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(72) Feltaláló(k):
**CLARAC, André, 33650 Saint Morillon (FR)**

(73) Jogosult(ak):
**COLAS, 92100 Boulogne-Billancourt (FR)**

(74) Képviselő:
**Danubia Szabadalmi és Jogi Iroda Kft., Budapest**

(54) **Berendezés bitumenes útburkoló anyag leterítésére az útburkoló anyag egy meghatározott vastagságú vékonyrétegéből kiindulva, valamint eljárás annak alkalmazására**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

**Device for spreading a bituminous coating from a film with a pre-determined coating thickness, method of implementation**

The present invention relates to a device for spreading a bituminous coating into a small thickness layer, called a film, as well as a method for implementing this device. It finds applications in the field of public works, and in particular the construction of circulating lanes or, particularly advantageously, the maintenance or reconditioning thereof.

A coating (or bituminous coating) is a mixture of gravels, sand and hydro-carbonated binder (commonly called "asphalt") applied into one or several layers to form the road pavement. Conventionally, the deposition of a layer of coating may be performed according to different modes. It is hence possible to make the distinction between the hot coatings having a temperature higher than 130°C, the warm coatings having a temperature between 100°C and 130°C, the half-warm coatings having a temperature between 85°C and 100°C, the cold dense coatings, the cold open coatings or the emulsion gravels, which all forms "coatings" within the meaning of the present document.

Currently, the deposition of a layer of coating is performed by adjustment of the layer directly on the support, which is generally the ground or a sub-layer of coating. The adjustment is performed by means, either of a smoothing table such as a finisher table or a fast intervention finisher table (FIR), or a blade such as a levelling blade. These working means are tributary of the quality of the support that is to receive said layer. This support quality is characterized by the more or less marked presence of longitudinal deformations, transverse deformations, depressions, the different surface textures, i.e. smooth, much roughened, fat or thin support, etc. Such heterogeneities do not allow a good control of the dosage nor a correct smoothing of the coating deposited to form the layer, and this is all the more impacting that the deformations are great or that the working thicknesses are small, in particular when the layer thickness is lower than 3 cm.

The conventional methods of spreading bituminous coatings on the ground implement automotive machines, called finishers, which include, at the rear with respect to their direction of advance, a means for depositing and distributing transversally, in the width direction, on the ground, the bituminous coating, followed, more on the rear, by a smoothing table intended to perform a levelled surface layer. Vibrating means intended to facilitate the distribution and to pack down the layer are also implemented. Possibly, a ramp for spraying on the ground a bonding and/or sealing layer may be implemented upstream from the deposition of the bituminous coating on the ground. A tank of bituminous coating is installed at the front of the machine and this tank may be continuously fed, at the rear of the truck whose bituminous coating dump is discharged into the tank. A conveying line allows to convey the bituminous coating from the tank, on the front, towards the rear of the machine, where it is deposited on the ground. The machine includes tracks for its displacement on the ground, or tires, and means for controlling its displacements and its various members. In particular, control means allow a certain level of automation and adjustment of the making of the bituminous coating layer.

With this method, the bituminous coating is deposited directly on the ground and is thereafter levelled to form a layer of a certain width and thickness. The height of the layer, and hence the thickness thereof, depend on the position in height, of the angle of attack, of the smoothing table. The latter is integral with the automotive machine and hence follows the movements of the machine in its displacement, and in particular, the untimely movements due to the deformations of the ground surface. These untimely movements may be more or less

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important as a function of the deformations of the ground on which the machine moves, wherein such movements may even be amplified as a function of the lever arm between the machine and the smoothing table. In order to limit the layer surface irregularities that would result therefrom, it is possible to implement means for correcting these untimely movements due to the deformations of the ground. However, given that the smoothing table is a rigid bar, it is not possible to correct all the effects of these untimely movements.

Another drawback of this method resides in the fact that it is not possible to obtain a layer of low thickness because if the smoothing table is too much lowered, the distribution of the coating over the ground risks to be deteriorated, for example with a risk of tearing out of the bituminous coating, or in case of deformation of the ground under the machine or under the levelling blade, of friction of the levelling blade on the ground.

Finally, with this method, the quantity of bituminous coating in the layer, at any point of the ground, cannot be controlled accurately. Indeed, if there is a recess in the ground, the bituminous coating fills it up to the level of the layer surface, which is in practice at the same absolute height as all around the recess and there will hence be more bituminous coating at the vertical of such a recess than elsewhere. This will be the opposite at the level of a boss of the ground, with less bituminous coating, not to mention the risk that the smoothing table knocks said boss if it is attempted to make a layer of low thickness.

This method must hence preferably be executed after a sufficient preparation of the ground, in particular the levelling thereof. Moreover, it leads to make layers of relatively high thickness and for which it is in practice impossible to have an accurate control of the quantity of bituminous coating spread by surface unit.

The present invention proposes to remedy in particular these drawbacks by using a method for spreading with a spreading device, in which a dosage of the bituminous coating is made before the deposition to the ground. Thanks to that, a determined quantity of bituminous coating is deposited on the ground. The so-obtained layer includes a determined quantity of bituminous coating that is constant in any point of its surface and whatever the deformations of the ground surface on which the layer is spread. It then becomes possible to obtain a layer of much reduced thickness, which is particularly interesting in the case of circulation lane reconditioning or on adapted supports.

It will be seen that it is possible to use two means for performing this dosage, either by making a bituminous coating film of determined thickness between two cylinders, or by making an extended bituminous coating film of determined thickness on an endless belt. In both cases, the bituminous coating film is then crumbled and falls, in particular by being projected, down to the ground. In the first case, it can be considered that the film that is created is almost immediately crumbled because that are the same cylinders that both make the film (control of the quantity of material) and then crumble the film. In the second case, the film has a longer material existence thanks to the fact that one of the cylinders is an extended roll as an endless belt.

The document DE2125970 discloses a device including pairs of parallel rolls between which a coating film is made to be spread on a ground. This device allows a uniform spreading but it does not include final crumbling means for projecting the coatings to the ground.

Hence, the invention relates to a device for spreading a layer of a bituminous coating on a ground to be covered, including means for moving on said ground along a longitudinal direction of advance and spreading means fed with bituminous coating by feeding means and adapted to spread during the displacement of the device the layer

of bituminous coating over a determined width of said ground considered transversally to the direction of advance.

According to the invention, the spreading means are adapted to make above the ground a rolling of the bituminous coating and a crumbling of the rolled bituminous coating and the falling down to the ground of the crumbled bituminous coating.

In various embodiments of the invention, the following means, which can be used alone or in any technically possible combination, are used :

- the rolling of the bituminous coating is performed over a determined transverse length;

- the device includes a distributing machine adapted to distribute the bituminous coating at the entry of the spreading means;

- the device includes a distributing machine adapted to distribute the bituminous coating over a determined transverse length at the entry of the spreading means;

- the spreading means are adapted to perform the projection of the crumbled bituminous coating, so that the latter falls down to the ground;

- the spreading means include at least one crumbling-rolling sub-unit held at a determined height above the ground and consisted of two rough cylinders both arranged along a same transverse direction, such that the cylinders form between them a film of bituminous coating with a determined thickness corresponding to the determined distance between the opposite generating lines of the two cylinders, the two cylinders being of substantially equal length, the two cylinders rotating in the opposite direction relative to each other so as to be able to carry along between them the bituminous coating entering by an entry side of the crumbling-rolling sub-unit;

- the rough cylinders have, on their surfaces, relief patterns for carrying along the bituminous coating, causing, at the exit side of the crumbling-rolling sub-unit, a crumbling of the rolled film of bituminous coating passing between the two cylinders, as well as the falling of the crumbled coating down to the ground,

- the two rough cylinders turn, in absolute value, at the same radial speed,

- the spreading means include at least one crumbling-rolling sub-unit consisted of an extended roll and a rough cylinder and the extended roll is formed by an end part of an endless belt extended between an upstream inner roll and a downstream inner roll, the upstream and downstream inner rolls being parallel to the rough cylinder, the downstream inner roll being opposite to the cylinder, the belt having a width substantially equal to the length of the cylinder, a film of bituminous coating of determined thickness being made on the upper surface of the belt by a levelling machine arranged upstream from said belt, said film being carried along towards the cylinder by the belt and the cylinder rotates, in absolute value, at a speed that is higher than the radial speed of the belt passing over the downstream inner roll, the determined distance between the surfaces of the rough cylinder and of the belt passing over the downstream inner roll being lower than the determined thickness of the film of bituminous coating made on the upper surface of the belt;

- the levelling machine includes a transverse levelling wall whose lower end is substantially parallel to the upper surface of the belt and whose lower end is at an adjustable determined height from the upper surface of the belt;

- the belt section arranged between the levelling wall and the downstream inner roll is equipped with a weighing belt system that allows to measure the mass of the coating vein that passes on the belt at said weighing belt system;

- the distributing machine is arranged transversally above the belt and upstream from the levelling wall, the distributing machine being adapted to spread bituminous coating upstream from the levelling wall over a determined width of the belt and over a height that is higher than the determined thickness of the film of bituminous coating to be made;

- the distributing machine includes, in a cage, a worm for carrying along the bituminous coating over the width of the belt, the cage, closed by lateral walls, having no bottom so that the bituminous coating can be distributed over the upper surface of the belt and being open on the top for the feeding of bituminous coating;

- the levelling wall is independent of the distributing machine cage;

- the distributing machine cage is at a fixed height;

- the distributing machine cage is at an adjustable height;

- the height of the worm in the cage is fixed;

- the height of the worm in the cage is adjustable;

- the adjustment of the height of the lower end of the levelling wall is independent of the adjustment of the height of the distributing machine cage;

- the adjustment is a manual mechanical adjustment;

- the manual mechanical adjustment is chosen among at least the following means: adjustment by screws, bolts, shims, notches, rack, jaws;

- the adjustment is ensured by a controlled position actuator;

- the controlled position actuator is chosen among the electric, pneumatic, hydraulic actuators;

- the levelling wall forms the downstream lateral wall of the distributing machine cage, the distributing machine cage being located at an adjustable determined height from the upper surface of the belt;

- the height of the worm in the cage is adjustable so as to be able to adjust the height of the worm with respect to the upper surface of the endless belt, whatever is the height of the cage with respect to the upper surface of the belt, in particular in the case where the downstream lateral wall of the distributing machine cage is the levelling wall and that the cage is adjustable in height to adjust the height of the lower end of the levelling wall;

- the device includes four crumbling-rolling sub-units each consisted of a patterned cylinder and an extended roll;

- the device includes three crumbling-rolling sub-units each consisted of a patterned cylinder and an extended roll;

- the device includes two crumbling-rolling sub-units each consisted of a patterned cylinder and an extended roll;

- in the case of a device including at least two crumbling-rolling sub-units each consisted of a patterned cylinder

and an extended roll, the sub-units are laterally offset relative to each other so as to sum up the spreading widths of each sub-unit over a greater total width of ground, the spreading being continuous over the ground width, i.e. with no lack or with no superimposition/overlap of the spreading passes;

- in the case of a device including at least two crumbling-rolling sub-units laterally offset relative to each other, the lateral offset of the sub-units being adjustable so as to be able to choose the total spreading width, the spreading being continuous over the width of the ground, i.e. with no lack or with no superimposition/overlap of the spreading passes;

- the device includes a frame carrying two crumbling-rolling sub-units each consisted of a patterned cylinder and an extended roll, the two sub-units being offset, on the one hand, laterally relative to each other, and on the other hand, in height relative to each other, the two crumbling-rolling sub-units being mobile in translation laterally against the carrying frame, so as to be able to move the two sub-units apart from each other or closer to each other, in overlap, along a lateral direction parallel to the lane width, and to hence increase or reduce the determined width of said ground on which the bituminous coating is spread;

- the device includes one distributing machine per crumbling-rolling sub-unit, the two distributing machines of the two sub-units carrying the bituminous coating in two opposite directions diverging over a width of each endless belt, and the distributing machine is fed with bituminous coating through a chute in fixed position above the distributing machine cage, and the two chutes for the two crumbling-rolling sub-units are arranged against the median axis of the device superimposable to the direction of advance;

- the device forms an automotive spreading machine, said spreading means being arranged at the rear of said machine, or being removably installed at the rear of the automotive machine, said automotive machine including from the front/upstream to the rear/downstream according to the direction of advance: a reserve of bituminous coating, at least one line for conveying the bituminous coating rearward and said spreading means;

- the device includes at least two crumbling-rolling sub-units and one bituminous coating conveying line per sub-unit, each conveying line being controllable independently from the other(s) conveying lines;

- the relief patterns are substantially elongated over the length of the rough cylinder,

- the relief patterns are essentially filiform and of a height comprised between 1 mm and 15 mm.

