combustion boiler.

[0040] The discharge of the ash from the housing according to step d) is effected in particular solely on account of the gravitational force.

[0041] In addition, in the method proposed here, it is considered to be advantageous that the hot ash is portioned at least during step b) or c). That is to say in particular that the quantity of the hot ash to be discharged is substantially the same in accordance with the load conditions of the combustion boiler, such that the distribution and/or the cooling of the hot ash on the conveyor belt in the treatment region can be specifically set. For such portioning, in particular large widths of the conveyor belt and/or webs and/or variable drives of the conveyor belt are used.

[0042] In addition, it is considered to be advantageous that the comminuting of the ash and the storing of the ash in a silo directly follow step d). This means in particular that the discharged ash falls directly into a comminutor on account of the gravitational force, is ground there if need be and then falls (likewise on account of the gravitational force) directly into a silo, where the ash (substantially completely solidified) can now be stored. The extensive silo and the solidified ash already being stored there complete the cooling function for possibly not yet completely solidified hot ash which has just been discharged.

[0043] As already described several times, it is especially advantageous to vary the speed of the conveyor belt during the operation of the combustion boiler. In this case, in particular a regulated change in the speed of the conveyor belt can take

place as a function of information obtained from the boiler and/or the device with the conveyor belt.

[0044] The invention and the technical environment are explained in more detail below with reference to the figures. It should be noted that the figures show especially preferred embodiment variants of the invention but are not restricted thereto. In the drawing is schematically shown:

[0045] FIG. **1**: a first embodiment variant of a device,

[0046] FIG. **2**: a further embodiment variant of the device,

[0047] FIG. **3**: a detail of a further embodiment variant of the device,

[0048] FIG. **4**: an embodiment variant of a plant,

[0049] FIG. **5**: a detail of a conveyor belt with material to be treated,

[0050] FIG. **6**: a cross section through a device according to a further embodiment variant,

[0051] FIG. **7**: a device embodied with various slopes, and

[0052] FIG. **8**: a chain drive for a device according to the invention.

[0053] FIG. **1** shows a first embodiment variant of a device **1** in a side view. In this case, the collecting region **6** is illustrated in the left-hand region of the device **1**. In this collecting region **6**, the housing **5** has, for example, an opening via which the material **2** is delivered onto the conveyor belt **4**. In this case, the collecting region **6** has a second length **32**, which in particular is less than 10 m (meters). On account of the transport movement of the conveyor belt **4**, the material **2** is then moved out of the collecting region **6** (to the right in this case) toward a treatment region **7**. The treatment region **7** constitutes a section of the conveyor belt **4** or of the housing **5** which has a first length **9** of at least 10 m (meters), but preferably more than 30 m. In addition, the treatment region **7** is inclined relative to a horizontal **31** with a slope **10**. The slope (or the angle of slope) is preferably within the range of between 40 and 45° (degrees), but if need be can be selected to be even steeper. In addition, the conveyor belt **4** is connected to a drive **30**, which in particular is also positioned close to the outlet **8** for the material **2**. The material, which, as explained later in detail, is therefore burned or cooled in the treatment region **7**, then falls downward at the top end of the conveyor belt **4** through the outlet **8** on account of gravitation and therefore leaves the device **1**.

[0054] In particular the provision of the cooling air flow **21** is now illustrated in FIG. **2**. For this purpose, the device **1** or the housing **5** is connected (in a sealed-off manner) to a combustion boiler **3** (indicated here). The combustion boiler **3** can be operated with a slight vacuum, such that an air flow **21** can be generated by the provision of an air supply **20** in the region of the outlet **8**, this air flow **21** being formed in opposition to the transport direction for the material **2**. The air flow **21** therefore flows above the conveyor belt **4** over the material transported there and is finally sucked into the combustion boiler **3**. The large first length and the slope of the conveyor belt in the treatment region also ensure that the outlet and the air supply **20** are positioned at a very high conveying height **33**. The conveying height **33** can be in particular at least 30 m, if need be even up to 50 m. With regard to the air supply **20**, this also has the advantage that air containing less floor dirt is fed here, thereby further assisting the cooling process or combustion process in the device.

[0055] Furthermore, it is illustrated in FIG. **2** that the collecting region **6** substantially forms an end **12** where the delivery of material by the combustion boiler **3** no longer takes place. It is now considered to be advantageous to connect the inclined treatment region **7** as close to the end **12** of the collecting region **6** as possible, a maximum distance **11** of, for example, 5 m (meters) being specified here. In this case, the distance **11** is dimensioned, in particular starting from the end **12**, up to the point at which the deflecting region **13** of the conveyor belt **4** ends.

