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(54) Method and device for placing of kerb stones

(57) The invention relates to a device for placing kerbstones in a sand bed. The device comprises for this purpose a vehicle to which is coupled a profile of U-shaped cross-section which is closed on a front side and open on a rear side and which in a situation of use can be carried through a ground surface, as well as supply means for supplying and successive placing of kerb-stones in the U-shaped profile.

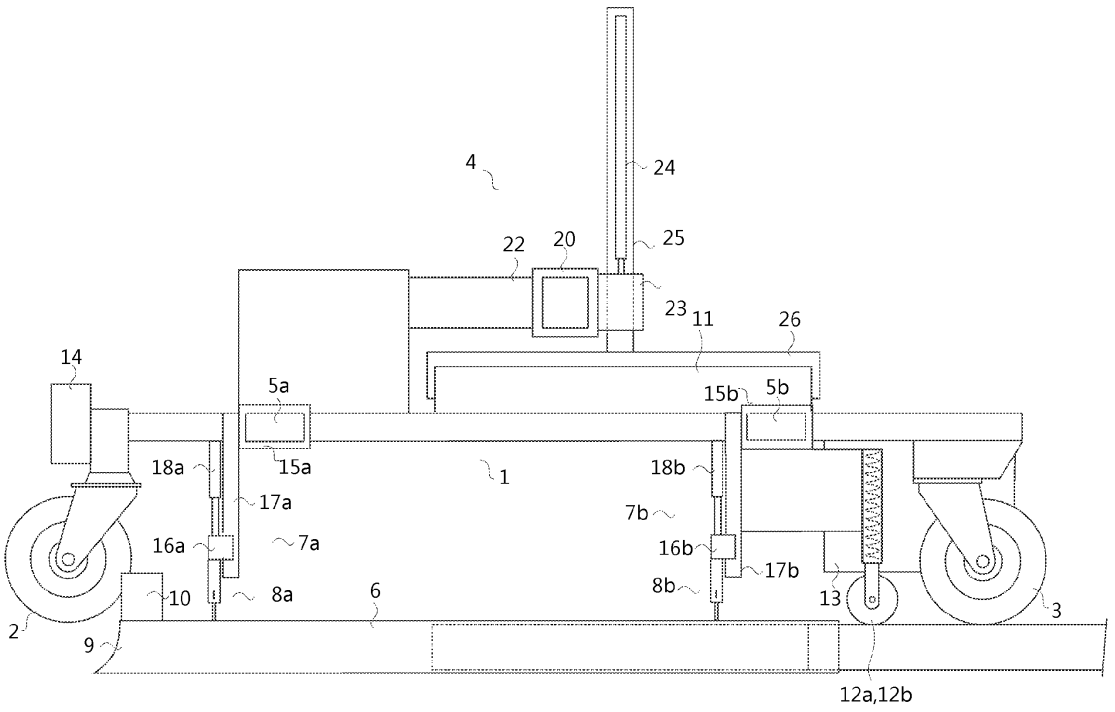

Fig. 1

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Description

[0001] The invention relates to a method for placing kerbstones in a sand bed or in setting cement. In the paving profession the placing of kerbstones is usually still heavy and time-consuming manual work, wherein a trench is dug in a compacted sand layer, after which the kerbstones are set in place using a line. The trench is then closed and sand is added and compacted, wherein the kerbstones can displace. In the case setting cement is used, kerbstones are placed on a layer of setting cement to which a ridge of setting cement is then added on either side, after which sand is once again then added. The results of these efforts therefore greatly depend on the skill of the person carrying out the work.

[0002] The inventive method does not have these drawbacks. Use is preferably again made of a compacted sand layer which has the desired height for the intended paving surface, or a bed of setting cement with a height slightly above the intended underside of the kerbstones. According to the invention however, a profile of U-shaped cross-section closed on a front side and open on a rear side is pulled through the sand bed or the setting cement and the kerbstones are placed successively in the U-shaped profile and pushed to the rear. In order to achieve a perfect result it is then sufficient to guide the profile in a predetermined path through the compacted sand layer or the setting cement. For this purpose a per se known laser-controlled vehicle can for instance be utilized equipped with adjusting members for steering the profile.

[0003] The invention also relates to a device for placing kerbstones in a sand bed or in setting cement. The inventive device has the feature that it comprises a vehicle and, mounted on the vehicle, a profile of U-shaped cross-section which is closed on a front side and open on a rear side and which in a situation of use is carried through the sand bed or through the setting cement, as well as supply means for supplying and successive placing of kerbstones in the U-shaped profile. Because the profile has a finite length, a continuous row of kerbstones will leave the profile at the rear.

[0004] A favourable embodiment of the inventive device has the feature that the device is provided with at least one adjusting member for adjusting a position of the U-shaped profile relative to the vehicle, so that it is possible to pass through long straight parts but also bends with a predetermined radius of curvature.

