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(54) Desiccator for inert material

(57) A desiccator for inert material comprises an axially rotating desiccator cylinder (11), into which products to be processed are inserted. The inlet (16) for the insertion of the products is close to an end of the cylinder and near the opposed end there is an outlet (21) of the treated products and a combustor formed by a burner (19) and by a hollow coaxial cylindrical element (20) into which the burner directs the flame.

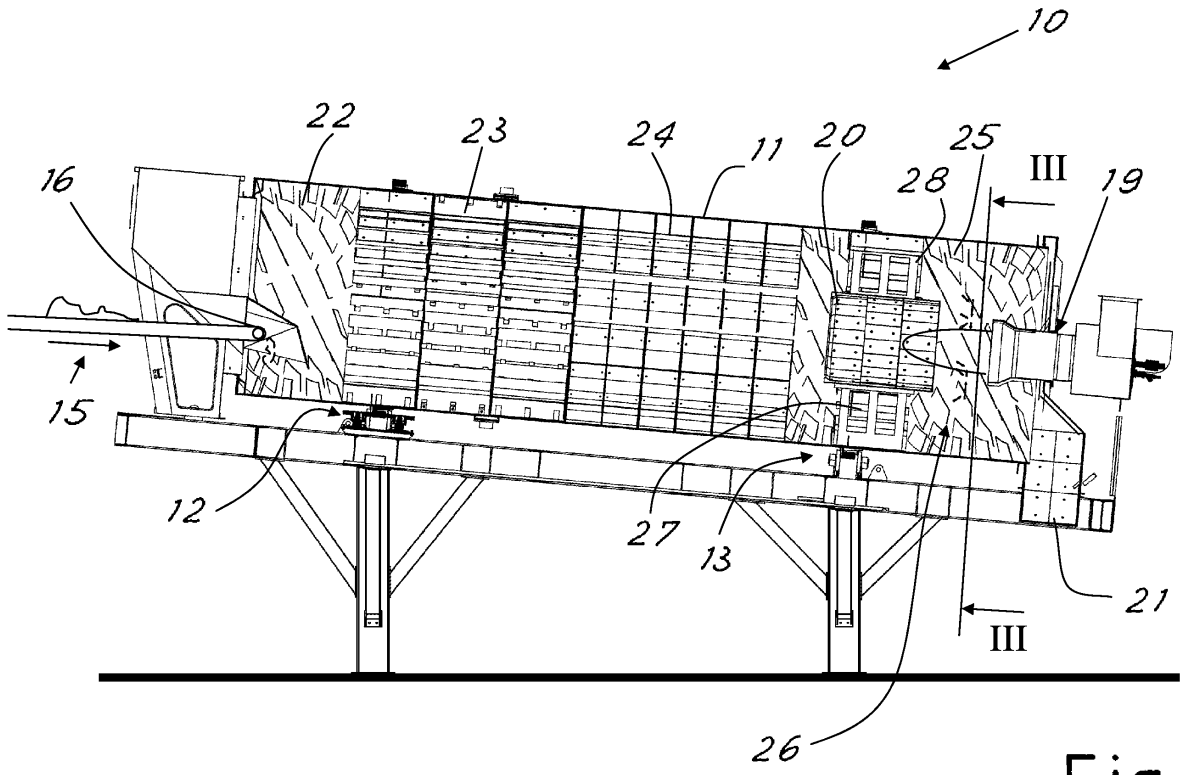

Fig.2

EP 2 202 473 A1

Description

[0001] The present invention refers to an innovative desiccator for inert material, in particular bituminous conglomerates that have been recycled, that are new or mixtures thereof.

[0002] Plants for treating and producing bituminous conglomerates are penalised by known desiccators and by their technologies for introducing and desiccating the materials or conglomerates, in particular conglomerates recovered through milling (RAP) of road surfaces.

[0003] Desiccators of the prior art foresee a rotating cylinder, with a slightly tilted axis, in which the material to be treated is inserted. Inside the cylinder there is a flame heater and the heated product rolls in counter-current with respect to the direction of the flame up to an outlet of the desiccator. Usually, the inert material is inserted into the cylinder on the side opposite the heater and the RAP product is inserted through a suitable recycling ring in a central position with respect to the ends of the cylinder.

