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(54) Device for brushing a top surface, a train carriage using the device for cleaning rail tracks and a vehicle provided with the device

(57) The invention concerns a device for brushing a top surface. The device comprises a cylindrical body having brushing elements rotatable around an axis whereby the device is fastened such that the top surface and the device move relative to one another in a direction making a sharp pitch angle with the plane perpendicular to the axis. The brushing elements rotate the cylindrical body and have a wire tip length that extends outside the cylindrical body which wire tip length reduces springy by pressing the brushing elements against the top surface. The invention also concerns a train carriage and a vehicle provided with the device.

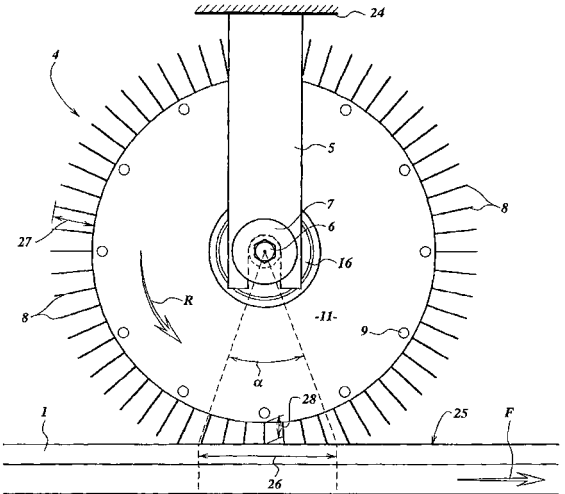

Fig. 4

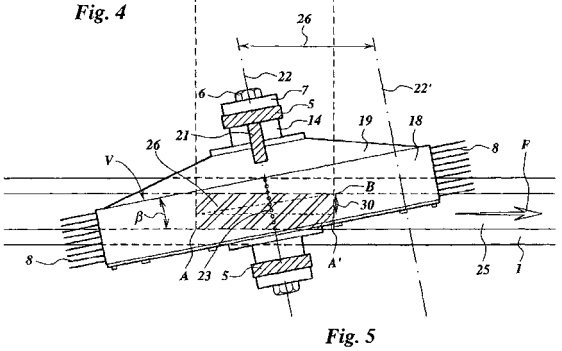

Fig. 5

EP 1 653 006 A2

Description

[0001] The invention concerns a device in accordance with the preamble of claim 1. Such a device is known from DE 4024291. In the known device, brushes for cleaning a top surface of rails are known. These known brushes comprise wires of a fixed length which are extending radial from the cylindrical body and which rest with the side of the wires against the top surface. This results in sliding the wires along the top surface without the wires scratching over the top surface so that the cleaning of the top surface is inadequate.

[0002] In order to overcome this disadvantage the device is according to claim 1. This device has relative short and stiff wire tips extending with varying length from the cylindrical body whereby the wire tip scratches over the top surface. This scratching removes contamination of top surfaces in a simple way and also prevents build-up of a slippery layer on top surfaces under adverse conditions.

[0003] In an embodiment the device is in accordance with claim 2. This makes a simple and robust connection of the device to a carriage or vehicle possible.

[0004] In a further embodiment the device is in accordance with claim 3. By using springy wires side by side the device has sufficient width so that the brushing element cleans a considerable width of top surface.

[0005] In a further embodiment the device is in accordance with claim 4. This way a simple device is created of which the outer radius is reducible in an easy way.

[0006] In a further embodiment the device is in accordance with claim 5. This way the springy wires in the cylindrical body do not get entangled.

[0007] In a further embodiment the device is in accordance with claim 6. In this way forces acting sideways by the sides adjacent to the top surface on the springy wire, are avoided in those situations whereby the top surface has a limited width for instance as with rails. This makes an increased pitch angle possible, without the risk of bending of the springy wire.

[0008] In a further embodiment the device is in accordance with claim 7. This reduces the risk of permanent bending the springy wire.

[0009] The invention also concerns a train carriage according to claim 8. With this train carriage rails can be cleaned frequently in an easy way.

[0010] The invention also concerns a method for cleaning the rail tracks regularly according to the method of cleaning. In this way no additional train runs are made for cleaning the tracks, which saves costs and is easier to organize.