[0005] A further favourable embodiment has the feature that the device is provided with an automatic steering device for controlling the vehicle and the at least one adjusting member. The automatic steering device can for instance be controlled in per se known manner on the basis of laser-generated horizontal and vertical lines or on the basis of GPS information.

[0006] A further favourable embodiment has the feature that the longitudinal sides of the U-shaped profile are bent at least substantially at right angles. The stiffness of the U-shaped profile is hereby improved significantly, and sand or setting cement is moreover prevented from entering the profile.

[0007] A further favourable embodiment has the feature that the front side of the U-shaped profile is provided with a digging member for digging out and transporting ground material or setting cement upward or to the side. On the one hand the force required to pull the U-shaped profile through the ground material or the setting cement can hereby be significantly reduced, and on the other this achieves that the ground structure around the U-shaped profile is substantially unchanged. This is important for the purpose of preventing the kerbstones, once they have been placed, from beginning to displace laterally due to differences in density in the ground.

[0008] A further favourable embodiment has the feature that the front side of the U-shaped profile is provided with a discharge member for discharging ground material transported upward by the digging member, so that it does not enter the U-shaped profile and can pass unobstructed over the bent longitudinal sides of the U-shaped profile.

[0009] A very favourable embodiment has the feature that the discharge member comprises a plate running obliquely over the front side of the U-shaped profile for lateral discharge of ground material transported upward by the digging member.

[0010] A further favourable embodiment has the feature that the device is provided with pressing rollers and/or silos, filled in a situation of use with dry sand or with cement for the purpose of filling spaces on either side of placed kerbstones. This is important because the spaces around the kerbstones, of a thickness of the plate material from which the U-shaped profile is manufactured, are hereby filled and/or pressed closed. If desired, it is then also possible when setting cement is used to arrange an extra ridge on either side of the kerbstones, which ridges can then in turn be pressed down by the rollers.

[0011] The invention also relates to profiles suitable for the use in a device as specified in the foregoing paragraphs.

[0012] The invention will now be further elucidated with reference to the following figures, in which:

- Fig. 1 shows a schematic side view of a possible embodiment of a kerbstone placer;
- Fig. 2 shows a schematic front view of this embodiment;
- Fig. 3 shows a schematic rear view of this embodiment;
- Fig. 4 shows a schematic side view of an alternative embodiment;
- Fig. 5A shows a schematic perspective view of a possible embodiment of a profile of U-shaped cross-section;
- Fig. 5B shows a schematic perspective view of an alternative embodiment of a profile of U- shaped cross-section;

Fig. 6A shows a schematic top view of a possible embodiment of a U-shaped profile;

Fig. 6B shows a schematic top view of an alternative embodiment of a U-shaped profile;

Fig. 1 shows a schematic side view of a possible embodiment of a kerbstone placer consisting of a vehicle 1 with controlled and driven front wheels 2 and driven and controlled rear wheels 3, on which is placed a robot arm 4. A profile 6 of U-shaped cross-section is suspended on a side of vehicle 1 from two beams 5a,5b using two identical adjusting members 7a,7b provided with four identical coupling members 8a,8b,8c,8d. Profile 6 is pulled through a sand bed or a bed of setting cement using vehicle 1. The front side of profile 6 is provided with a digging member 9, which displaces sand or cement upward, and with a discharge member 10 for lateral discharge of the upward displaced sand or cement. Digging member 9 and discharge member 10 are embodied in combination such that the interior of U-shaped profile 6 remains free of sand. Robot arm 4 can then take kerbstones 11 from a supply, place them in U-shaped profile 6 and press them rearward so that a row of kerbstones can be placed in the sand bed or in the setting cement during travel. At the rear the row of kerbstones slides out of U-shaped profile 6, wherein a narrow gap inevitably remains open on either side of U-shaped profile 6. In order to close this gap, and more generally to compact the sand or the cement on either side of U-shaped profile 6, the kerbstone placer is provided with two resiliently mounted pressing wheels 12a,12b. Further shown are a drive 13 coupled to wheels 2,3, and an automatic steering device 14 for overall steering of vehicle 1 using wheels 2,3 and accurate control of U-shaped profile using the two adjusting members 7a, 7b. Adjusting members 7a,7b are provided for this purpose with carriages 15a,15b which can slide over beam 5a and with carriages 16a,16b which can slide over beams 17a,17b mounted on carriages 15a,15b using actuators 18a,18b and two actuators 19a,19b (not shown in the figure). In this way the position of U-shaped profile 6 can be precisely set, and the position of U-shaped profile 6 relative to vehicle 1 is moreover precisely known. Pressing wheels 12a, 12b are preferably mounted on carriage 15b so that they can follow the movement of the U-shaped profile. In the embodiment shown here robot arm 4 is provided with a carriage 20 which can slide over an arm 22 using an actuator 21 (not shown in the figure) in order to obtain a lateral displacement, and a bearing 23 which is mounted on carriage 20 and in which an arm 25 can slide using an actuator 24, to which arm is attached a clamp 26 which can place kerbstone 11 accurately in U-shaped profile 6. The placed profile can then be pushed rearward with an outer end of clamp 26. Automatic steering device 14 consists for instance of a video camera which can detect a system of lines generated by lasers in per se known manner, after which a video processor derives control signals therefrom for wheels 2,3 and adjusting members 7a,7b. In this manner long, straight rows of kerbstones can then be placed, although it is also possible in this way to realize bends with a relatively large radius of curvature. U-shaped profile 6 can further be given a radius of curvature, after which kerbstones with this radius of curvature can be placed in U-shaped profile 6 using robot arm 4.