[0004] In the case of recycled product, usually in an area of the desiccator, a percentage of RAP product that it is wished to mix with the virgin inert material, already greatly heated, is inserted (separately from the recycled product).

[0005] This technology has some problems concerning combustion emissions, the low percentage of RAP which can be inserted, the impossibility of reclassifying the mixture in outlet from the desiccator due to clogging, and the high percentage of residual humidity in the mixture at the outlet.

[0006] Moreover, it is easy for clogging and encrusting to occur, with consequent problems and maintenance costs.

[0007] Moreover, the insertion of product through the ring also causes cold air to be sucked in, reducing performance. The insertion in the discharge chamber, on the other hand, allows usage only with a low percentage of product which can be desiccated. The mixture in outlet, in any case, has a high percentage of residual humidity. In known plants, the normal values can be, for example, maximum percentages of RAP which can be desiccated of around 20% and residual humidity in the conglomerate of even 70%.

[0008] The general purpose of the present invention is to avoid the aforementioned drawbacks by providing a desiccator which makes it possible to cut down combustion emissions, to increase the percentage of RAP which can be inserted (when used), to reclassify the mixtures, to have an acceptable percentage of residual humidity for the preparation process of the bituminous conglomerate, and to reduce the costs and the need for maintenance.

[0009] In view of such a purpose it has been thought to make, according to the invention, a desiccator for inert material comprising an axially rotating desiccator cylinder, into which products to be treated are inserted, and with a heating burner, **characterised in that** the inlet for the insertion of the products to be treated is close to an end of the cylinder and near the opposed end there is an outlet of the treated products and a combustor formed by the burner and by a hollow coaxial cylindrical element into which the burner directs the flame.

[0010] In order to clarify the explanation of the innovative principles of the present invention together with its advantages with respect to the prior art, hereafter, with the help of the attached drawings, we shall describe a possible embodiment given as an example applying such principles. In the drawings:

- figure 1 represents a top side view of a desiccator plant according to the invention;
- figure 2 represents a longitudinal section view of the desiccator of figure 1;
- figure 3 represents a cross section of the cylinder taken along the line III-III of figure 2.

[0011] With reference to the figures, figure 1 shows a desiccator plant, wholly indicated with reference numeral 10, comprising a desiccator cylinder 11, mounted with a tilted axis and rotating through rolling supports 12, 13 and a motorization 14, advantageously with spur gears.

[0012] A conveyor 15 inserts the material to be treated near the top end of the cylinder, through an insertion mouth 16. Advantageously, in the case in which recycled conglomerates are treated, both the product to be recycled as well as the new product for integrating with the product to be recycled are discharged into the cylinder. For such a purpose, controlled discharge means 17, 18 (*per se* known, and thus not described any further, for example formed by motorized hoppers and by an electronic control system) feed the selected quantity of new product (virgin inert material) and recycled product (RAP) onto the belt. The inlet area of the desiccator cylinder thus receives both products and they mix together in this area while substantially not yet heated.

[0013] Pre-mixing can also be foreseen.

[0014] As can be better seen in figure 2, at the opposite end of the desiccator cylinder 11 there is a stationary burner 19, which emits a flame into the cylinder in a direction axial to the cylinder and directed inside it. In front of the inlet of the burner there is a hollow and open cylindrical element 20, which is coaxial to the desiccator cylinder 11, into which the flame of the burner is axially directed. Advantageously, the cylindrical element is made up of (or covered with) tiles made from refractory material. The cylindrical element with the flame of the burner forms a combustion chamber 26 and the cylindrical element and burner assembly thus form a combustor unit that has proven to substantially increase the performance of the desiccator oven.

[0015] The distance between the burner and the cylindrical element is set (also depending on the size of the flame) so that a Venturi effect is generated in front of the burner which takes the fumes from the periphery of the

cylinder back towards the inside of the flame and inside the cylindrical element. This contributes to a reduction of pollutants.

[0016] The products to be treated are introduced from the coldest area of the cylinder and gradually come closer to the hottest area before being evacuated from a discharge outlet 21 in the lower areas of the desiccator cylinder.