The invention also relates to a method for spreading a layer of a bituminous coating on a ground to be covered, wherein, in a first time, the bituminous coating is rolled to make a bituminous coating film of determined thickness over a determined width and remote above the ground, and, in a second time, said film is crumbled and the bituminous coating of the crumbled film is made to fall down to the ground.

In a particular embodiment of said method, the bituminous coating film of determined thickness is made over an upstream part of an extended roll consisted of an endless belt extended between an upstream inner roll and a downstream inner roll, and a rough cylinder including relief patterns is implemented opposite the downstream inner roll to crumble the film made on the endless belt.

In certain particular embodiments of the method, a bituminous coating is used, which is chosen among: a hot coating having a fabrication temperature higher than 150°C, a warm coating having a fabrication temperature higher than 100°C and lower than 150°C, a half-warm coating having a fabrication temperature between 85°C

and 100°C, a half-cold or cold coating having a fabrication temperature lower than 85°C.

In certain particular embodiments of the method, a bituminous coating is used, whose values d and D of the d/D ratio are chosen among: a value of 0-2-4 or 6.3 mm for d and a value of 4-6.3-10-14-20 mm for D.

The present invention will now be exemplified, without being limited thereby, by the following description in relation with the following figures, in which:

- Figure 1 shows a simplified block diagram of bituminous coating spreading means in the embodiment with an extended roll consisted of an endless belt extended between an upstream inner roll and a downstream inner roll,

- Figure 2 shows an oblique and perspective front view of a finishing machine equipped on the rear with two bituminous coating spreading means according to the embodiment with an extended roll,

- Figure 3 shows an oblique and perspective rear view of a finishing machine of Figure 2 equipped with its two bituminous coating spreading means with an extended roll,

- Figure 4 shows a rear and perspective lateral view of a first side of the equipped finishing machine of Figure 2,

- Figure 5 shows a rear and perspective lateral view of a second side of the equipped finishing machine of Figure 2,

- Figure 6 shows a closer lateral view, centred on the worm-based distributing machine of the first of the bituminous coating spreading means located on the first lateral side of the equipped finishing machine of Figure 2,

- Figure 7 shows a closer lateral view, centred on downstream inner roll driving the endless belt and on the corresponding patterned cylinder of the bituminous coating spreading means located on the second lateral side of the equipped finishing machine of Figure 2,

- Figure 8 shows a close rear view of the equipped finishing machine of Figure 2,

- Figure 9 shows a perspective rear lateral view of the equipped finishing machine of Figure 2, in operation, with projection and falling down of crumbled bituminous coating to the ground,

- Figure 10 shows a schematic cross-section of spreading means with two rough cylinders, and

- Figure 11 schematically shows a trailer towed by bituminous coating spreading means according to the invention and which includes in particular three wheels that are cylinders with smooth wheel rims and means for storing water and a bonding/sealing emulsion, as well as means allowing to use these products.

In its general principle, the invention is characterized in that the spreading of the bituminous coating is performed by rolling means that condition the coating into a film of controlled thickness and over a controlled width before being splintered/crumbled and to fall down to the ground by being preferably projected to the latter. The making of the film is qualified as rolling and the film is obtained by passing the bituminous coating between two elements that are mobile relative to each other, in particular two rotating cylinders or between a fixed element relative to a mobile element, in particular a levelling wall with respect to an endless belt of an extended cylinder.

In the case where two cylinders are used, the film of bituminous coating of determined thickness is made

between the two cylinders preferably rotating at the same absolute radial speed so as to facilitate the dosage. If, preferably, the two cylinders turn in opposite directions, the case is contemplated in which they would turn in the same direction, in particular in the case where one of the cylinders turn faster than the other to project the bituminous coating to the ground. It may hence be chosen to have different absolute radial speeds for the two cylinders but, in certain conditions, this could complicate the theoretical estimation, on the paper, of the quantity of material of the film, due to effects that can be nonlinear. In such cases, measurements on a machine in activity will allow, if desired, to obtain dosage curves as a function of the adjustments of the machine. Indeed, it has been observed in certain conditions, during tests, an absence of linearity of the dosage with the radial speed of the roll(s) and also with the spacing between the rolls.

In case of use of an extended cylinder, the moving of an endless belt is combined with successive functions of feeding with bituminous coating, transverse distribution of the bituminous coating on the endless belt, creation on the endless belt of a film of bituminous coating having a determined thickness, crumbling of the film and spreading by falling down, and preferably projection, of the crumbled film to the ground.

The ground on which the layer is spread is preferably a ground prepared to receive said layer of bituminous coating. A bonding and/or sealing layer may be applied on the ground before spreading of the bituminous coating or simultaneously during the spreading.

In the present description, the words "front" and "rear" are defined with respect to the direction of advance on the ground of the spreading means, the spreading means moving forward. The words "upstream" and "downstream" are defined with respect to the direction of circulation of the bituminous coating in the spreading means, the spreading being performed downstream to form on the ground a layer of bituminous coating, the bituminous coating arriving into the spreading means from the upstream.

In the spreading machine that will be described in more detail, on the one hand, the rear and the downstream correspond to each other because the spreading is made on the rear, and on the other hand, the upstream is oriented forward. Moreover, the spreading means are arranged on the rear of the machine. Other arrangements may however be contemplated, with for example a spreading machine in which the downstream of the unit is oriented toward the front of the machine and/or the spreading unit is arranged on the front, wherein the machine can moreover be a rolling machine.

Thanks to the invention, the dosage of the bituminous coating is applied in a uniform and continuous way whatever the deformations of the ground, provided that it is possible for building machines, and in particular the spreading machine implementing the invention, to circulate thereon. The invention allows a controlled dosage of the spreading of the bituminous coating over a range of 6 kg/m$^2$ to at least 30 kg/m$^2$.

Moreover, given that the invention can be applied to all the hot coatings, the warm coatings, the half-warm coatings, the half-cold coatings, the cold coatings of the emulsion gravel type, the cold open coatings, or the cold dense coatings, it is possible to adapt the formulation of the bituminous coating to the particularities of the spreading working place. The adaptation may be done as a function of the thickness of the layer of bituminous coating it is desired to be obtained, as a function of the characteristics of the support and in particular as a function of the level of the deflections and/or as a function the aggressiveness of the traffic.

For example, for applications as a thin layer which correspond to dosages comprised between 6 kg/m$^2$ and less

than 30 kg/m$^2$, it may be used a continuous or discontinuous formulation with a high richness module: dosage of binder higher than 5.4 % and dosage of the elements of size lower than 63 µm higher than 6 %, preferably, and with the use of an asphalt of a grade chosen among 30/70, 70/100, 160/220, 250/330, 330/430, 500/650, 650/900, or of modified asphalts. The modified asphalts are preferably used for roads having a high circulation or roads that, due to their geometric configuration, in particular sinuous and/or as a ramp…, generate high constraints.

For depositions in thicker layers, in a range of 30 to 60 kg/m$^2$, the coating may be formulated in accordance to the texts or standards in force. For the gravel emulsions, according to the standard NF 98-121. For the BBUM (Ultra-Thin Bituminous Concrete), with a mean dosage of 30 kg/m$^2$, in accordance to the standard NF EN 13109-9. For the BBTM (Very Thin Bituminous Concrete) with a mean dosage of 60 kg/m$^2$, in according to the standard NF EN 13 108-2. For the BBM (Thin Bituminous Concrete) of mean dosage 90 kg/m$^2$, i.e. 4 cm of nominal thickness, in accordance to the standard NF EN 13 108-1. For the BBF, in accordance to the standard NF EN 98-139. For the BBDr (Draining Bituminous Concrete).

The invention may be applied to bituminous coating whose (D) is 4 mm, 6.3 mm, 10 mm or 14 mm, and the (d) of the bituminous coating is equal to 0 mm, 2 mm, 4m or 6.3 mm. It is reminded that the grain-size class, noted d/D with d<D, denotes an interval of particle sizes in terms of lower size (d) and upper size (D) of screen, expressed in mm. The conventional means for producing bituminous coating may be used within the framework of the invention, in particular hot coating plant or cold coating plant.

In the following of the description, the embodiment with an endless belt, i.e. with implementation of spreading means including a patterned cylinder and an extended roll, will be more particularly detailed, given that the film of determined thickness made in this device has a life duration and an extension higher than the embodiment with a crumbling-rolling sub-unit having two patterned cylinders, which make the explanation easier. Indeed, in the embodiment with a sub-unit having two patterned cylinders, the film of bituminous coating made between the patterned cylinders is almost immediately crumbled due to the fact that the zones of creation of the film and of crumbling are very close the each other. The implementation of an endless belt comes to use a cylinder that is in an extended form and it is hence possible to furthermore separate the zone of creation of the film of bituminous coating from that of the crumbling of said film.

In a variant equivalent to the first embodiment with a sub-unit having two patterned cylinders, two extended cylinders, consisted of two opposite endless belts with relief patterns, rotating in the same direction for the opposite belt parts, preferably with the same radial speed in absolute value, may be implemented. In such a case, it is understood that this allows to separate the zone of creation of the film (upstream, entry side of the unit with two patterned extended cylinders) from the crumbling area (downstream, exit side of the unit with two patterned extended cylinders). The adjustable spacing between the two opposite endless belts allows to adjust the thickness of the film of bituminous coating and hence the dosage, hence the quantity, of bituminous coating spread on the ground. The fact to constrain the film of bituminous coating between two endless belts of two patterned extended cylinders allows a vertical arrangement, inclined or horizontal, of the two patterned endless belts.

The endless belt and the combined operational means are integral and carried by an automotive tractor machine that ensures a function of motricity of controlled speed and brings the energies and fluids required for the good operation of the spreading device. This machine is generally a finishing machine or a finishing tractor that

ensures the displacement as well as the bituminous coating, energy and fluid feeding functions, and the spreading device is then installed at the place of the finishing table. In the first case, a specific machine is made and, in the second case, a conventional machine is used, the device being added on the tractor in replacement of the conventional spreading tool. In still another variant, the device of the invention is a trailer that can be towed by an automotive machine, for example a bituminous coating delivery truck, a fast coupling means being implemented between them.

In the block diagram of Figure 1 showing a sub-unit 1 with a cylinder 12 provided with relief patterns 13 and an extended roll consisted of an endless belt 8 between an upstream inner roll 10 and an downstream inner roll 9, the bulk bituminous coating arrives on the upstream/entry side of the unit, which has been shown by a wide curved arrow 11 on the left of Figure 1 and which corresponds to a bituminous coating feeding function. The bituminous coating arriving on the endless belt on the upstream side is spread transversally/laterally over the width of the belt 8 by a distributing machine 7 ensuring the function of transverse distribution of the bituminous coating on the belt 8. The upper face of the belt 8 which receives the bituminous coating moves from the upstream to the downstream. In this functional scheme, the distributing machine 7 also ensures a function of levelling machine so as to form a film 6 of bituminous coating of determined thickness on the belt 8. In Figure 1, certain areas of the film 6 has been omitted to allow to seen the belt 8 that supports the film 6 and, indeed, the film 6 of bituminous coating led downstream by the belt 8 is continuous at the exit of the distributing machine 7 having a levelling machine function. This film 6 is crumbled on the downstream/exit side of the unit by a cylinder 12 having relief patterns 13 arranged opposite the downstream inner roll 9. In Figure 1, the spacing between the cylinder 12 with patterns 13 and the belt 8 carried by the downstream inner roll 9 has been exaggerated to better schematize the crumbled bituminous coating 5 projected down to the ground 2. In practice, the spacing between both is lower than the thickness e of the film 6 so that the relief patterns 13 of the cylinder can effectively carry along and crumble the bituminous coating of the film 6. These relief patterns 13 of the cylinder 12 are preferably substantially elongated in the direction of the cylinder length: blades, chevrons… In a variant, these are "bristles" or picks of the brush-type but they have then an effective driving surface that is smaller than the patterns elongated along the cylinder length.