Fig. 2 shows a schematic front view of this embodiment. Visible are vehicle 1 with wheels 2,3, robot arm 4 and the U-shaped profile 6 shown in cross-section. Also shown is beam 5a with adjusting member 7a, actuators 18a,19a and coupling members 27a,27b, which consist of female coupling parts attached to adjusting member 7a and male coupling parts attached to U-shaped profile 6, wherein the actual coupling is for instance realized using split pins. Pressing wheels 12a,12b are not shown in this figure for the sake of clarity.

Fig. 3 shows a schematic rear view of this embodiment. Visible are vehicle 1 with wheels 2,3, the U-shaped profile 6 shown in cross-section and robot arm 4, which in this figure has taken a kerbstone 11 from a supply 28 and will place it in U-shaped profile 6. Also shown are the resiliently arranged pressing wheels 12a,12b which are mounted on carriage 15b and which compact the sand bed or the setting cement on either side of U-shaped profile 6. Further shown is an automatic device 29 which presses through kerbstones 11 present in supply 28 so that robot arm 4 can always pick up a kerbstone 11 blindly. Adjusting members 7a,7b are not shown in this figure for the sake of clarity.

Fig. 4 shows a schematic side view of an alternative embodiment, which corresponds wholly with the embodiment shown in Fig. 1 but where silos for cement or sand 30a,30b are added on either side of the U-shaped profile, using which extra cement can be applied on either side of a kerbstone placed in a bed of setting cement. If desired, vehicle 1 can be provided on the front side with a silo filled with cement so that the bed of setting cement can be arranged simultaneously, just before the kerbstones are placed.

Fig. 5A shows a schematic perspective view of a possible embodiment of a profile 6 of U-shaped cross-section, consisting of the actual profile manufactured from steel, wherein the front side is provided with a plough-like digging member 9 and wherein the top side is provided with a plate-like discharge

member 10 which pushes the dug sand to the side. For application in a sand bed ploughing member 9 preferably takes a form somewhat wider than the width of U-shaped profile 6, so that it can be pulled through the sand with relatively little resistance. It can further be seen that the upper side of profile 6 is closed in front of discharge member 10 so that the channel formed by profile 6 remains free of sand. Finally, male coupling halves 31 are shown which form part of coupling members 8a,8b,8c,8d.

Fig. 5B shows a schematic perspective view of an alternative embodiment of a profile of U-shaped cross-section, which corresponds wholly with profile 6 described with reference to Fig. 5A, but where profile 6 is provided with a curve running in longitudinal direction and U-shaped profile 6 can receive curved kerbstones 11.

Fig. 6A shows a schematic top view of a possible embodiment of U-shaped profile 6, wherein it can be seen that at the end of profile 6 the bottom is removed so that kerbstone 11 rests wholly on the sand bed at the moment that wheels 12a,12b press down on the sand or cement.

Fig. 6B shows a schematic top view of an alternative embodiment of U-shaped profile 6 which is more suitable for forming a path in setting cement. For this purpose ploughing member 9 is embodied such that the cement is discharged uniformly to the left and to the right.

Claims

1. Method for placing kerbstones in a sand bed or in setting cement, **characterized in that** a profile of U-shaped cross-section closed on a front side and open on a rear side is pulled through the sand bed or the setting cement, and that the kerbstones are placed successively in the U-shaped profile and pushed to the rear.

2. Device for placing kerbstones in a sand bed or in setting cement, **characterized in that** the device comprises a vehicle and, mounted on the vehicle, a profile of U-shaped cross-section which is closed on a front side and open on a rear side and which in a situation of use is carried through the sand bed or through the setting cement, as well as supply means for supplying and successive placing of kerbstones in the U-shaped profile.

3. Device as claimed in claim 2, **characterized in that** the device is provided with at least one adjusting member for adjusting a position of the U-shaped profile relative to the vehicle.

4. Device as claimed in claim 3, **characterized in that** the device is provided with an automatic steering device for controlling the vehicle and the at least one adjusting member.

5. Device as claimed in any of the claims 2-4, **characterized in that** the longitudinal sides of the U-shaped profile are bent at least substantially at right angles.