[0017] Advantageously, the desiccator cylinder is equipped, on the inner wall, with members for stirring and circulating the treated products. Such members are differentiated according to the area of the cylinder along the axis. The temperature of the areas will also increase from one end of the cylinder to the other, thanks to the burner coming closer.

[0018] In a first area, or inlet area 22, the RAP and the virgin inert material are mixed together well through an inner surface of the cylinder which is equipped with advantageously helicoidally arranged blades.

[0019] In such a first area, the temperature in the cylinder has been found to be able to be advantageously around 120°C. Of course, the mentioned temperatures for the various areas are average temperatures of the area, with the temperature gradient gradually increasing moving along the axis of the cylinder. Moreover, the temperature of the moving product will obviously be lower.

[0020] In the next area, or the second area 23, (advantageously defined in a portion of the cylinder with a temperature of around 200°C) the temperature increase undergone by the mixture makes it possible for the humidity contained in the RAP (greater than that contained in the virgin inert materials) to be evaporated. In such a second area, the inner surface of the cylinder is advantageously equipped with cups, blades or buckets extending along generatrices of the cylinder.

[0021] A third area 24 (temperature advantageously of around 300°C) is also equipped with cups, blades or buckets (advantageously bigger than those of the previous area) extending along generatrices of the cylinder.

[0022] In such an area the mixture is amalgamated; the particles of virgin inert materials bond with the particles of RAP thanks to the softening of the bitumen creating a conglomerate having characteristics similar to those of the virgin inert material, without the problems of clogging and sticking to the parts of the plant of the RAP itself in known plants.

[0023] In the last portion 25 of the oven, provided at the combustion chamber 26, there is a fourth area where the last step, the final heating step, takes place, in which the conglomerate reaches a temperature of 180-200°C, with a temperature in the combustor of around 800°C.

[0024] Such a last area comprises an inner surface of the desiccator cylinder which is again equipped with helicoidally arranged blades, whereas on the surface of the cylinder around the cylindrical element 20 there are buckets 27. As can clearly be seen also in figure 3, the cylindrical element is supported at the cylinder through radial supports 28.

[0025] It should be noted that the special construction of the oven foresees stirring and desiccation of the treated material without it being hit by the flame.

[0026] At this point it should be clear how the aforementioned purposes have been achieved.

[0027] Thanks to the combustor formed by the burner which sends the flame into the facing coaxial cylindrical element, a double function is obtained consisting of the function of a combustion chamber, in the case in which the oven desiccates only the virgin inert material, and the function of a post-combustor, in the case in which the treated material contains RAP.

[0028] With a desiccator according to the invention there are low combustion emissions.

[0029] It has been found that with a plant according to the invention, it is possible to desiccate a mixture made up of RAP and virgin inert materials with a percentage of conglomerates recovered through milling of 40% and more.

[0030] Moreover, the percentage of residual humidity in the mixture is of around 5%.

[0031] The particular inner geometry of the oven ensures that the material in transit is lifted and stirred in an optimal way without being directly hit by the flame of the burner.

[0032] By desiccating only virgin inert material, the possible uncombusted particles which come into contact with the refractory surface (from the high temperature) of the cylindrical element of the combustor burn completely.

[0033] In the case in which virgin inert materials and RAP are desiccated, the bitumen softening step creates a gas which goes by the name of "blue smog". This gas, potentially pollutant, is burnt inside the combustor cylinder. Indeed, the "blue smog" created by the RAP, and which advances in the lower part of the desiccator cylinder, is forcedly sucked inside the combustor thanks to the Venturi effect that the burner creates (also helped by its own fan) between the outlet of the burner and the inlet of the combustor cylinder.

[0034] With the desiccator of the invention there is an improved amalgamation of the mixture avoiding clogging phenomena and allowing it to be reclassified.

[0035] All of this with high energy efficiency standards.

[0036] Of course, the description above concerning an embodiment applying the innovative principles of the present invention is given as an example of such innovative principles and must not therefore be taken to limit the scope of protection claimed hereby. For example, the dimensions and the proportions between the various parts can vary according to the specific practical requirements. The inlet conveyors of the products can be different.