The crumbled bituminous coating projected down to the ground 2 then forms thereon a layer 4 of bituminous coating on which a rolling roll is subsequently passed. In Figure 1 is schematized the previous application of a sealing and binding layer 3 before the spreading of the crumbled bituminous coating 5. The unit that is above the ground 2 moves in the direction indicated by the arrow 32. It is hence understood that it is created with the film of bituminous coating carried and transported by the belt 8, the equivalent of the layer 4 that is formed on the ground, the dosage on the ground however depending on the speed of advance of the unit on the ground as will be described in more detail latter.

The belt 8 is consisted of a rubber belt that resists to the high temperatures, at least up to 180°C, or any other means that allows to support the coating and to transport it with a linear speed comprised between 2 meters per minute and 20 meters per minute. The belt, substantially horizontal, is supported by two inner rolls, an upstream inner roll 10 on the side of arrival of the bituminous coating and a downstream inner roll 9 on the side of crumbling of the bituminous coating film. One of the inner rolls of the endless belt is a driving roll to ensure the rotation of said belt. Preferably, it is the downstream inner roll 9 that is a driving roll to maintain tensioned the

belt carrying the coating film. The motor is preferably a hydraulic motor.

The spacing between the inner rolls 10, 9 gives an efficient length of the endless belt 8 of at least 1 m, the efficient length corresponds to the upper surface of the endless belt 8 on which the bituminous coating film 6 is made and transported. Furthermore, between the inner rolls 10, 9, at least the upper part of the endless belt slides over a rigid plate to prevent the latter to be deformed under the load of the bituminous coating film and hence to keep a film of constant thickness.

The bituminous coating feeding function 11 for the distributing machine 7 arranged above an endless belt 8 is ensured by a conveyor or any other device that allows to ensure a bituminous coating flow rate comprised between 10 tons per hour and 100 tons per hour.

We will now describe, starting by Figure 2, the implementation of the bituminous coating spreading device on a finishing tractor 14 in replacement of a conventional finishing table. The device is installed on a removable module 33 that may be connected to the rear of the finishing tractor 14 in replacement of the finishing table. The device split into two sub-units each consisted of a patterned cylinder 12 and an extended roll of the endless belt 8 type.

In Figure 2, the finishing tractor 14 includes, in front, a bituminous coating buffer tank 35 that can be laterally open to come on the rear of the truck for being fed with bituminous coating. Protective members 29 in the front of the tractor allow to push the bituminous coating truck as the finishing tractor moves forward on the ground thanks to tracks 28. A motor and piloting unit is arranged on the rear of the buffer tank 35. A conveyor that is not visible but signaled by the reference 30 with dashed-line arrows, takes bituminous coating from the bottom of the buffer tank 35 to send it to the rear of the finishing tractor by passing between the tracks 28 and under the motor and piloting unit. This conveyor 30 is herein double, with two parallel lanes able to be controlled independently from each other as a function of the needs in bituminous coating for each sub-unit 1a, 1b having a cylinder 12 with patterns 13 and extended roll 8, 9, 10.

In Figure 3, we can see more precisely the removable module 33 with its two sub-units 1a and 1b having cylinders 12 with relief patterns 13 and extended rolls each consisted by an endless belt 8 between an upstream inner roll 10 and a downstream inner roll 9. The two sub-units 1a, 1b are offset both laterally and vertically. The lateral offset between the two sub-units 1a, 1b is adjustable so as to be able to perform a more or less wide layer of bituminous coating on the ground. The two sub-units 1a, 1b may hence more or less overlap, hence the necessity of the height offset so that one of them 1b can pass under the other 1a.

The removable module 33 includes a rigid support frame 16 fixed to the finishing tractor and whose inclination and/or height with respect to the finishing tractor may be adjusted thanks to controlled jacks. A bridge is fixed on the upper part of the support frame 16 so as to allow the staff to accede to the piloting station and to observe the operation of the two sub-units, or even to adjust certain members accessible from the bridge.

The two sub-units 1a, 1b are laterally slidingly carried by the support frame 16 through rolling members 17 towards the rear/downstream of the sub-units and 17' towards the front/upstream of the sub-units. It is to be noted that the unit 1a that is the highest also slidingly support towards the rear/downstream the unit 1b that is the lowest. It can be seen more precisely in Figure 7 one of the embodiments of the rolling members 17 for the sub-unit 1b.

The cylinder 12 with patterns 13 is driven into rotation by a hydraulic motor 26 and the downstream inner roll 9 by a hydraulic motor 25 that is best seen for the unit 1a because theses motors are on the side of the observer. A belt doctor 34 is arranged downward the downstream inner roll 9 so as to scrape the upper/outer surface of the belt 8 and to make fall down to the ground the bituminous coating that could have stayed stuck on the belt after the latter has passed under the cylinder 12 with patterns 13.

On the side of the sub-unit 1b that is the most visible in Figure 3, it can be seen towards the upstream of the endless belt 8, the levelling wall 22 of the levelling machine that is at the rear/downstream of the cage 15 of the distributing machine 7.

The transverse distribution function of the distributing machine is ensured by a worm, visible in Figures 5 and 6 for each sub-unit 1a, 1b positioned in a cage 15 open at the upper part to receive the coating coming from a ramp 21 and from the conveyor 30 and open in the lower part to transversally distribute the coating over the belt 8.

In order to ensure the regularity of the transverse distribution of the bituminous coating by the worm on the endless belt, this transverse distribution of the coating is performed in the cage 15 over a width of the belt by making a vein whose thickness is preferably at least higher than four times the (D) of the coating. For example, with a coating 0/10, the vein under the worm must have preferably a minimum thickness of 40 mm.

In practice, the bituminous coating, characterized by its d/D, may be chosen with a value of 0-2-4 or 6.3 mm for the (d) and a value of 4-6.3-10-14-20 mm for the (D). Likewise, the bituminous coating may be chosen among a hot coating having a fabrication temperature higher than 150°C, a warm coating having a fabrication temperature higher than 100°C and lower than 150°C, a half-warm coating having a fabrication temperature between 85°C and 100°C, a half-cold or cold dense having a fabrication temperature lower than 85°C.

As can be seen in Figure 4 for the unit 1a, a spraying ramp 19 of a sealing and/or bonding product is arranged in the upstream/front of the sub-units. This spraying ramp is fed with a bonding/sealing emulsion by devices that will be described in relation with the trailer of Figure 11 and that comprise in particular an emulsion tank and an emulsion pump. These spraying ramps follow the lateral displacement of the sub-units during the adjustment of the spreading width. Preferably, during the implementation of the device, it is first spread on the ground, by spraying with the spraying ramp, a bounding layer in front of the falling down and projection on the ground of the crumbled bituminous coating.

It can be noted the presence of a level sensor 18 on the lateral end of the cage 15 of the worm-based distributing machine 7 of the unit 1a. This level sensor 18 is arranged on the lateral side of the cage 15, i.e. opposite the place of the cage 15 where arrives the bituminous coating by the feeding function 11, the upper end of the feeding ramp 21 of which can be seen. The worm rotates so as to send and distribute the bituminous coating into a vein towards the lateral end of the cage 15. This sensor 18 allows to cut the bituminous coating feeding 11 when there is enough bituminous coating in the case and that may have reach the lateral side of the cage. A possible overflow of the bituminous coating out of the cage is hence avoided, while ensuring a correct distribution of the coating over the surface of the endless belt 8 and in order to obtain a uniform film.

The two feeding ramps 21 of the two sub-units receive the bituminous coating arriving by the double conveyor 30 arranged between the tracks 28 of the tractor 14. These two feeding ramps 21 allow to move the bituminous coating up above the two cages 15 of the two sub-units 1a, 1b. The two feeding ramps are in fixed positions and

are arranged on either side of the median axis of the tractor and of the module 33, substantially against each other. It is hence understood that the bituminous coating will fall down into the cage at a place that will depend on the lateral position of the unit 1a, 1b. When each sub-unit 1a, 1b is fully pushed outward to obtain a maximal layer width, the place where the bituminous coating falls down into the cage is the central end, i.e. towards the median axis, of the cage 15 and the film is hence made over the whole width of the endless belt 8.

On the other hand, when the sub-units are close to each other and overlap each other for making a narrower layer, the place where the bituminous coating falls into the cage is an intermediate position between the two lateral and central ends of the cage 15. It results from the fact that the worm distributes the coating toward the lateral side that the film will be made only over a reduced width of the endless belt and on the lateral side of the latter. Thanks to that, there is no overlap of spreading in the central area of the layer and hence no double thickness of the layer in its central area when it has been chosen a layer width that is lower than the maximum width of spreading by moving closer and overlapping of the two sub-units 1a, 1b.

The bituminous coating feeding of the distributing machine is preferably controlled by its own automatism that does so that the vein of bituminous coating in the cage 15 will have the required minimum thickness for a correct distribution, while avoiding an overflow of the bituminous coating out of the cage. At least one sensor 18 is hence implemented within the cage to stop the feeding of the latter when the level of bituminous coating rises too high in the cage, with a risk of overflow. The bituminous coating feeding of the cage is resumed when the level of coating goes down in the cage and risks to pass under the required minimum thickness. It is also implemented a level sensor at the exit of each feeding ramp 21, in the corresponding chute 31. Thanks to such an automatism, the device can operate correctly even if the adjustments thereof are modified to modify the dosage of the layer obtained on the ground.

Figure 5 allows to view the worm 20 in the cage 15 of the distributing machine 7 of the unit 1b. The same members than those described in Figure 4 for the unit 1a, and in particular the level sensor 18, are found. It can be noted the presence of a chute 31 just under the end of the feeding ramp 21 and above the opening of the top of the cage 15, the chute being fixed as the feeding ramp 21 (it is reminded that the cage 15 can move under the chute). This chute 31 forms a funnel intended to guide into the cage 15 the bituminous coating that falls from the feeding ramp 21.

In Figure 6 can be seen the worm 20 in the cage 15 of the distributing machine 7 of the unit 1a.

The function of creating, on the belt, a bituminous coating film having a determined thickness comprised between 20 mm and 100 mm to within more or less 2 mm is ensured by a levelling wall 22 forming the guillotine of a levelling machine. The thickness of the bituminous coating film is preferably at least equal to four times the (D) of the bituminous coating. For example, for a coating 0/10, the thickness of the film under the guillotine will be preferably at least equal to 40 mm. The position in height of the levelling wall 22 forming the guillotine of the levelling machine with respect to the upper surface of the belt is adjustable so as to be able to choose the thickness of the bituminous coating film and hence to adjust the dosage of bituminous coating spread on the ground.

The function of creation of the bituminous coating film may be associated with the function of transverse distribution. It is preferable that the two conditions relating the thicknesses of the vein in the cage and of the film

on the belt are respected, i.e. a vein thickness at least equal to four times the (D) of the bituminous coating, and a film thickness at least equal to four times the (D) of the bituminous coating, modifications of these thicknesses having to be made in a correlated manner.

The bituminous coating film that is transported by the endless belt is then dislocated by being crumbled by a cylinder 12 with patterns 13, then spread on the ground by falling down, preferably the patterned cylinder rotating at a rotational speed such that the crumbled bituminous coating is projected to the ground.