[0011] The invention also concerns a vehicle according to claim 10. With this vehicle a slippery layer on roads can be loosened from the road surface.

[0012] In a further embodiment the vehicle is in accordance with claim 11. This is especially suitable for de-icing a road surface.

[0013] The invention is explained below with reference to a number of exemplary embodiments and with the aid of a drawing, in which:

Figure 1 shows a side view of a train carriage provided with a device according to the invention,

Figure 2 shows a partial section and a view of the device as used in figure 1,

Figure 3 shows a detailed side view of a springy wire as used in the device of figure 1,

Figure 4 shows a side view of the device as used in figure 1,

Figure 5 shows a top view of the device as used in figure 1,

Figure 6a shows a detail of a springy wire scratching a top surface of a rail as shown in figures 4 and 5,

Figure 6b shows a detail of a springy wire when contacting the top surface of a rail sideways,

Figure 7 shows a perspective view of coupling means for coupling springy wires, and

Figure 8 shows a perspective view of a de-icing truck with a device according the invention.

[0014] In the different embodiments similar parts are provided with identical identification numbers.

[0015] Figure 1 shows a train carriage 2 riding with wheels 3 on rails 1. It is known that in specific climatic circumstances friction between rails 1 and wheels 3 is reduced to very low levels, which results in difficulties when accelerating the train carriage 2 or when brakes are applied. The reason that friction reduces is not clear but wet and/or oily deposits on the rails 1, which are rolled in on the rails 1 by the wheels 3 play an important role. It has been found that removal of these rolled-in deposits reduces the frequency and/or severeness of the reduced friction conditions. Special vehicles for cleaning the rails have been used for removing the deposits. It is found to be difficult and expensive to let these vehicles clean all tracks regularly as they disturb the normal train service.

[0016] In order to improve this situation a brush 4 is permanently mounted with a fixed support 5 under the train carriage 2 and during normal use of the train carriage 2 this brush 4 cleans the rails 1. As the brush 4 is of simple construction and does not need a separate drive for rotating it (see hereunder) several brushes 4 can be mounted under the train carriage 2. This improves the brushing action when a train moves over a track. By providing brushes 4 for many or all trains travelling on a track the rails 1 is regularly cleaned at fairly short intervals so that build up of friction reducing deposits is reduced or avoided. Preferably at least every hour a train with brush-

es 4 travels over the track, if necessary this will be continued during night time when normal train service is at a stand still. As will be clarified hereunder the brushes 4 are pressed on the rails 1 whereby the circumference of the brush 4 rolls over the rails 1. The brushing action of the brush 4 on rails 1 arises from an angle β between a plane V perpendicular on a rotation-axis 22 of the brush 4 and a direction of movement F, of the train carriage 2 over rails 1, see figure 5. This results in short brushing movements in the direction of the rotation-axis 22. These small brushing movements occur only at the location of a springy wire 8 (see figures 2-5) it is advantageous to have for each train on each rails at least four brushes 4 and to have several springy wires 8 side by side in the brush 4.

[0017] In figures 2-5 the brush 4 is shown in more detail. An outer housing ring 18 is welded with a conical housing 19 on a sleeve 13. The sleeve 13 is mounted with bearings 16 on shaft 17 and can rotate around the rotation axis 22. The axial movement of the bearings 16 is limited by rings 14 which are positioned on the shaft 17 with dowels 15. The shaft 17 is positioned in the bracket 5 using caps 7 fastened with bolts 6. The bracket 5 is provided with a stiffener 21 for transferring the axial forces to a support beam 24.

[0018] A support ring 12 is fastened for instance by welding on the sleeve 13. The support ring 12 is provided with positioning holes 31 and the outer housing ring 18 is provided with the same number of guidance holes 23 of approximately the same diameter. The guidance holes 23 can be positioned side by side as shown in figure 4, but they may also be staggered for a more regular distribution. A springy wire 8 extends with a wire tip length 27 through the guidance hole 23 of the outer housing ring 18 and is positioned in the positioning hole 31 and supported by the support ring 12. Between the outer housing 18 and the support ring 12 the springy wire 8 is provided with one or more bends so that the wire tip length 27 extending through the guidance hole 23 can elastically be reduced to a reduced wire tip length 28 as is shown in figure 3 by the springy wire 8 drawn with interrupted lines.