6. Device as claimed in any of the claims 2-5, **characterized in that** the front side of the U-shaped profile is provided with a digging member for digging out and transporting ground material or setting cement upward or to the side.

7. Device as claimed in claim 6, **characterized in that** the front side of the U-shaped profile is provided with a discharge member for discharging ground material transported upward by the digging member.

8. Device as claimed in claim 7, **characterized in that** the discharge member comprises a plate running obliquely over the front side of the U-shaped profile for lateral discharge of ground material transported upward by the digging member.

9. Device as claimed in any of the claims 2-6, **characterized in that** the device is provided with pressing rollers and/or silos, filled in a situation of use with dry sand or with cement for the purpose of filling spaces on either side of placed kerbstones.

10. Profiles suitable for the use in a device as claimed in any of the claims 2-9.

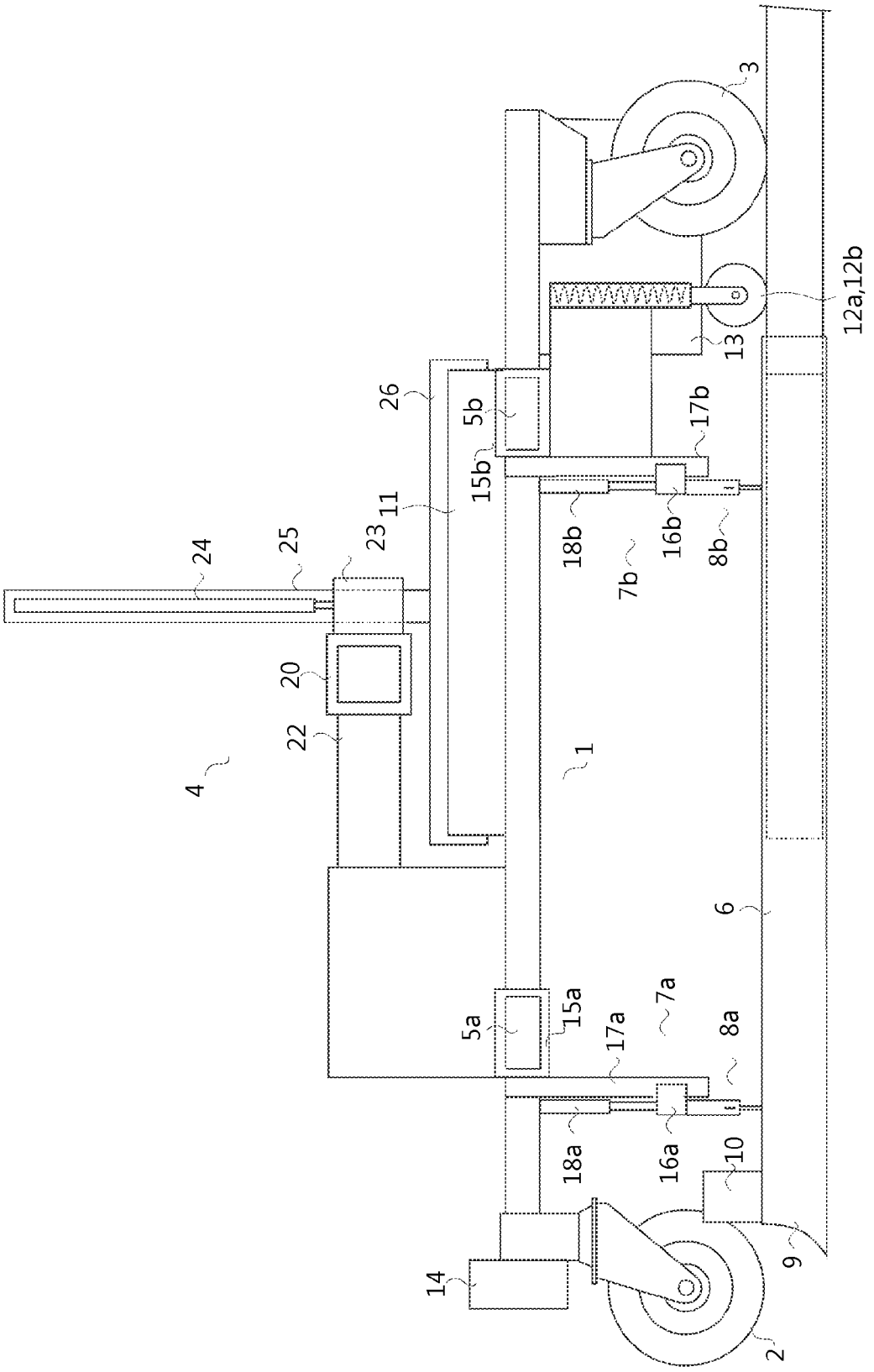
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Fig. 1