In Figure 7 are seen more precisely the relief filiform patterns 13 of extension substantially longitudinal along the cylinder 12. They result from the welding on the cylinder 12 of an expanded metal grid with diamond patterns and of a few millimetres thick.

The relief patterns are filiform and are essentially elongated along the length of the cylinder and form bituminous coating driving patterns. Typically, the relief pattern is similar to a substantially regular repetition of square edge or diamond edge shapes. Other elongated shapes are possible, for example saw-teeth, triangle, chevrons, zigzag… but they all have a substantially longitudinal extension, over the length of the cylinder, so that the driving effect of the bituminous coating is efficient. These relief patterns may be integrated or added on the surface of the cylinder.

If, preferably, the relief patterns at the surface of the cylinder are filiform, it may be implemented as an alternative a hedgehog cylinder including points and/or blades for the crumbling of the film and the projection the bituminous coating towards the ground. It is to be noted that the projection to the ground of the bituminous coating resulting from the crumbling of the film may be more or less important according to the needs, the crumbled bituminous coating falling naturally down to the ground due to the fact that it is released from the endless belt, the latter rolling downward around the downstream inner roll and going back towards the upstream at the bottom of the device. It is however preferable that the patterned cylinder rotates fast enough so that the crumbled bituminous coating can be detached efficiently from said cylinder under the effect of the centrifugal force. With a too slow rotational speed of the patterned cylinder there is a risk of formation of too voluminous packets of bituminous coating. Hence, it is preferred that the patterned cylinder rotates rapidly to project the crumbled bituminous coating to the ground. In practice, the radial speed of the patterned cylinder is higher than the radial speed of the endless belt.

The cylinder 12 with patterns 13 has an effective length substantially identical to the effective width of the conveyor belt 8, and it is placed at the downstream end of the endless belt 8, opposite the downstream inner roll 9. The diameter of the cylinder 12 with patterns 13 is of at least 150 mm.

In the case of a hedgehog cylinder, the points of the hedgehog are spaced apart by about 10 mm and have a length of 50 mm for a coating of grain size 0/10. More generally, it may be provided different patterned cylinders, or different patterns if the patterns are removable, adapted to the grain size of the coating to be projected. In the case where the relief patterns, filiform or hedgehog, have a great height able to do so that they come into contact with the belt, it is provided that these relief patterns have a certain flexibility to retract upon contact with the belt.

The distance between the patterned cylinder and the belt passing on the downstream inner roll that is opposite said patterned cylinder is adjustable by adjustment means 23 visible in Figure 7. The spacing between the

upstream and downstream inner rolls, and hence the tension of the endless belt, is adjustable thanks to adjustment means 24 acting more particularly on the position of the downstream inner roll 9. It can be noted that the adjustment of the position of the downstream inner roll 9 automatically causes the displacement of the cylinder 12 with patterns 13 and of the belt doctor 34 due to the fact that these latter are mounted on a common adjustment plate. These adjustment means 23 and 24 are herein manually operable but in other embodiments, they are operated by controlled position actuators. It is understood that these adjustments are possible at the two ends of the cylinder 12 with patterns 13 and of the extended roll 8, 9, 10, so as to keep a parallelism between both and so that the belt between its upstream and downstream inner rolls.

A motor 26, preferably hydraulic, ensures the rotation of the patterned cylinder at a speed of 200 to 400 rpm. These values are given by way of indication as an order of magnitude for a better understanding.

A belt doctor 34 is arranged downward the downstream inner roll to scrap the surface of the endless belt in the case where bituminous coating would remain stuck on the belt and hence make it fall down to the ground where it will join the remaining of the bituminous coating that had been crumbled and detached from the belt by the patterned cylinder.

In Figure 8, we can perfectly see the very partial overlap of the two sub-units 1a, 1b du to the fact that they are positioned to make a layer whose width corresponds to the maximal possible width due to the fact that the spacing between the two sub-units is maximum. It is understood that this very partial overlap is linked to the fact that the useful width of the belt, hence of the film, is a little lower than the width of the unit and that, to avoid a lack of bituminous coating towards the centre of the layer, the useful widths of the belts must join the median axis of the tractor and of spreading. When it is desired to make a layer having a width equal to or lower than the useful width of the belt, only one of the two sub-units is operated.

It is understood that the speeds of the different elements of the device are adapted between each other so that there is no cutting of supply or clogging along the path of the bituminous coating in the device. In the case of a normal operation with no breaking or clogging, it is possible to calculate the dosage of the bituminous coating that is spread on the ground with the following formula:

Dosage ($kg/m^2$) = 1000 * MVA * Ev * Vr / Va

where

MVA ($M.g/m^3$) is the bulk density of the film on the endless belt,

Ev (m) is the thickness of the film on the endless belt,

Vr (m/min) is the speed of advance or rotation of the belt,

Va (m/min) is the speed of advance of the device on the ground.

The bulk density of the film on the endless belt, MVA, is determined for each formula of bituminous coating. The thickness of the film, Ev, is adjustable and it is preferably chosen a thickness equal to four times (D), (D) being the greatest dimension of the gravels that compose the formula of the bituminous coating. The speeds of advance or rotation of the endless belt and the speed of advance of the device with respect to the ground are synchronized and dependent on each other so as to obtain the desired dosage for the layer on the ground.

In a variant, a weighing means is installed under the belt section arranged between the levelling wall and downstream inner roll so as to measure the mass of the coating vein that passes on the belt at said weighing means, this means being a weighing belt system that can for example be consisted of a weighing roll extended under the belt. It is thus possible to continuously measure the weight of the coating moving on the belt. This weighing means may be used in combination with the dosage calculation explained hereinabove or to be used alone to adjust the dosing. It hence exists several means to control the speed of advance of the device on the ground and the desired dosage.

It is understood that it is possible to act on one or several parameters to adjust the dosage of the bituminous coating of the layer on the ground, which allows a very high flexibility of operation.

A regulating automaton is implemented to command and control the different elements of the device. The operation of the spreading device may be adjusted in various ways. Generally, it is chosen a dosage in $kg/m^2$ to be obtained for the layer on the ground and the automaton adjusts the parameters of speed of the advance of the device on the ground, of speed of rotation of the belt, of thickness of the film for that purpose. In some cases, one of the parameters may be constrained: for example the speed of advance of the device is moreover imposed by an operator and the automaton hence adjusts the two other parameters. It is to be noted that the automaton may include tables or formulas of calculation giving possible areas of values of parameters as a function of the dosages. It is then possible to implement securities informing the operator about an impossibility to reach the desired dosage. For example, if the operator imposes a too high speed of advance of the device for a given formulation and a desired dosage, the automaton will indicate an impossibility and will possibly be able to indicate a compliant lower speed of advance of the device. The automaton may further determine as a function of the desired dosage, an optimum speed of advance of the device in terms of consumption and/or of roadwork time or any other criterion of optimization, as for example the speed or period of rotation of the semi-trailers supplying the bituminous coating to the machine having the spreading device.

Likewise, the automate may take into account, thanks to sensors, of certain deformations of the ground on which the layer must be performed. Hence, the dosage to be applied at the plane coordinates x-y, may be made proportional to the deformation in z of the pavement. The values in z as a function of the couple x-y may be predefined and used for the management of the regulation automaton or be measured in real time. In such a mode, the operator may possibly define maximum and minimum limits of the dosage.

In Figure 9, it can be seen that the finishing tractor in action, spreading a layer 4 of bituminous coating. It can be noted that the unit 1a is higher and more on the rear than the unit 1b, this rear offset of the top unit 1a is due to the fact that its feeding ramp 21 is longer and that it has the same inclination than that, shorter, of the low unit 1b. A film of bituminous coating is made on the whole useful width of each belt 8 and this film is crumbled by the corresponding patterned cylinder 12 to form crumbled bituminous coating 5 that falls down to the ground to form the layer 4. It can be noted that the obtained layer 4 has a relatively reduced thickness, which would be uneasy to obtain with a conventional finishing.

Spreading means with two rough cylinders are schematized in Figure 10 with a lateral sectional view of a crumbling-rolling sub-unit 100 according to an alternative to the invention. In this cross-section, a hopper 102 includes on the upstream side of introduction of the bituminous coating, a spreading machine 7, and on the downstream side of exit of the crumbled rolled bituminous coating 5, two rough cylinders 112 that ensure the

rolling of the spread coating and the crumbling of the bituminous coating film resulting from the rolling. The crumbling is performed almost immediately after the rolling in this embodiment. The feeding function 11 has been shown by an enlarged arrow but, as a variant, the hopper 102 instead of being a simple hopper for introducing the bituminous coating 101 coming from a storing means located upstream, may also be a means for storing the bituminous coating. In the latter case, it may be interesting that the storing means of the hopper 102 is a little offset with respect to the vertical of the exit of the crumbled rolled bituminous coating 5 so that the variable weight of the column of stored bituminous coating whose height may vary has a little influence on the dosage of the bituminous coating at the exit, this offset may correspond to a bent or a fall inclined towards the spreading machine 7 and the two rough cylinders 112.

Figure 11 schematically shows a trailer on rolls 114 attached to a spreading device according to the invention, for example that with a crumbling-rolling sub-unit as described hereinabove. This trailer, in addition to its ability to store a bonding/sealing emulsion, allows, after the spreading of the bituminous coating layer on the ground, the rolling of said layer. The trailer 114 includes rolling rolls 115 allowing the displacement of the machine on the layer 4. The trailer 114 includes a divided tank 116 of 6 $m^3$ with a first part for a bonding/sealing emulsion and a second part for the water intended for the watering of the rolling rolls 114. These rolling rolls 115 are shown as being three, but it is understood that this number and/or the rolling structure of the machine may be adapted as a function of the needs, as well as the length of each rolling roll that is herein of 1.50 m and with smooth wheel rims. The trailer 114 also includes a platform with a pump for the bonding/sealing emulsion, a pump for the watering of the rolling rolls and an air compressor for forming jets from the bonding/sealing emulsion ramp 19. The trailer may also include an electrogenerating plant.

It has been schematically shown in the front of the trailer 114, according to the direction of advance 32 of the unit, a ramp 19 for spraying a layer 3 of bonding emulsion to the ground 2 and a spreading sub-unit. The compressed bonding/sealing emulsion and air are transmitted to the ramp 19 through flexible pipes schematically shown by dashed lines in Figure 11. At the rear of the ramp 19 is located the crumbling-rolling sub-unit 100 equipped with two rough cylinders that allows to make the crumbled bituminous coating 5 fall down to the ground, possibly by projecting in to the ground, and to make the layer 4 of bituminous coating on the ground 2. The rolling rolls of the trailer act more on the rear to roll the bituminous coating layer 4 that has been made. Linking means 117 allow to link the trailer 114 to the spreading machine, which includes the spreading sub-unit(s).

**Berendezés bitumenes útburkoló anyag leteritésére az útburkoló anyag egy meghatározott vastagságú vékonyrétegéből kiindulva, valamint eljárás annak alkalmazására**

**Szabadalmi igénypontok**

1. Berendezés bitumenes útburkoló anyag egy rétegének (4) leterítésére egy lefedendő talajra (2), amely berendezés tartalmaz a talajon hosszanti haladási irányba (32) történő elmozdulást biztosító eszközöket, valamint betápláló eszközök által beszállított bitumenes útburkoló anyagot leteritő eszközöket, amelyek alkalmasak a bitumenes útburkoló anyag leterítésére a berendezés előrehaladása során az érintett talaj egy meghatározott szélességére a haladási irányra keresztirányban, ahol a leteritő eszközök alkalmasak a talaj felett a bitumenes

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útburkoló anyag lelapítására és a lelapított bitumenes útburkoló anyag elaprózására, továbbá az elaprózott bitumenes útburkoló anyag lehullatására a talaj felé, ***azzal jellemezve***, hogy a leteritő eszközök tartalmaznak legalább egy lelapító és elaprózó alegységet, amely egy megnyújtott görgőből és egy érdes hengerből áll és hogy a megnyújtott görgőt egy a haladási irányt tekintve elülső belső görgő (10) és egy ezt követően elrendezett hátsó belső görgő (9) között kiterjedő végtelenített szállítóheveder (8) végszakasza képezi, ahol az elülső és az ezt követő hátsó belső görgő párhuzamos az érdes hengerrel (12) és ahol a hátsó belső görgő (9) szemben helyezkedik el a hengerrel (12), emellett a szállítóheveder (8) szélessége lényegében egyenlő a henger (12) hosszúságával, és a szállítóheveder (8) felső felületén egy meghatározott vastagságú (e) vékonyréteg (6) van képezve a bitumenes útburkoló anyagból, amely vékonyréteg a szállítóheveder által a henger felé van továbbítva, ahol a henger felülete és a hátsó belső görgön átforduló szállítóheveder felülete között meghatározott távolság kisebb, mint a szállítóheveder (8) felső felületén bitumenes útburkoló anyagból képzett vékonyréteg (6) meghatározott vastagsága (e).