[0019] In the shown embodiment the springy wire 8 is provided with one bend forming approximately a semi circle so that all springy wires 8 that extend through guidance holes 23 lying in a plane perpendicular to the rotation axis 22 can be positioned in that plane as well. In order to prevent random positioning or rotating of the springy wires 8 partitioning disks 10, for instance made of thin plastic sheet material, are placed between groups springy wires 8 that extend through holes 23 lying in the plane perpendicular to the rotation axis 22. For positioning the partitioning disk 10 nearest to the conical housing 19 a distance bush 20 is fastened to the conical housing 19. On the other side of the brush 4 a cover 11 is fastened with bolts 9 to the outer housing ring 18 in order to position the springy wires 8.

[0020] The springy wires 8 are made from hardened steel wire and are dimensioned such that applying a force directed to the rotation axis 22 on the wire tip 36, shortens the wire tip length 27 as the springy wire 8 moves through the guidance hole 23. The springy wire 8 can freely move in the guidance hole 23. Forces parallel to the rotation axis 22 outside a guidance hole 23 cause it to bend. In an embodiment the hardened steel wire has a diameter of 1,5 mm and the force which must be extended on the wire tip 36 in order for the wire tip length 27 to get shorter can be in the range of 3-8 Newton.

[0021] Figure 4 and 5 show the interaction between the brush 4 and rails 1. The brush 4 is fastened with bracket 5 to the support beam 24 at the underside of the train carriage 2. The height of the support beam 24 is fixed in such a way that the wire tips 36 touch on a top surface 25 of rails 1, whereby the wire tip length 27 is reduced to the reduced wire tip length 28. In this situation there is a contact area 26 between brush 4 and top surface 25. In the embodiment shown in figures 4 and 5 there is a relative movement between the support beam 24 with brush 4 and the rails 1 with the forward movement F, this relative movement causes the brush 4 to rotate. The brush 4 rotates in a direction R over a contact angle α from the instant that a wire tip 36 touches the top surface 25 in a location A until the wire tip 36 is free again from the top surface 25 in a location B. Preferably the contact angle α is between 30° - 60°, in the embodiment of figure 4 the contact angle α is approximately 40°. During this rotation over the contact angle α rails 1 have made a relative movement forward in a forward movement F over a length equal to the length of the contact area 26. The springy wires 8 rotate in a plane of rotation perpendicular to the rotation axis 22, these planes are parallel to a plane V that makes a pitch angle β with the forward movement F. The guidance holes 23 rotate more or less synchronously with the relative movement F of the rails 1. The movement of the wire tip 36 over the top surface 25 is illustrated by assuming the wire tip 36 to touch the top surface 25 in position A', in that position the rotation axis is according to line 22', see figure 5, whereby it is the contact area length 26 in front of the shown position of brush 4. After moving the brush 4 over the contact area length 26 to the position according to figure 5 with the rotation axis 22 the wire tip 36 has moved over a wire tip path 30, due to rotation of the brush over the contact angle α.

[0022] In order that the brush 4 rotates synchronously with the forward movement F of rails 1 it is essential that the wire tip 36 is pressed resiliently against the top surface 25, that the wire tip length 27 can be reduced elastically and that the pitch angle β has a small value, for instance less than 10-15°. In this situation the wire tip 36 remains pressed against the top surface 25 and the springy wire 8 bends during the sideways movement of the guidance hole 23. When the guidance hole 23 moves upwards again and the force with which the wire tip 36 is pressed against the top surface 25 reduces, then the wire tip 36 starts scratching over the top surface 25 until

the wire tip 36 is lifted from the top surface in the relief position B.

[0023] In figure 6a the relative movement of a springy wire 8 over the top surface 25 is shown in a section view of the rails, whereby a relative guide hole path 34 is shown from the moment a wire tip 36 touches the top surface 25, in start position A where after the guidance hole 23 lowers to a lowest position as the brush 4 rotates, and moves upwards again. Wire positions 35 show the springy wire 8 in the start position A when the guidance hole 23 is in its lowest position and when the springy wire 8 is lifted from the top surface in the relief position B.