Claims

1. Desiccator for inert material comprising an axially

rotating desiccator cylinder (11), into which products to be processed are inserted, and with a heating burner (19), **characterised in that** the inlet (16) for the insertion of the products to be treated is close to an end of the cylinder and near the opposed end there is an outlet (21) of the treated products and a combustor formed by the burner (19) and by a hollow coaxial cylindrical element (20) into which the burner directs the flame.

2. Desiccator according to claim 1, **characterised in that** the hollow cylindrical element is positioned in front of the burner such as to cause a Venturi effect which sucks in the fumes from the periphery of the cylinder towards the inside of the cylindrical element.

3. Desiccator according to claim 1, **characterised in that** the cylindrical element has a surface in refractory material, advantageously tile-shaped.

4. Desiccator according to claim 1, **characterised in that** the cylinder is tilted with its end close to the inlet higher than the opposed end.

5. Desiccator according to claim 1, **characterised in that** from the end of the cylinder close to the inlet to the opposed end there are successive areas of treatment at gradually increasing temperature, such areas being defined by stirring and circulation members of the treated products which are arranged on the inner wall of the cylinder.

6. Desiccator according to claim 5, **characterised in that** it comprises at least one first inlet area with an inner surface of the cylinder equipped with mixing blades, a second area of humidity evaporation, a third area with amalgamation blades and a fourth area, provided at the combustion chamber, for the final heating of the product before the outlet.

7. Desiccator according to claim 1, **characterised in that** in the combustor there is a temperature of around 800°C.

8. Desiccator according to claim 6, **characterised in that** the first and fourth areas have helicoidally arranged blades.

9. Desiccator according to claim 1, **characterised in that** said inlet is fed by a conveyor on which controlled delivery means deposit both recycled and pure products, so that they enter substantially together into the rotating cylinder.