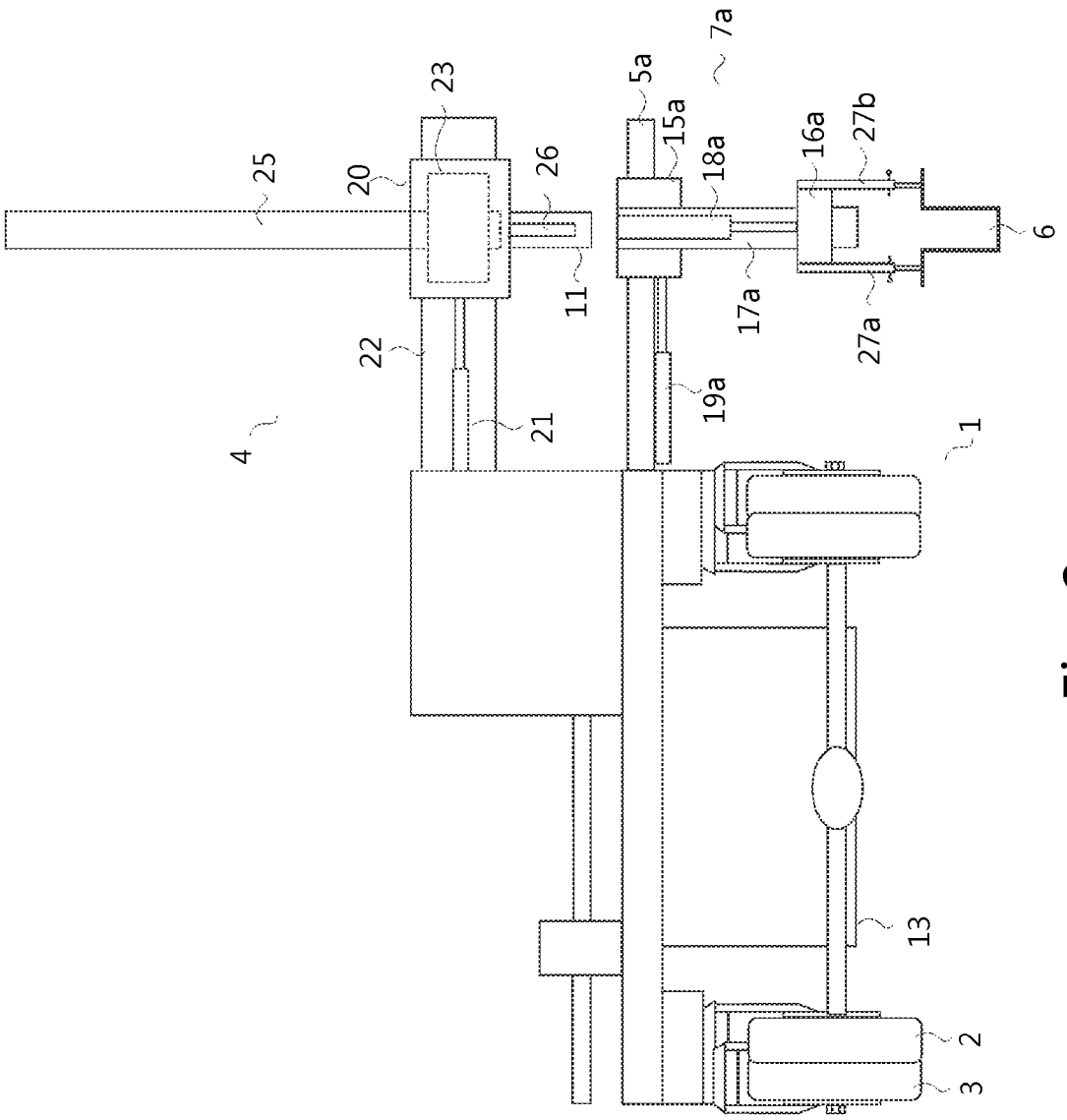


Fig. 2