[0024] In figure 6b wire positions 33 show the same view in a situation whereby the springy wire 8 cannot scratch over the top surface 25 as it is blocked in doing that, for instance because it rests against a side of the rails 1. In order to prevent permanent bending of or damage to the springy wires 8 the reduce wire tip length 28 must be chosen long enough so that elastic bending can take place in order to prevent permanent bending and also the pitch angle must not be too great, for instance between 5° to 10°, or a coupling between the springy wires 8 as shown hereafter must be used.

[0025] Figure 7 shows an embodiment whereby each springy wire 8 is provided with a loop 40. A coupling wire 41 is inserted through rings formed by the loops 40 of springy wires 8 which are inserted through guidance holes 23 which are lying in a plane through the rotation axis 22. If one or more springy wires 8 are pressed inwards the coupling wire 41 pulls the other springy wires 8 also inwards through the guidance holes 23, which prevents sideways pushing of springy wires 8 that are not pushed inwards by the top surface 26 as shown in figure 6b, and so bending of these springy wires 8 is prevented.

[0026] Figure 8 shows an embodiment of the invention whereby a truck 37 is provided with a salt spreader 38. It has been found that in circumstances whereby a road is covered in a thin layer of ice, that breaking and removing the thin layer by snow removing equipment is difficult. In order to scratch an iced surface so that salt can react better with the ice layer the truck 37 is provided with a roller 39 that is provided with springy wires 8 according to the invention.

[0027] It addition to the disclosed embodiments it is clear to the skilled man that in stead of the springy wires 8 other elastic elements can be placed around the circumference of the brush 4, such as spring supported scratching blocks and other elements that clean a surface when sliding over the surface.

Claims

1. Device for brushing a top surface (25) comprising a cylindrical body (18) having brushing elements (8) rotatable around an axis (22) whereby the device is fastened such that the top surface and the device move relative to one another in a direction (F) making a sharp pitch angle (β) with a plane (V) perpendicular to the axis causing the brushing elements to rotate the cylindrical body (18) **characterised in that** the brushing elements (8) have a wire tip length (27) that extends outside the cylindrical body (18) which wire tip length reduces springy by pressing the brushing elements against the top surface (25).

2. Device according to claim 1 whereby support means (5, 24) are available for maintaining the axis at a constant distance from the top surface (25).

3. Device according to a previous claim whereby the brushing elements comprise side by side placed springy wires (8) slidable extending through guidance holes (23) in the cylindrical body (18).

4. Device according to a previous claim whereby inside the cylindrical body the springy wire is bent in a elastically deformable loop which is supported near the axis (22), preferably by a bush (12, 13) with positioning holes (31).

5. Device according to a previous claim whereby in the cylindrical body (18) partitioning rings (10) are mounted for separating the springy wires (8) extending through guidance holes (23) laying in a first plane perpendicular to the axis (22) from springy wires laying in a next plane.

6. Device according to a previous claim whereby there are coupling means (40, 41) for coupling the springy wires (8) extending through guidance holes (23) laying more or less in a common plane through the axis (22).

7. Device according to a previous claim whereby the device is designed such that a wire tip (36) of each springy wire (8) can elastically bend in a direction parallel to the axis (22).

8. Train carriage (2) provided on its underside with devices (4) according to one of the previous claims for cleaning the top surface (25) of rails (1).

9. Method for cleaning rail tracks using a device according to claim 8 **characterized in that** the tracks are cleaned regularly by train carriages while executing their service schedule.

10. Vehicle (37) for cleaning roads provided on its underside with a device (39) according to one of the claims 1-7 for cleaning the top surface of the road.