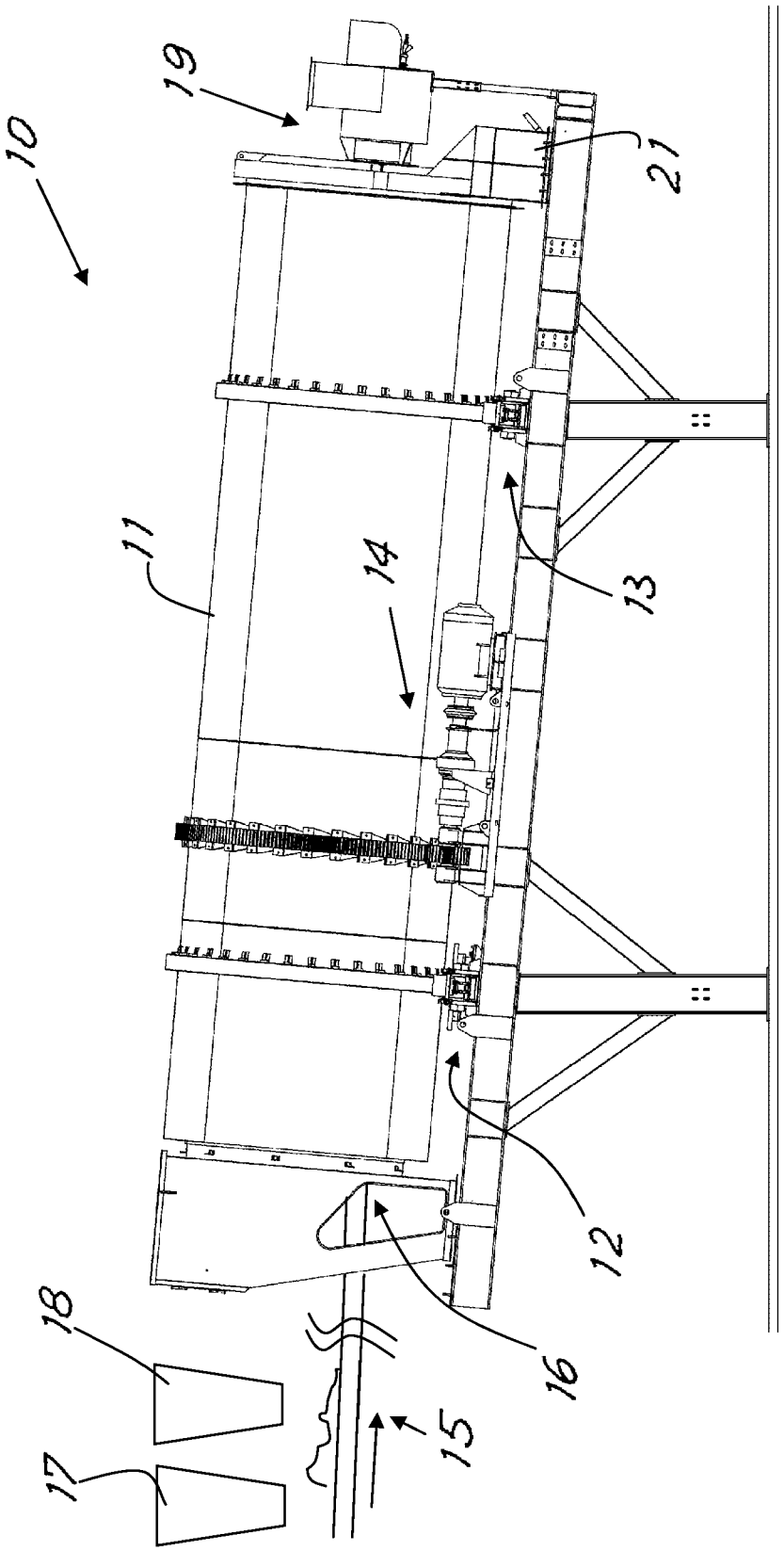

Fig.1

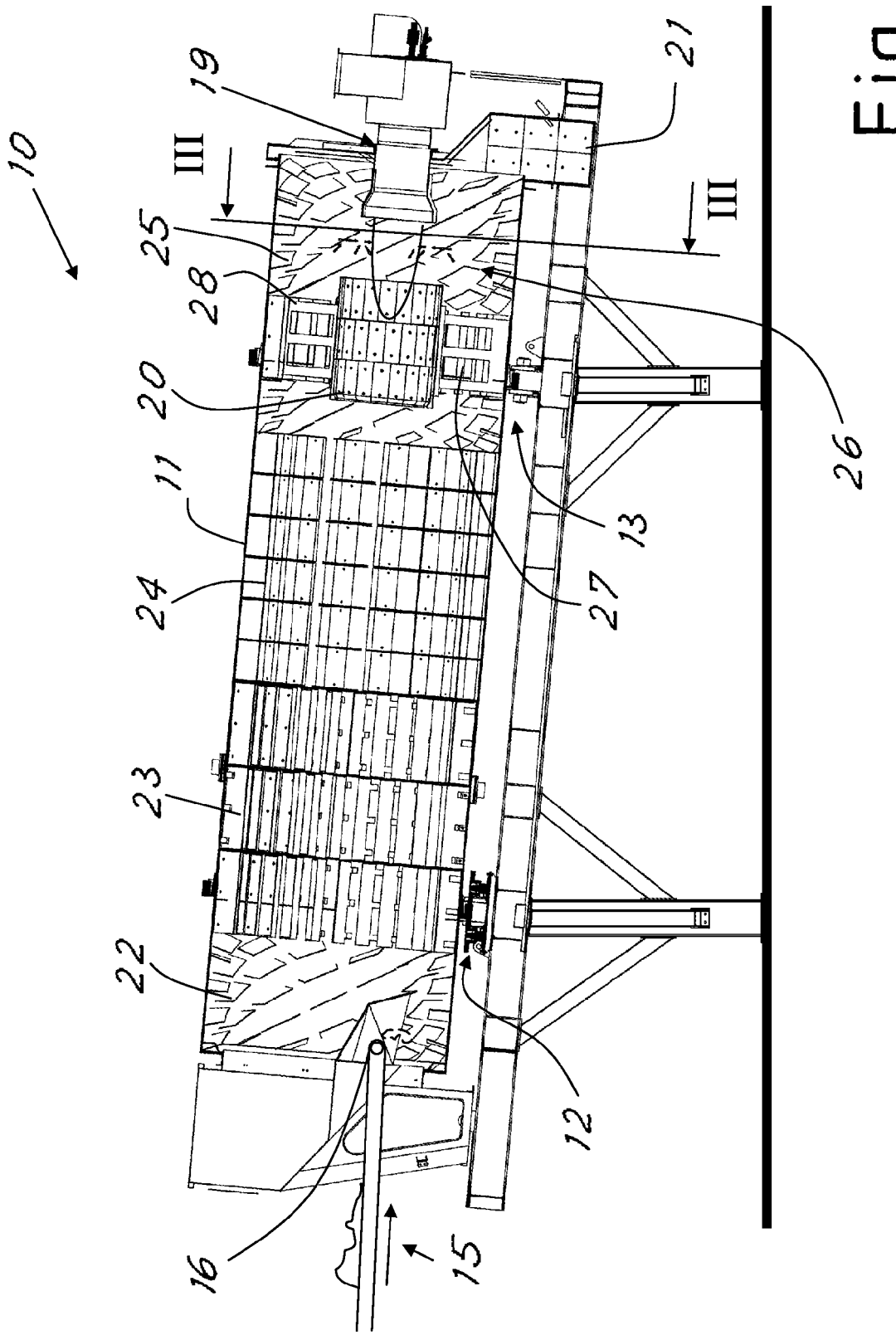

Fig.2

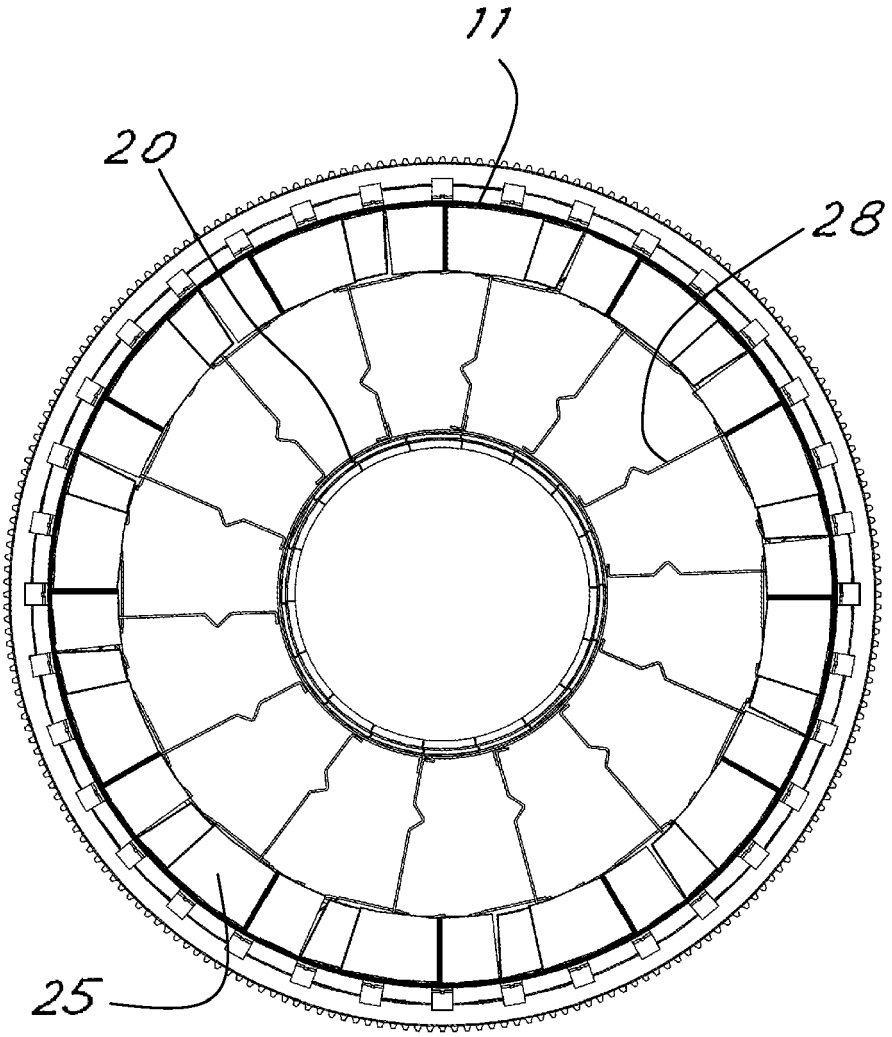

Fig.3

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 9837

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 January 2010	Hauck, Gunther

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