2. Az 1. igénypont szerinti berendezés, ***azzal jellemezve***, hogy a leteritő eszközök arra vannak kialakítva, hogy elvégezzék az elaprózott bitumenes útburkoló anyag kidobását annak a talajra való leszórásához.

3. A 2. igénypont szerinti berendezés, ***azzal jellemezve***, hogy a henger (12) abszolút értékben kifejezve nagyobb sebességgel forog, mint a hátsó belső görgön (9) átforduló szállítóheveder (8) radiális sebessége.

4. Az 1., 2. vagy 3. igénypont szerinti berendezés, ***azzal jellemezve***, hogy egy elosztó egységgel (7) rendelkezik, amely alkalmas a bitumenes útburkoló anyag szétterítésére a leteritő eszközök bemeneténél.

5. Az előző igénypontok bármelyike szerinti berendezés, ***azzal jellemezve***, hogy a bitumenes útburkoló anyag meghatározott vastagságú (e) vékonyrétege (6) a szállítóheveder (8) felső felületén egy a szállítóheveder haladási irányt tekintve elülső részén elrendezett szintező egység által van kialakítva.

6. Az 5. igénypont szerinti berendezés, ***azzal jellemezve***, hogy a szintező egység egy keresztirányú szintezőfalat (22) tartalmaz, amelynek az alsó vége lényegében párhuzamos a szállítóheveder (8) felső felületével és amelynek szintezővége egy szabályozható meghatározott magasságban van a szállítóheveder felső felületétől.

7. Az 5. vagy 6. igénypont szerinti berendezés, ***azzal jellemezve***, hogy a szállítóhevedernek (8) a szintezőfal (22) és a haladási irányt tekintve hátsó belső görgő (9) között elrendezett szakasza fel van szerelve egy súlymérő hevederrendszerrel, amely lehetővé teszi azon útburkolóanyag-szakasz tömegének a mérését, amely a szállítóhevederen áthalad a súlymérő hevederrendszer tartományában.

8. Az előző igénypontok bármelyike szerinti berendezés a 4. és 5. igényponttól függően, ***azzal jellemezve***, hogy az elosztó egység (7) keresztirányban van elrendezve a szállítóheveder (8) felett és a haladási irányt tekintve a szintezőfal (22) előtt helyezkedik el, ahol az elosztó egység (7) arra van kialakítva, hogy a szintezőfal előtt szétterítse a bitumenes útburkoló anyagot a szállítóheveder meghatározott szélességében és egy olyan magasságban, amely nagyobb, mint a bitumenes útburkoló anyag kialakítandó vékonyrétegének (6) meghatározott vastagsága (e).

9. Az előző igénypontok bármelyike szerinti berendezés a 4. igényponttól függően, ***azzal jellemezve***, hogy az elosztó egység (7) egy burkolatban (15) elrendezett szállítócsigával (20) rendelkezik a bitumenes útburkoló anyag kihajtására a szállítóheveder (8) szélességére kiterjedően, ahol az oldalfalak által határolt burkolatnak

nincs alja, hogy a bitumenes útburkoló anyag szétoszolhasson a szállítóheveder felső felületén és felfelé is nyitott a bitumenes útburkoló anyaggal történő feltöltéshez.

**10.** A 9. igénypont szerinti berendezés a 4. és 5. igénypontoktól függően, ***azzal jellemezve***, hogy a szintezőfal (22) az elosztó egység (7) burkolatának (15) a haladási irányt tekintve hátrébb elhelyezkedő oldalfalát képezi, ahol az elosztó egység burkolata egy szabályozható meghatározott magasságban helyezkedik el a szállítóheveder felső felületétől.

**11.** Az előző igénypontok bármelyike szerinti berendezés, ***azzal jellemezve***, hogy tartalmaz egy hordozókeretet (16) két lelapító és elaprózó alegység (1a, 1b) számára, amelyek mindegyikét egy érdes henger (12) és egy megnyújtott görgő (8, 9, 10) képezi, ahol a két alegység (1a, 1b) egyrészt oldalirányban, másrészt magassági irányban el van tolva egymáshoz képest és a két alegység lineárisan mozgatható oldalirányban a tartókeret felé, hogy a két alegység távolodhasson egymástól vagy egymást átfedően közeledhessen egymáshoz egy a mozgáspálya szélességével párhuzamos oldalirányban és ily módon növelni vagy csökkenteni lehessen a talaj azon meghatározott szélességét, amelyen a bitumenes útburkoló anyagot el kell oszlatni.

**12.** A 11. igénypont szerinti berendezés a 4. igénypontól függően, ***azzal jellemezve***, hogy lelapító és elaprózó alegységenként egy-egy elosztó egységgel (7) rendelkezik, ahol a két lelapító és elaprózó alegység két elosztó egysége a bitumenes útburkoló anyagot két ellentétes szélttartó irányba szállítja a végtelenített szállítóhevederek mindegyikének adott szélességében, és hogy az elosztó egység egy az elosztó egység (7) burkolata (15) felett rögzített helyzetben levő tápcsatornából (31) van bitumenes útburkoló anyaggal feltöltve, és hogy a két lelapító és elaprózó alegység (1a, 1b) két tápcsatornája (31) a berendezésnek a haladási irányra (32) szuperponálható középtengelyével szemben van elrendezve.

**13.** Az előző igénypontok bármelyike szerinti berendezés, ***azzal jellemezve***, hogy egy önjáró leteritő gépet képez, ahol a leteritő eszközök ezen gép hátsó tartományában vannak elrendezve, vagy levehető módon vannak felszerelve egy önjáró gép (14) hátsó tartományában, ahol az önjáró gép a haladási irányt tekintve elölről hátrafelé a bitumenes útburkoló anyag számára egy készlettárolót (35), legalább egy szállítószakaszt (30) a bitumenes útburkoló anyag hátrafelé történő továbbítására, valamint leteritő eszközöket tartalmaz.

**14.** Az előző igénypontok bármelyike szerinti berendezés, ***azzal jellemezve***, hogy a dombormináták (13) lényegében a henger (12) teljes hosszára kiterjednek.

**15.** A 11. igénypont szerinti berendezés, ***azzal jellemezve***, hogy a dombormináták (13) lényegében vonalszerűek és a magasságuk 1 mm és 15 mm közötti.

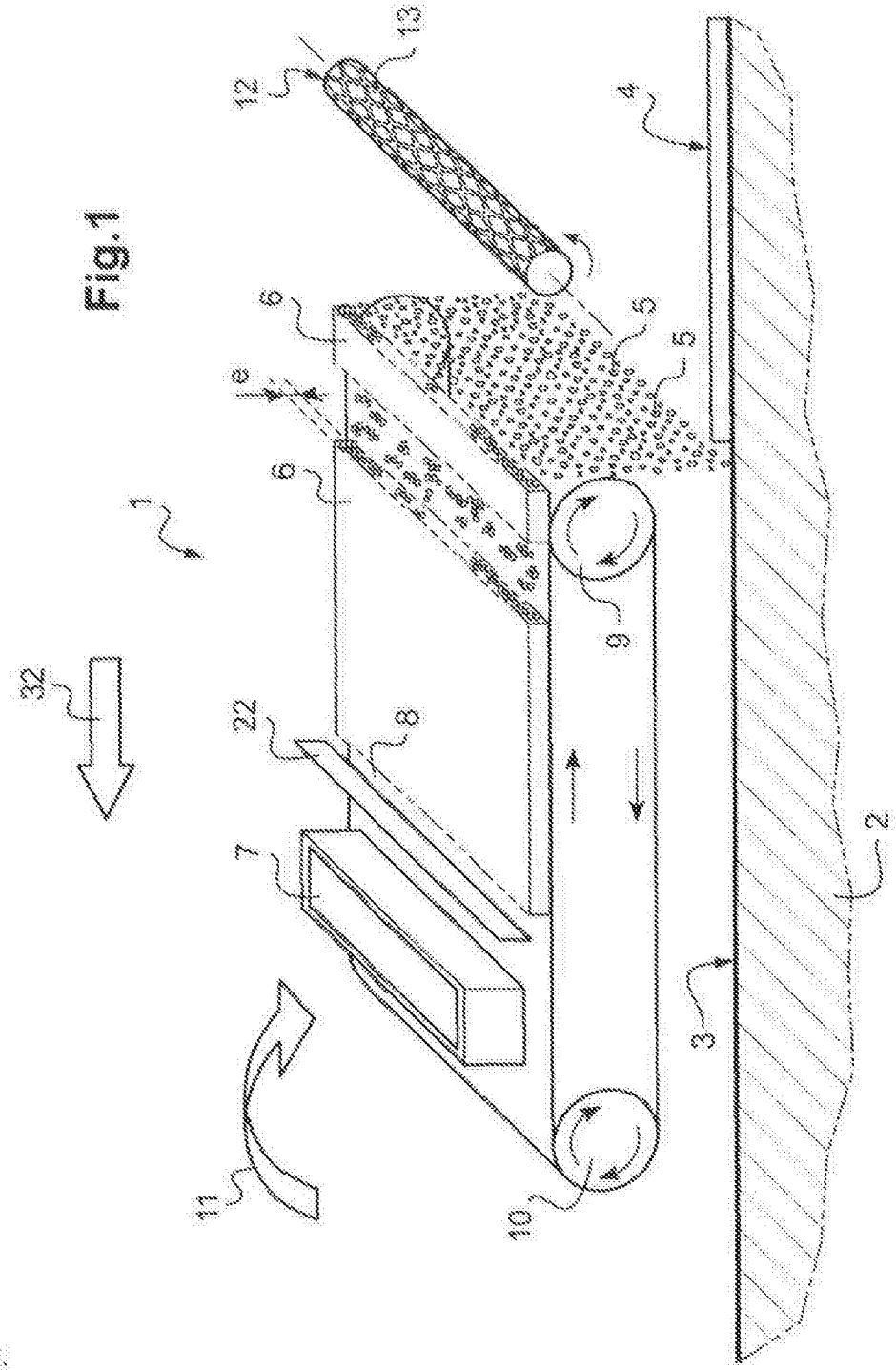
**16.** Eljárás bitumenes útburkoló anyag egy rétegének (4) leteritésére egy lefedendő talajra (2), amely eljárásnál először a bitumenes útburkoló anyagot lelapítjuk, hogy a bitumenes útburkoló anyag egy meghatározott vastagságú (e) vékonyrétegét (6) hozzuk létre meghatározott szélességben és adott távolságban a talaj felett, azután a vékonyréteget elaprózzuk (5) és az elaprózott vékonyréteg bitumenes útburkoló anyagát a talajra hullatjuk, ***azzal jellemezve***, hogy a bitumenes útburkoló anyag meghatározott vastagságú (e) vékonyrétegét egy megnyújtott görgő (8, 9, 10) haladási irányt tekintve elülső részén hozzuk létre, amely megnyújtott görgőt egy a haladási irányt tekintve elülső belső görgő (10) és egy a haladási irányt tekintve ezt követő hátsó belső görgő (9) között kiterjedő végtelenített szállítóheveder (8) képezi, és hogy egy dombormintákkal (13) rendelkező hengert

(12) helyezünk el a hátsó belső görgővel (9) szemben, hogy a végtelenített szállítóhevederen (8) készített vékonyréteget (6) elaprózzuk (5).