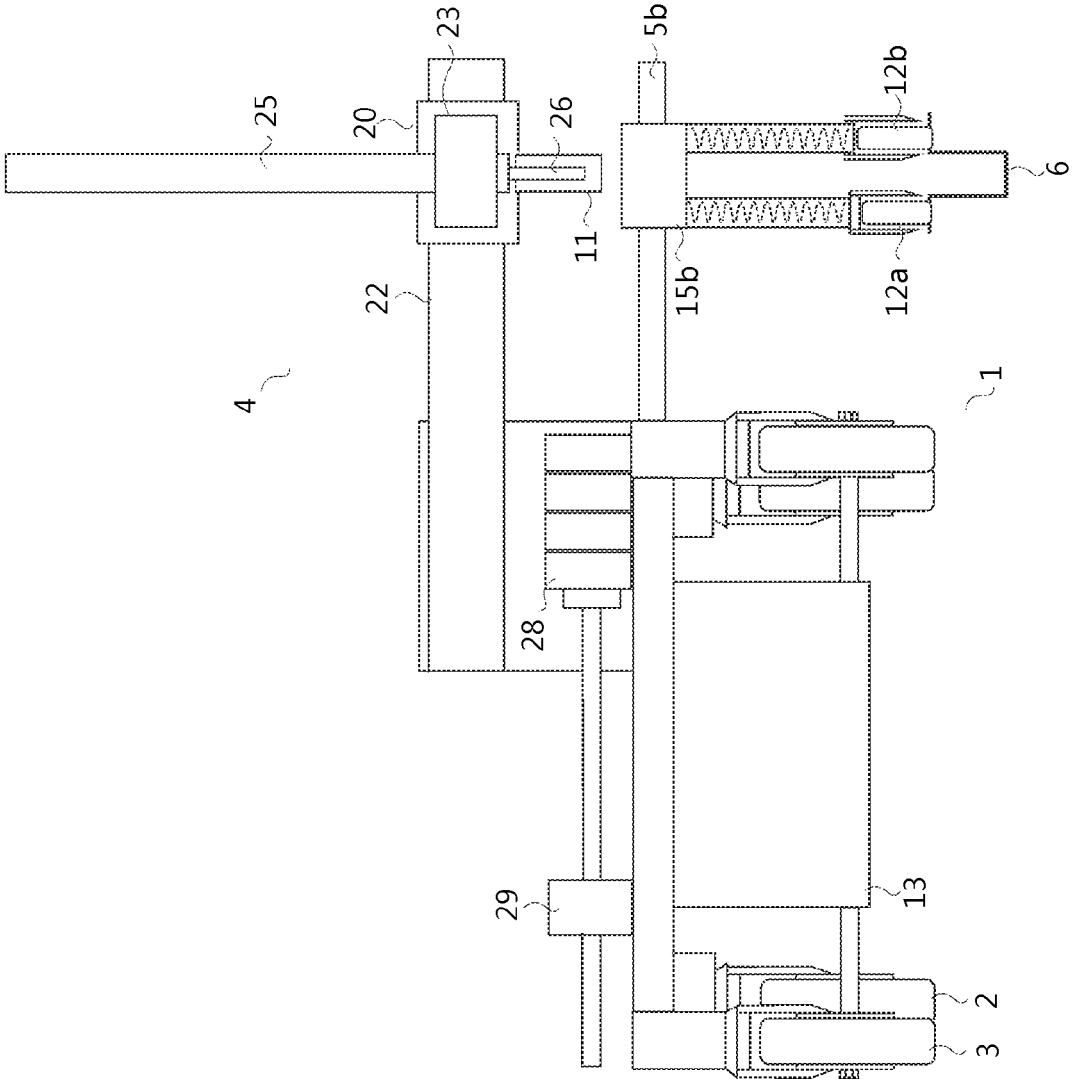
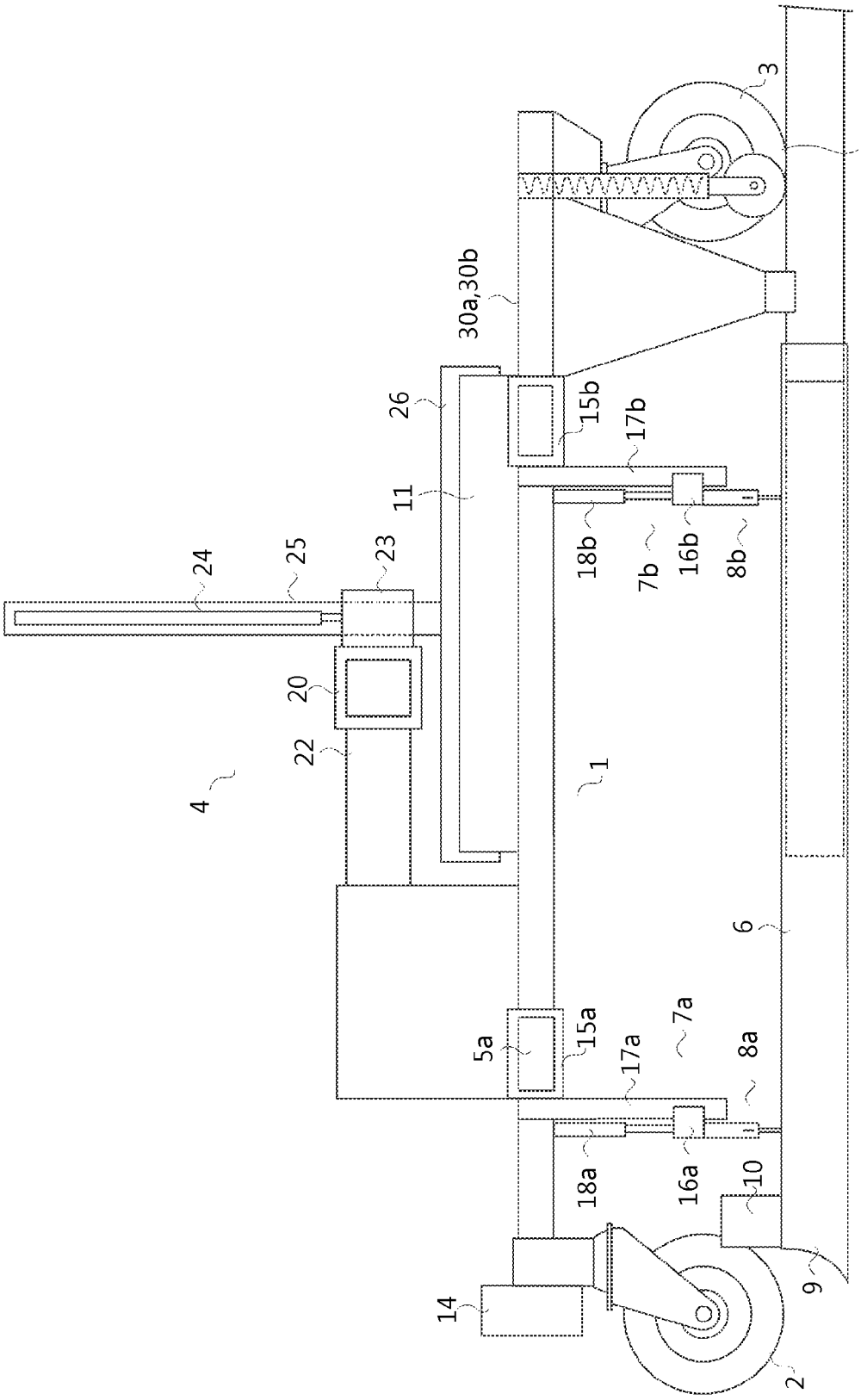