11. Vehicle according to claim 10 whereby a de-frosting material spreader (38) is mounted at the back of the vehicle.

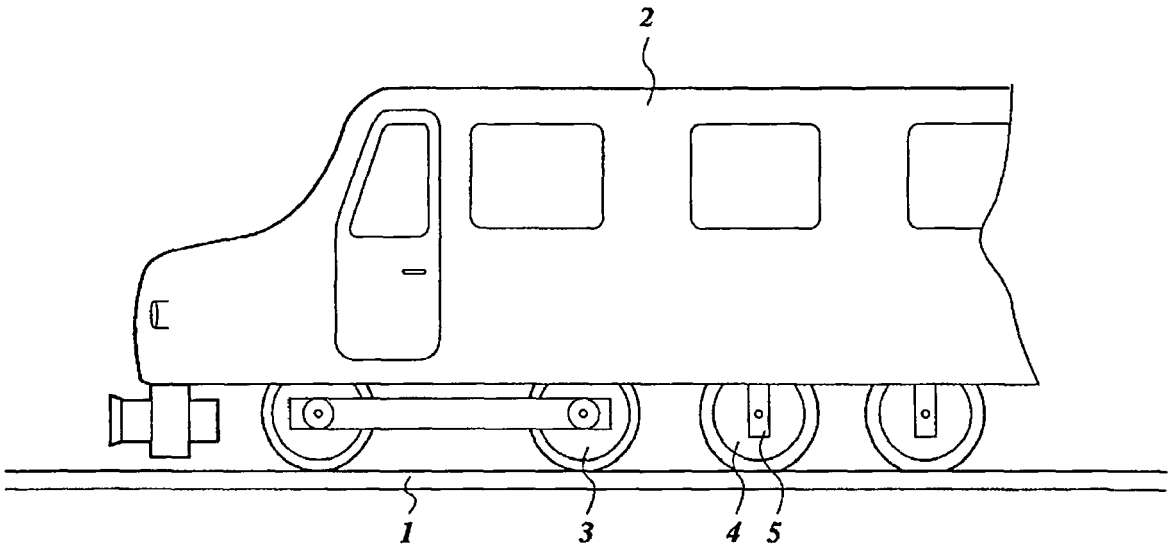