17. A 16. igénypont szerinti eljárás, ***azzal jellemezve***, hogy olyan bitumenes útburkoló anyagot alkalmazunk, amely egy 150°C-nál nagyobb előállítási hőmérsékletű forró útburkoló anyag, egy 100°C feletti és 150°C alatti előállítási hőmérsékletű meleg útburkoló anyag, egy 85°C és 100°C közötti előállítási hőmérsékletű félig meleg útburkoló anyag, valamint 85°C alatti előállítási hőmérsékletű félig hideg vagy hideg útburkoló anyag közül van kiválasztva.

18. A 16. vagy 17. igénypont szerinti eljárás, ***azzal jellemezve***, hogy olyan bitumenes útburkoló anyagot alkalmazunk, amelynek a d/D arányhoz tartozó d és D értékeit a d-hez hozzárendelt 0-2-4 vagy 6,3 mm értékek közül, és a D-hez hozzárendelt 4-6,3-10-14-20 mm értékek közül választjuk

Fig.1




SZTNH-100004454

Fig.2

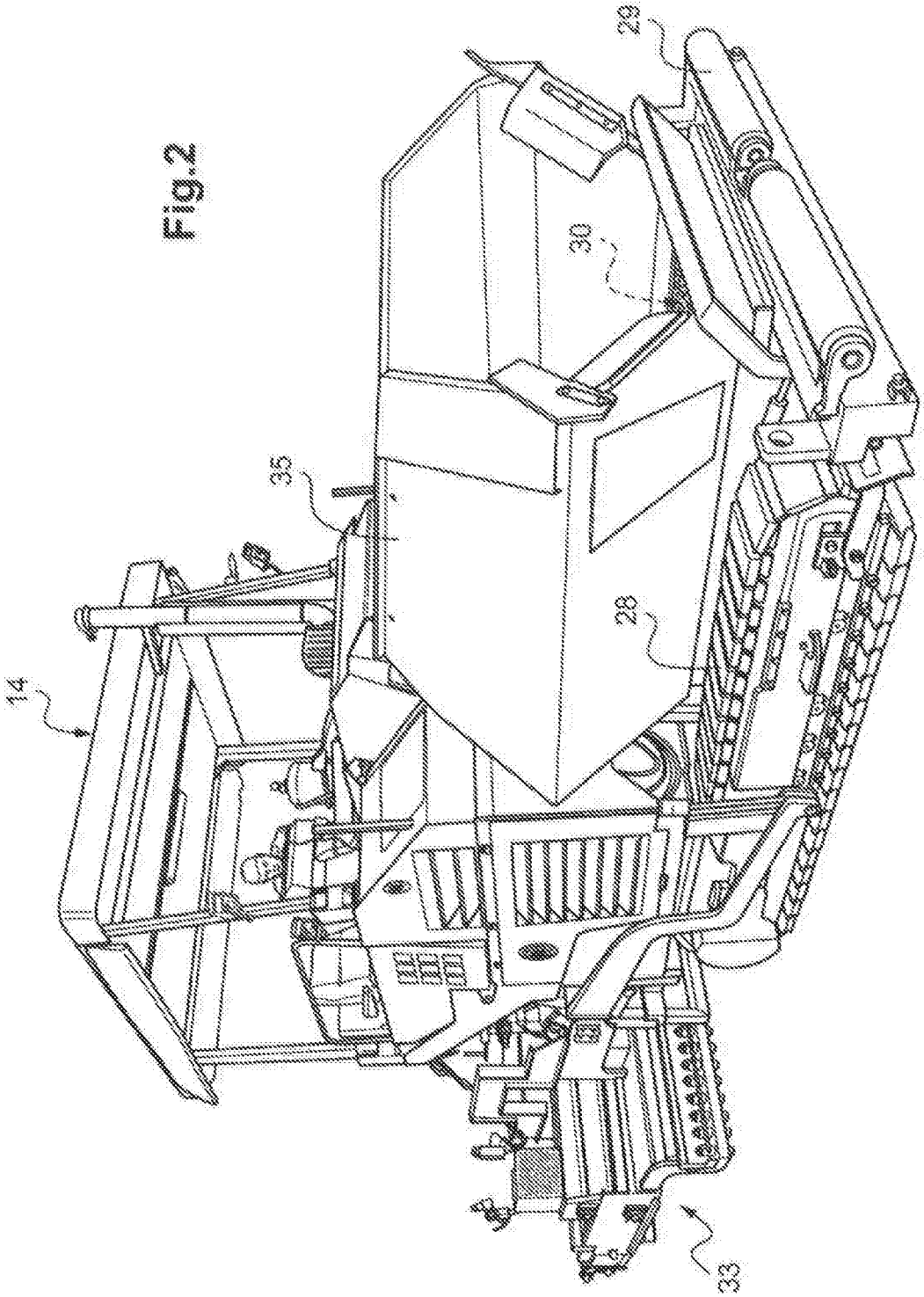
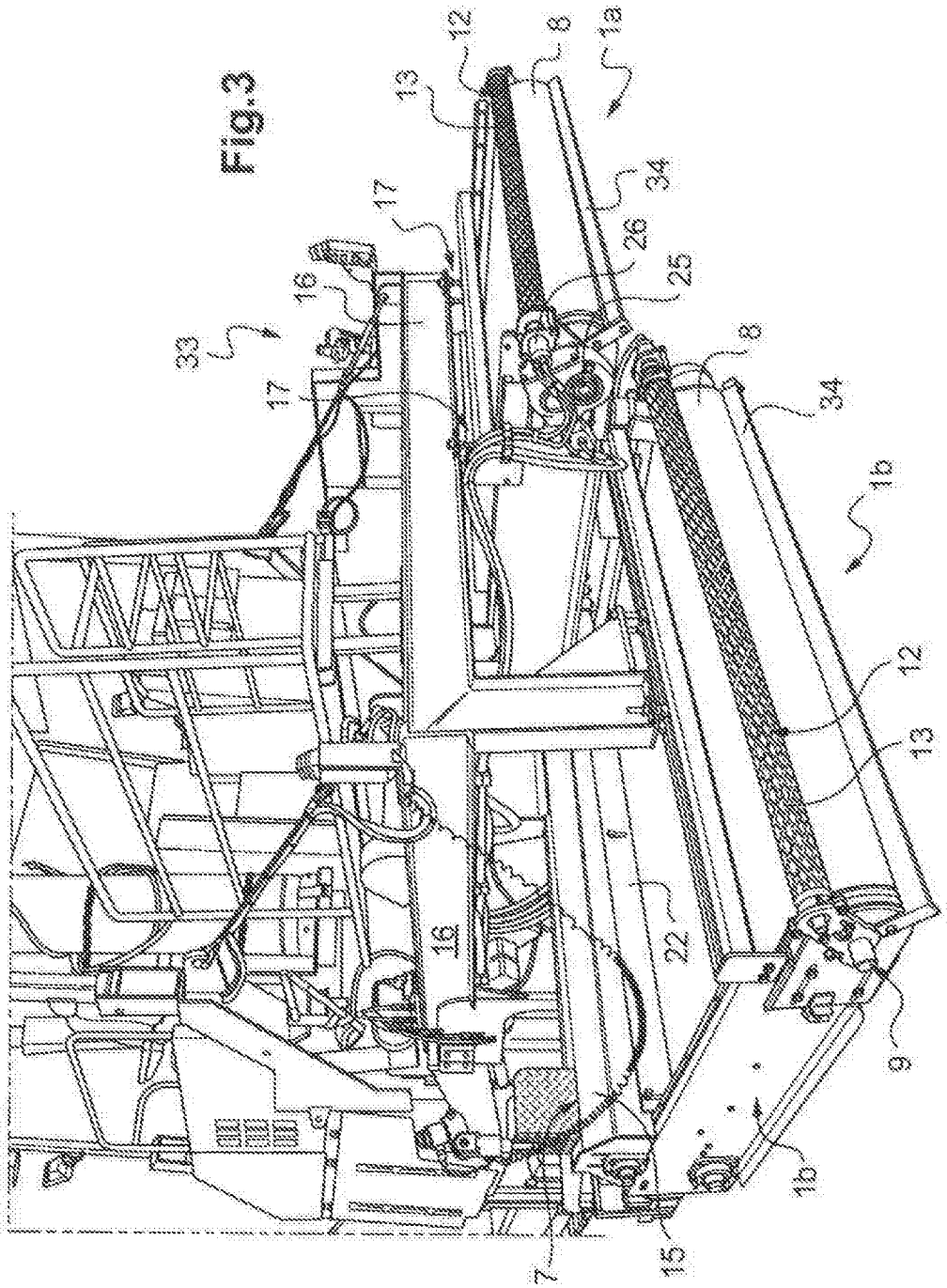