[0056] In addition, it is considered to be advantageous that an (enlarged) reservoir **14** is formed with the housing **5** in the section of the deflecting region **13**. Here, in particular, an increased accumulation of material is to be ensured if need be, the region between the conveyor belt **4** right up to the housing **5** being free of built-in components if possible.

[0057] FIG. **3** shows a detail of a further embodiment variant of the device, namely the turning region of the conveyor belt **4** close to the collecting region **6**. The housing **5** can also be seen there, the opening toward the combustion boiler also being indicated at the top right. On the left, a slide **34** forms the closure for the housing **5**, it also being possible, if need be, for material to be carried along from the bottom of the housing **5** by means of said slide **34**. The conveyor belt **4** in this case is embodied like a metal plate conveyor. The individual plates **35**, which are connected to one another in an articulated and overlapping manner, can be seen. The plates **35** have lateral boundary shells, such that material cannot fall off laterally over the width of the conveyor belt **4**. In addition, the plates **35** are connected to a chain **37**, which in this case is deflected via the sprocket **36**. In this arrangement, the sprocket **36** engages in the individual links of the chain **37**. A corresponding device is driven, the tensioning station **44** for tensioning the conveyor belt **4** being shown here—the opposite motor-operated drive can be seen, for example, from FIG. **8**. A chain drive **23** has proved to be advantageous especially for the large conveying heights and large lengths of the conveyor belt. Also indicated here are the cross members **22** which support the top part of the conveyor belt **4** and are thus intended to prevent an undesirable deformation of the plates **35** as a result of the impingement of the material from the combustion boiler **3**.

[0058] FIG. **4** schematically illustrates a preferred embodiment variant for a plant **24**. The plant **24** now comprises a combustion boiler **3** (only partly shown), for example a combustion plant for waste materials and/or fossil fuels. The device **1** is arranged below the combustion boiler **3** in such a way that the collecting region **6** is positioned below the bottom opening **25** of the combustion boiler **3**. The housing **5** is in this case sealed off and if need be fastened to the combustion boiler **3** by compensators for compensating for the different thermal expansions. The material **2** thus falls onto the conveyor belt **4** in the section of the collecting region **6** and is then rapidly transported into the treatment region **7**. In the treatment region **7**, the material **2** is cooled or burned by means of an air flow **21**. The air flow **21** then enters the combustion boiler **3** at a temperature of, for example, at least 200° C.

[0059] The conveyor belt **4** is embodied with a multiplicity of plates **35**, wherein isolated plates **35** have webs **16** which extend substantially perpendicularly to the plates **35**, as indicated in FIG. **5**. The webs **16** now hinder or limit the rolling movements of the material **2** back in the direction of the deflecting region **13** on account of gravitation. The webs **16** are in this case provided in the direction of the extent **18** of the conveyor belt **4** at a distance **19** apart of at least 1 m, preferably at least 2 m or even 3 m. Large lumps of the material **2** and/or a large accumulation of the material **2** now slides over

the other material and the webs **16** down into the reservoir **14**. In the process, firstly a large surface is created for the air flow **21**, and at the same time the material **2** is comminuted, if need be, upon impingement in the reservoir **14**. The hotter material, which regularly lies at the top, is also held back further in the reservoir before it is transported into the treatment region **7**.

[0060] FIG. **6** again schematically shows a cross section through a further embodiment variant of the invention. The substantially closed housing **5** is illustrated, in the interior space **24** of which the conveyor belt **4** is positioned. The conveyor belt **4** is again embodied with plates **35**, wherein the plates **35** illustrated here have a web **16** which extends over the entire width **15** of the conveyor belt **4**. The web height **17** of the webs **16** is preferably less than 200 mm (millimeters).

[0061] FIG. **7** schematically illustrates, in a highly simplified manner, a device **1** in which the conveyor belt **4** is embodied with sections **43** having various slopes **10**. The combustion boiler **3** is indicated on the left in FIG. **7** and the silo **26** on the right. Here, the conveyor belt **4** has, in the treatment region, six (6) sections **43** of different forms, namely in the following sequence: first slope, second slope (greater than the first slope), first horizontal, third slope (negative, declivity), second horizontal, fourth slope (like first slope). This figure is also intended to serve in particular as a schematic diagram and illustrates the diversity of variations; the actual sequence can be made according to requirements. In this case, the conveyor belt **4** preferably has only one drive **30** for the chain drive **23**, as indicated at the end (identified by VIII) and shown enlarged in FIG. **8**.