Fig. 1

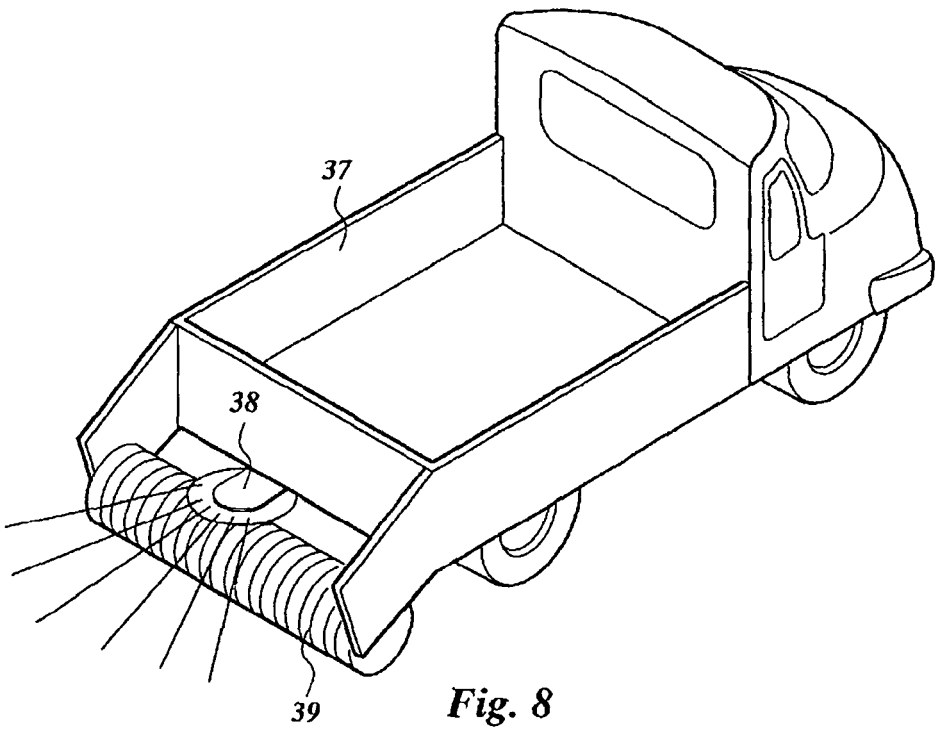

Fig. 8

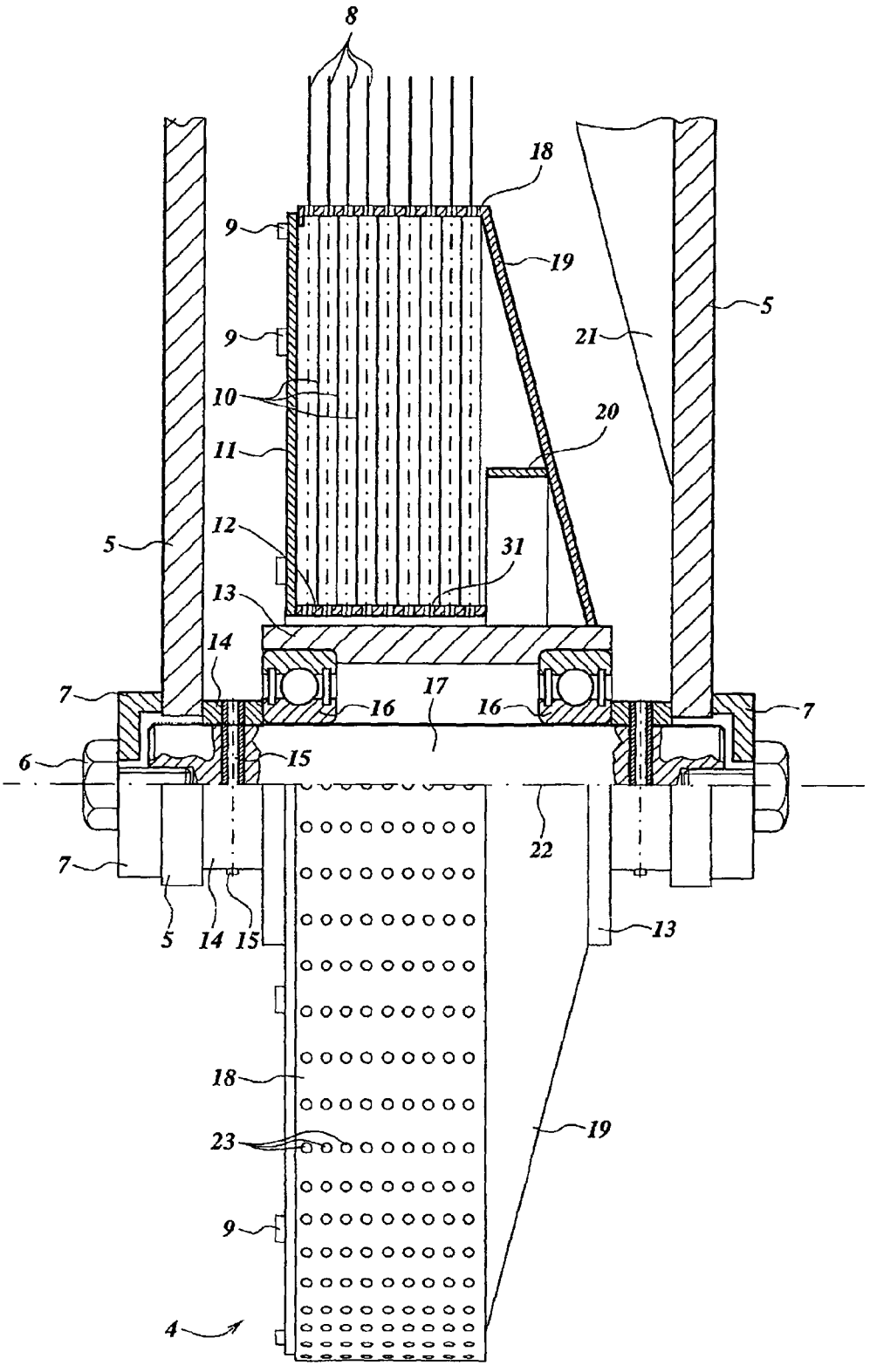
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Fig. 2