Fig.3



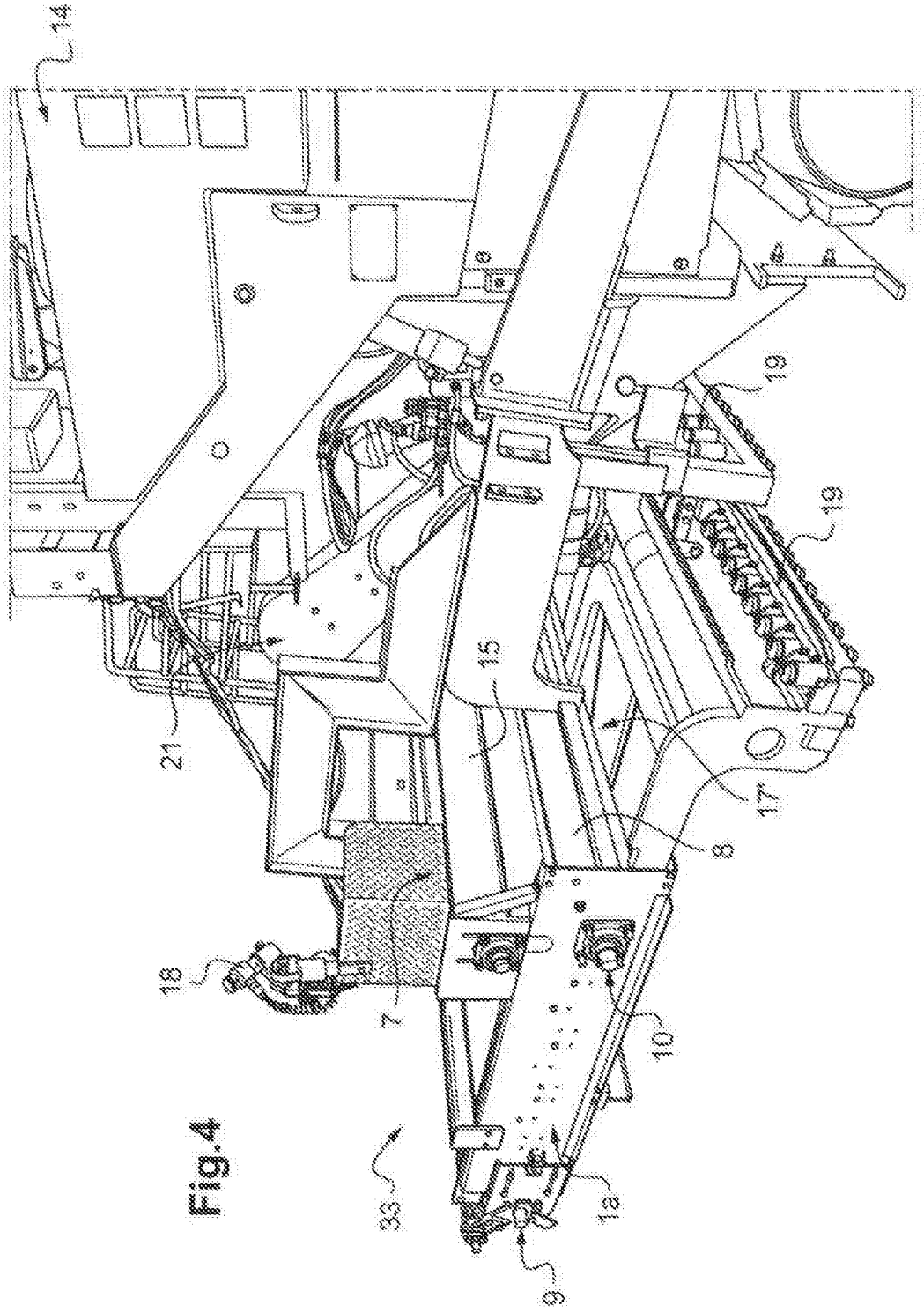



Fig.4

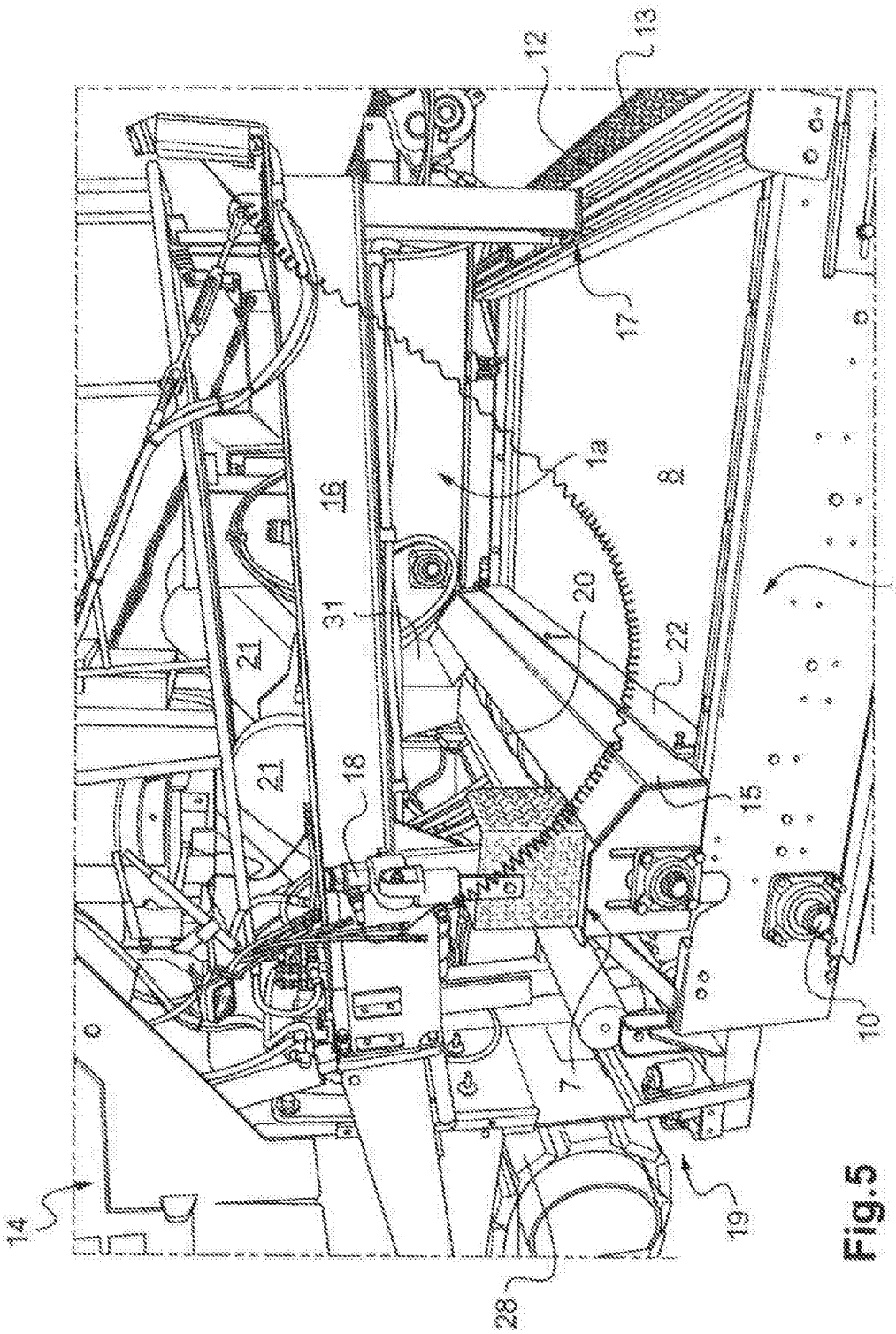



Fig.5

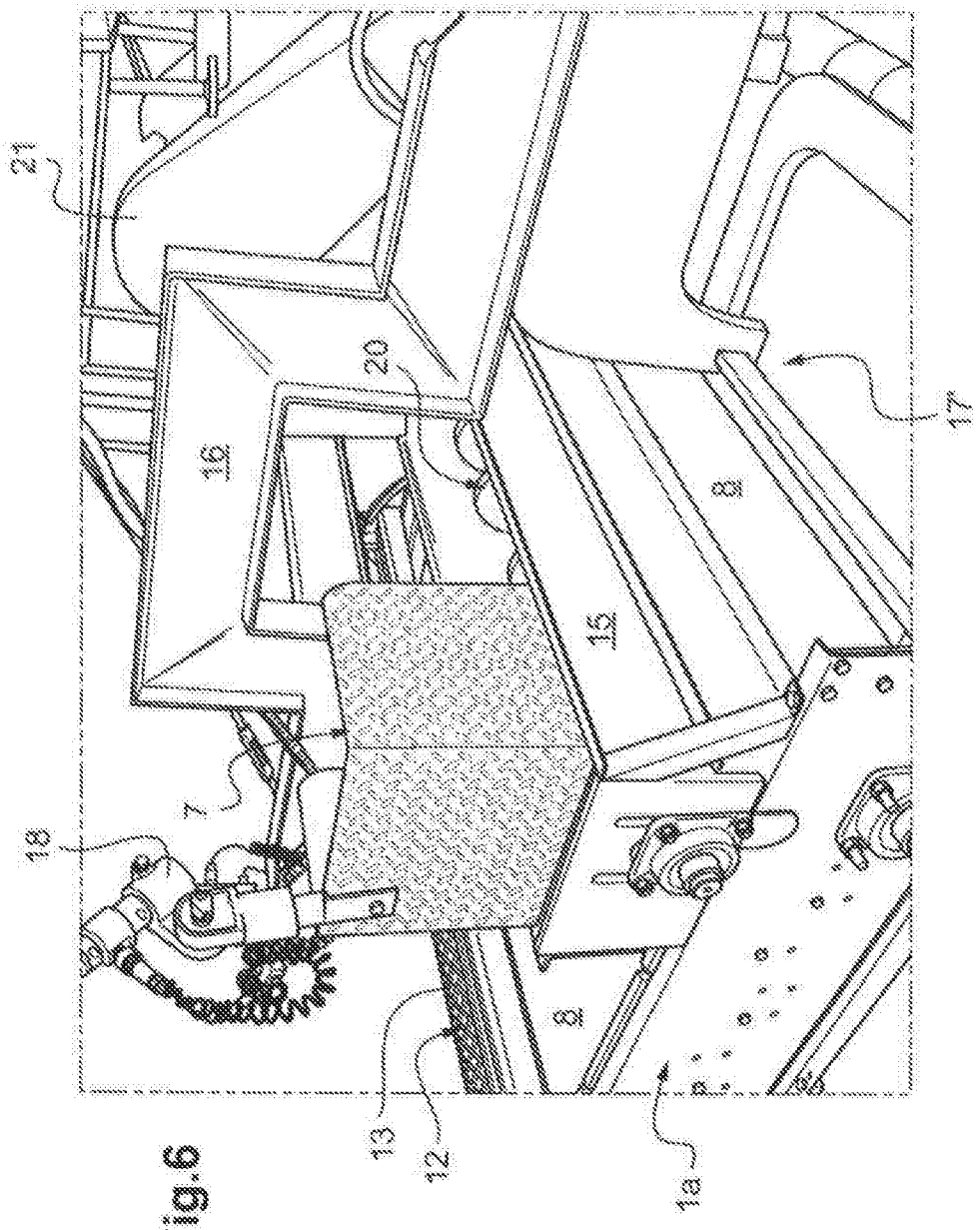



Fig.6

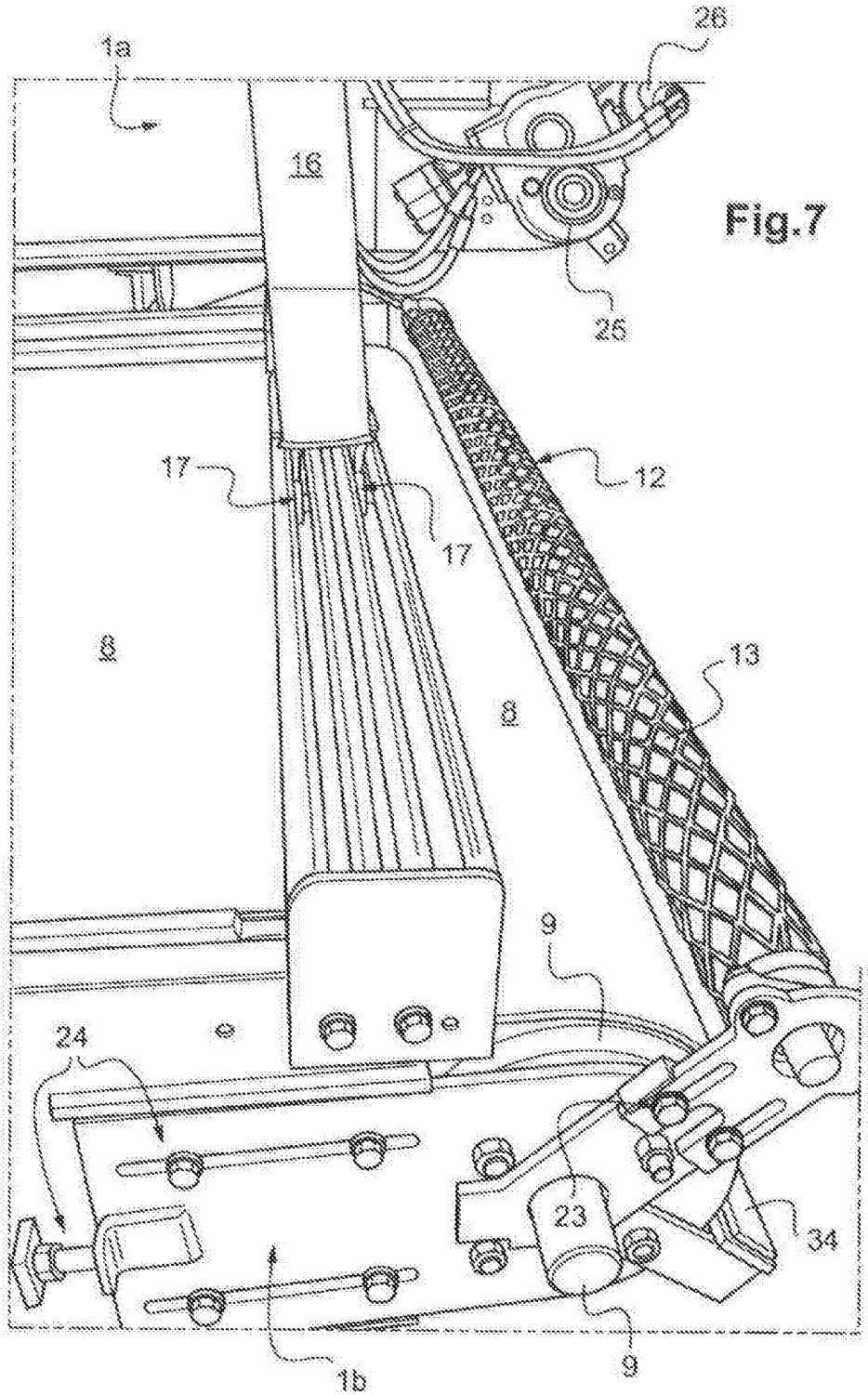



Fig.7

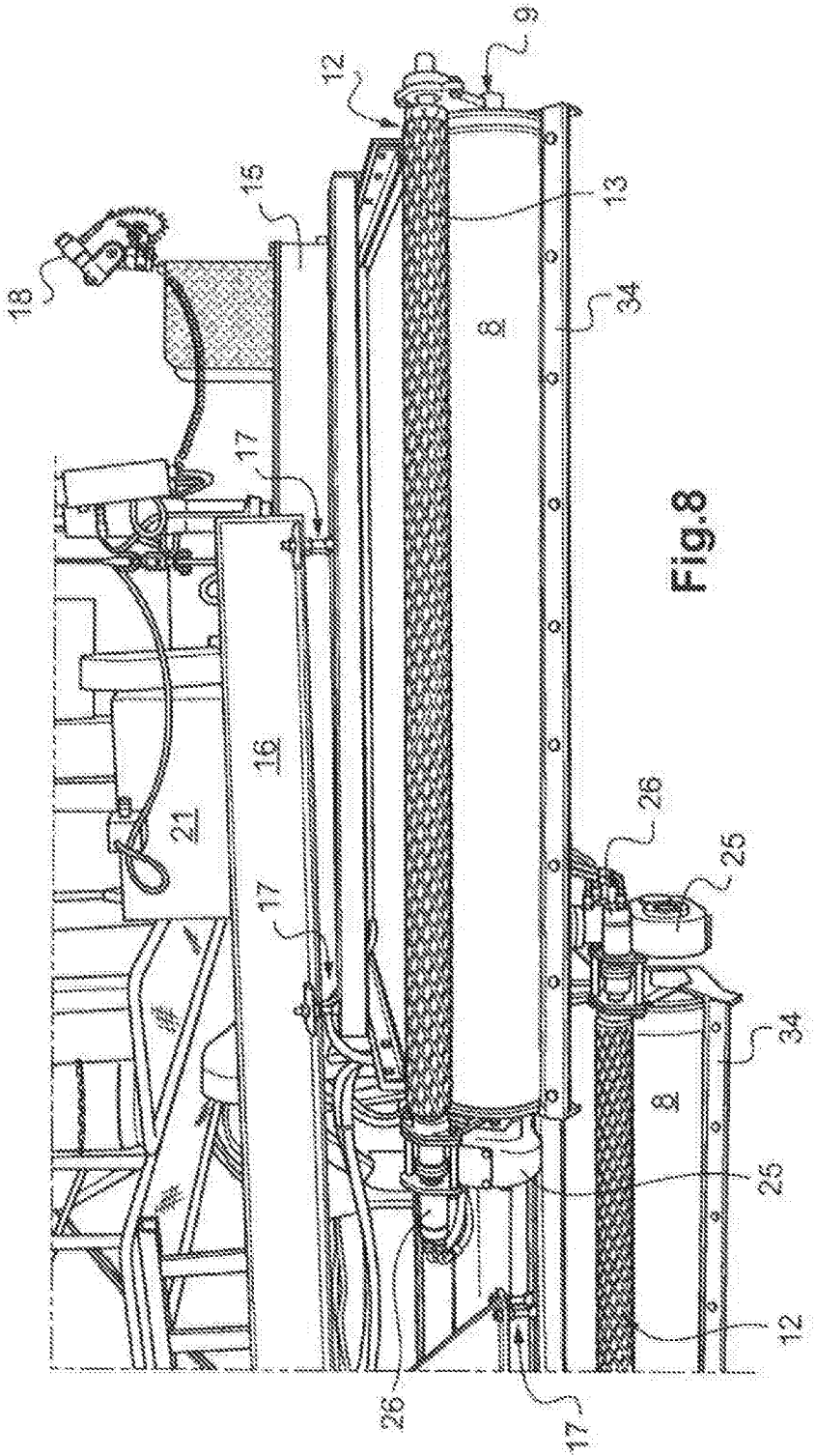



Fig.8

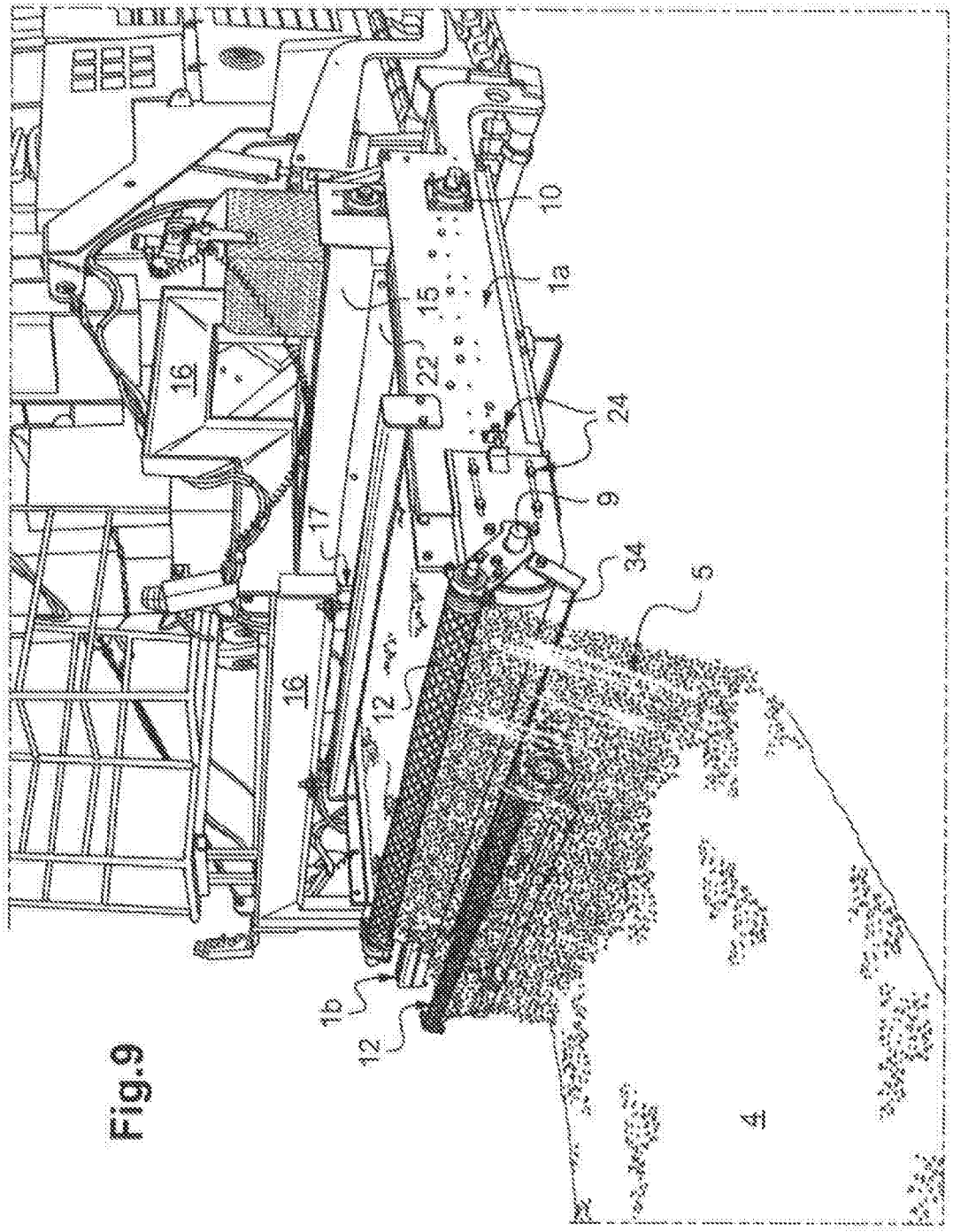



Fig.9

Fig.10