Fig. 3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17b
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18b
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16b
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25
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18a
16a
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14
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Fig. 4

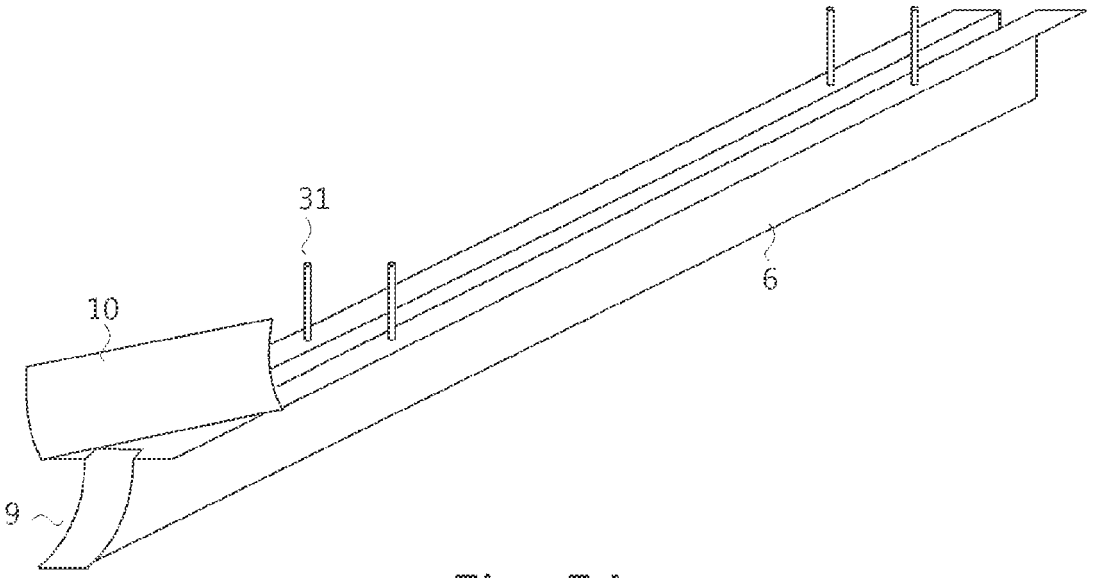

Fig. 5A

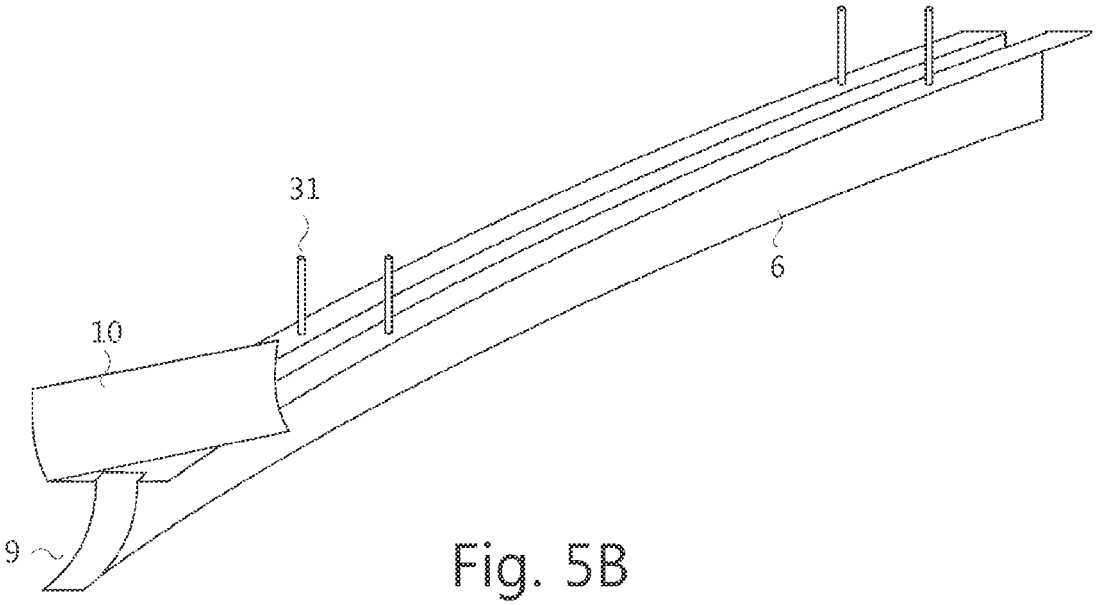

Fig. 5B

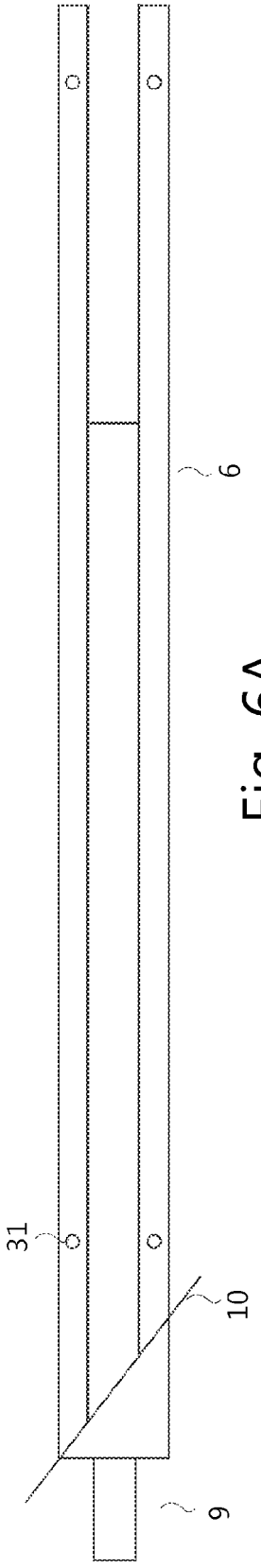

Fig. 6A

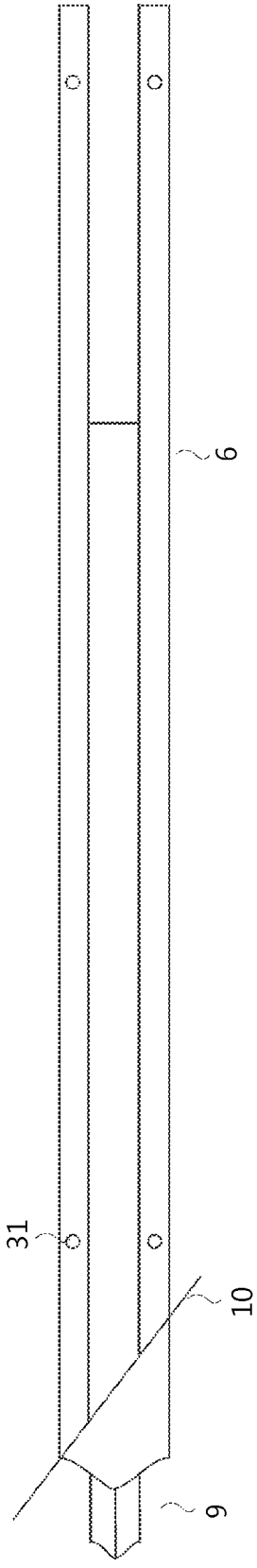

Fig. 6B

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EUROPEAN SEARCH REPORT

Application Number
EP 10 18 7026

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 325 987 A1 (APLICACIONES ESPECIALES DE ING [ES]) 9 July 2003 (2003-07-09)	2-10	INV. E01C19/52
Y	* paragraphs [0037] - [0039]; figures *	1	

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TECHNICAL FIELDS SEARCHED (IPC)

E01C
E02F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 January 2011	Movadat, Robin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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1

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 18 7026

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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18-01-2011

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