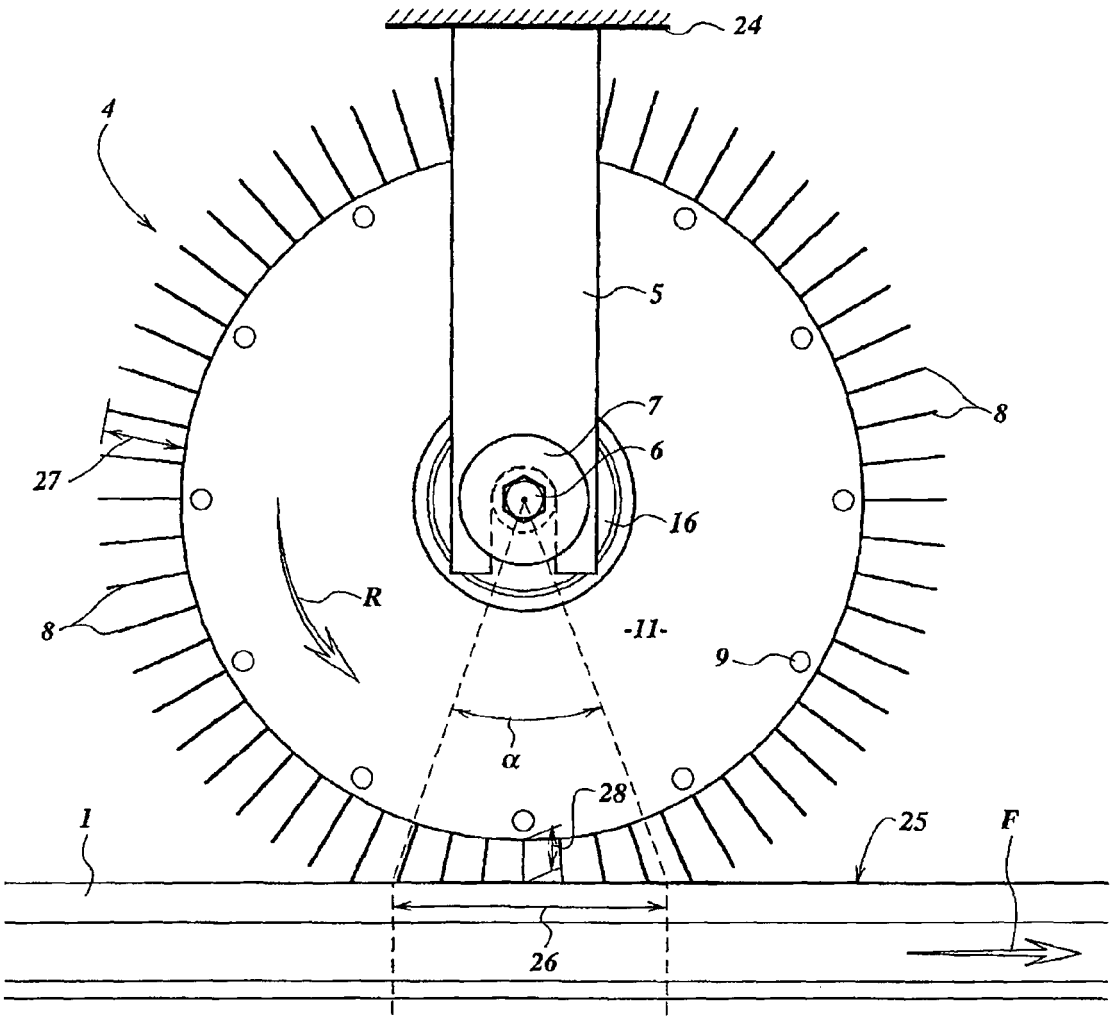
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Fig. 4