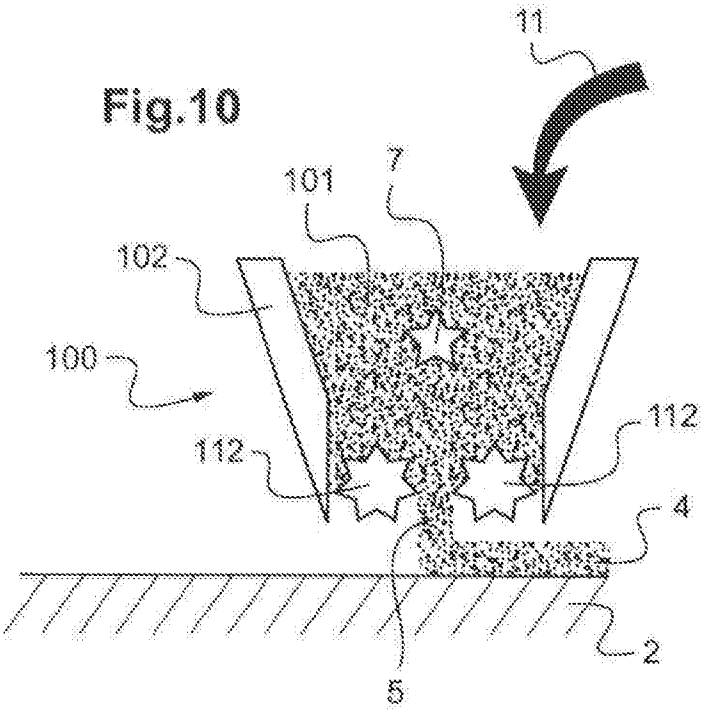
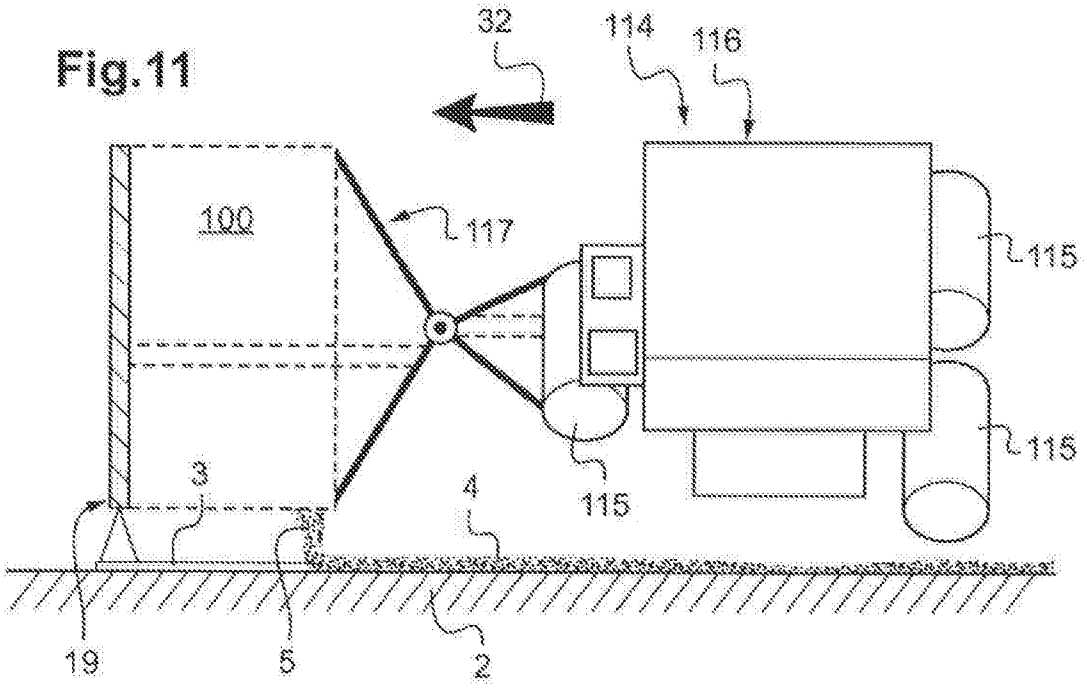

11
101
7
102
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Fig.11


32
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116
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19
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