[0062] FIG. **8** now shows a possible embodiment for the positioning of a drive **30** for the chain drive **23**, which is arranged at the end, identified by VIII, of the conveyor belt **4**.

LIST OF DESIGNATIONS

[0063] **1** Device
[0064] **2** Material
[0065] **3** Combustion boiler
[0066] **4** Conveyor belt
[0067] **5** Housing
[0068] **6** Collecting region
[0069] **7** Treatment region
[0070] **8** Outlet
[0071] **9** First length
[0072] **10** Slope
[0073] **11** Distance
[0074] **12** End
[0075] **13** Deflecting region
[0076] **14** Reservoir
[0077] **15** Width
[0078] **16** Web
[0079] **17** Web height
[0080] **18** Extent
[0081] **19** Distance
[0082] **20** Air supply
[0083] **21** Air flow
[0084] **22** Cross member
[0085] **23** Chain drive
[0086] **24** Plant
[0087] **25** Bottom opening
[0088] **26** Silo
[0089] **27** Comminutor
[0090] **28** Data acquisition means
[0091] **29** Controller
[0092] **30** Drive
[0093] **31** Horizontal
[0094] **32** Second length
[0095] **33** Conveying height
[0096] **34** Slide
[0097] **35** Plate
[0098] **36** Sprocket
[0099] **37** Chain
[0100] **38** Supporting pillar
[0101] **39** Truck
[0102] **40** Guide roller
[0103] **41** Cooling
[0104] **42** Interior space
[0105] **43** Section
[0106] **44** Tensioning station

1. A device for conveying and treating material from a combustion boiler, having at least one conveyor belt and a housing surrounding the conveyor belt, wherein the conveyor belt has at least one horizontal collecting region and a treatment region, and the housing has at least one outlet for the material, and furthermore the treatment region has a first length of at least 10 m and a slope of at least 38°.

2. The device according to claim **1**, wherein the treatment region is arranged at a maximum distance of 5 m from the end of the collecting region.

3. The device according to claim **1**, wherein the collecting region and the treatment region are connected via a deflecting region, wherein the housing forms a reservoir for material in the deflecting region above the conveyor belt.

4. The device according to claim **1**, wherein the conveyor belt is embodied with at least one of the following properties:

a width of the conveyor belt of at least 0.8 m,

webs running along the width and having a web height of at most 200 mm,

webs which are arranged along the extent of the conveyor belt at a distance apart of at least 0.65 m and which run along the width.

5. The device according to claim **1**, wherein an air supply for an air flow toward the treatment region of the device is provided in the region of the at least one outlet.

6. The device according to claim **1**, wherein cross members are arranged below the conveyor belt in the horizontal collecting region of the conveyor belt.

7. The device according to claim **1**, wherein the conveyor belt is connected to a chain drive.

8. The device according to claim **1**, wherein the treatment region of the device has various slopes.

9. A plant comprising at least one combustion boiler, having at least one bottom opening for delivering material, and at least one device for conveying and treating material from a combustion boiler, each device having at least one conveyor belt and a housing surrounding the conveyor belt, wherein the conveyor belt has at least one horizontal collecting region and a treatment region, and the housing has at least one outlet for the material, and furthermore the treatment region has a first length of at least 10 m and a slope of at least 38°, and wherein the collecting region is arranged below the at least one bottom opening, and at least one silo for the material is provided below the outlet.

10. The plant according to claim **9**, wherein at least one comminutor for the material is provided between the outlet of the housing and the at least one silo.

11. The plant according to claim **9**, wherein data acquisition means are provided at least in the combustion boiler or in the device, said data acquisition means being connected to a controller which is connected to a drive of the conveyor belt.

12. A method for conveying and treating hot ash of a combustion boiler, comprising at least the following steps:

a) delivery of the hot ash from a combustion boiler onto a horizontal collecting region of a conveyor belt arranged in a housing, such that the ash is transported with varying dwell time in the collecting region,

b) rearranging the hot ash, such that at least some of the ash is held back with a shorter dwell time in the collecting region,

c) transporting the ash in an inclined treatment region having a first length of at least 10 m and having a slope of at least 38°, an opposed air flow for cooling the ash being generated, and

d) discharging the ash from the housing.

13. The method according to claim **12**, wherein the hot ash is portioned at least during step b) or c).

14. The method according to claim **12**, wherein the comminuting of the ash and the storing of the ash in a silo directly follow step d).

15. The method according to claim **12**, wherein the speed of the conveyor belt is varied during the operation of the combustion boiler.

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