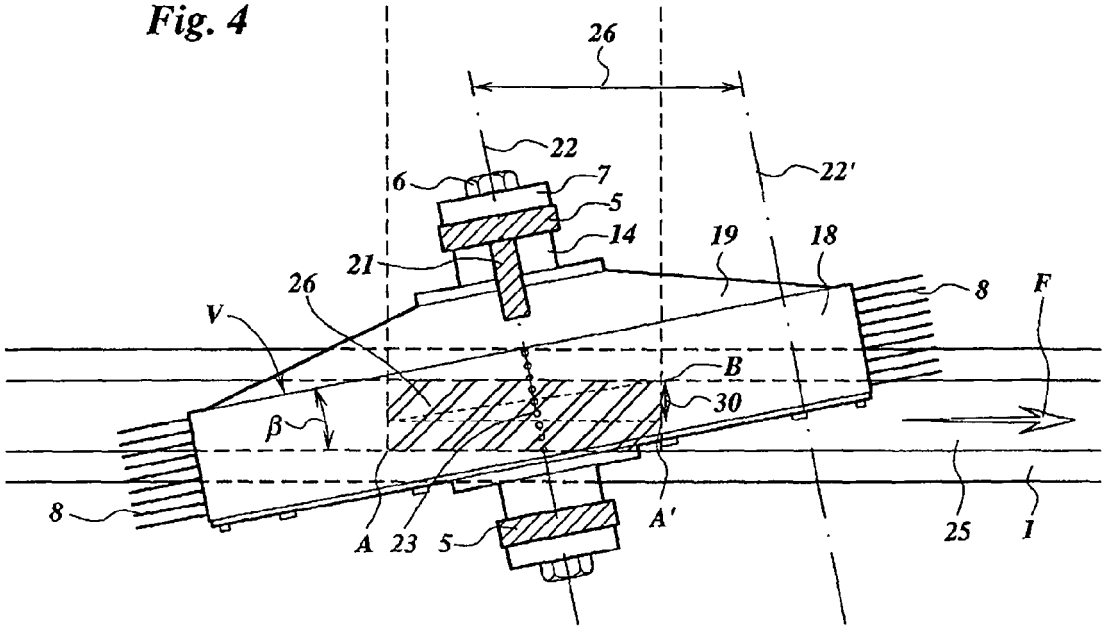
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Fig. 5

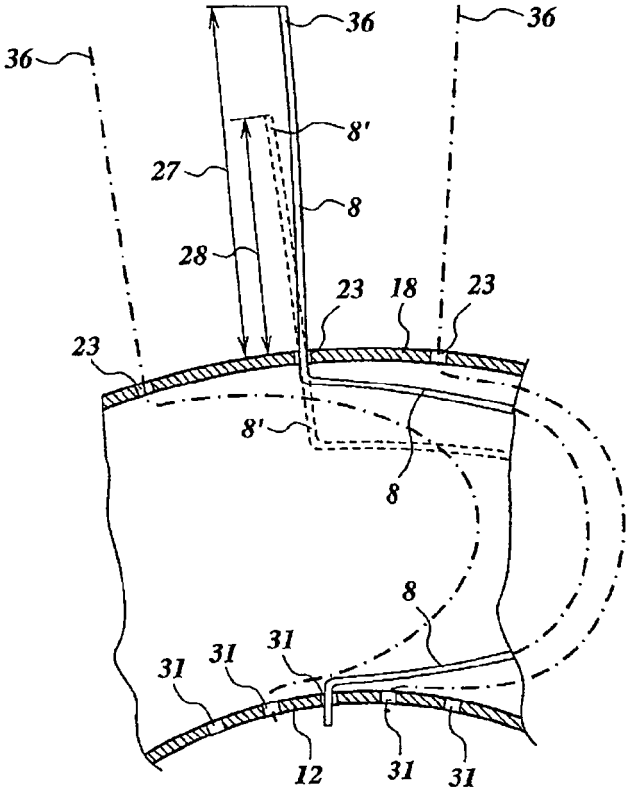

Fig. 3

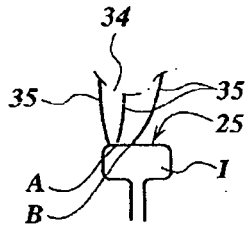

Fig. 6a

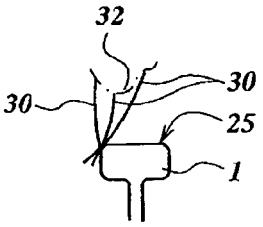

Fig. 6b

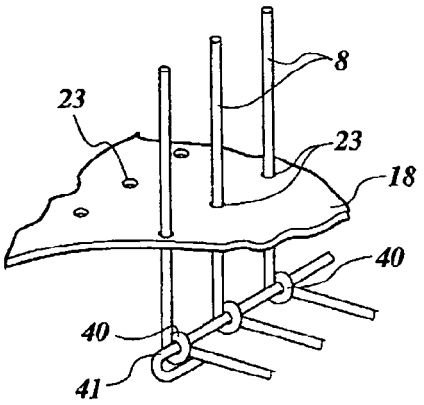

Fig. 7