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(54) Device for cleaning under over-floor layer cylinder blocks for tunnel kiln cars

(57) Device for cleaning floors and cylinder over-floor layer blocks in tunnel kiln cars, wherein the cylinder blocks form a set of adjacent hollow grooves, of axes visibly parallel to the direction of forward movement of the cars, the device comprising a first blow tube, capable of being connected to a first end of at least one hollow groove; a second suction tube, capable of being connected to the second end of the hollow groove or grooves connected simultaneously to the first tube by its first end; and a cover which, like a bell, completely or partially covers the over-floor layer and the lower sides whereof are somewhat separated from the surface of the ground and/or of the floor and over-floor layer, to enable the movement of the set of covers, first blow tube and second suction tube, a third suction tube being hermetically applied to an opening made in the cover.

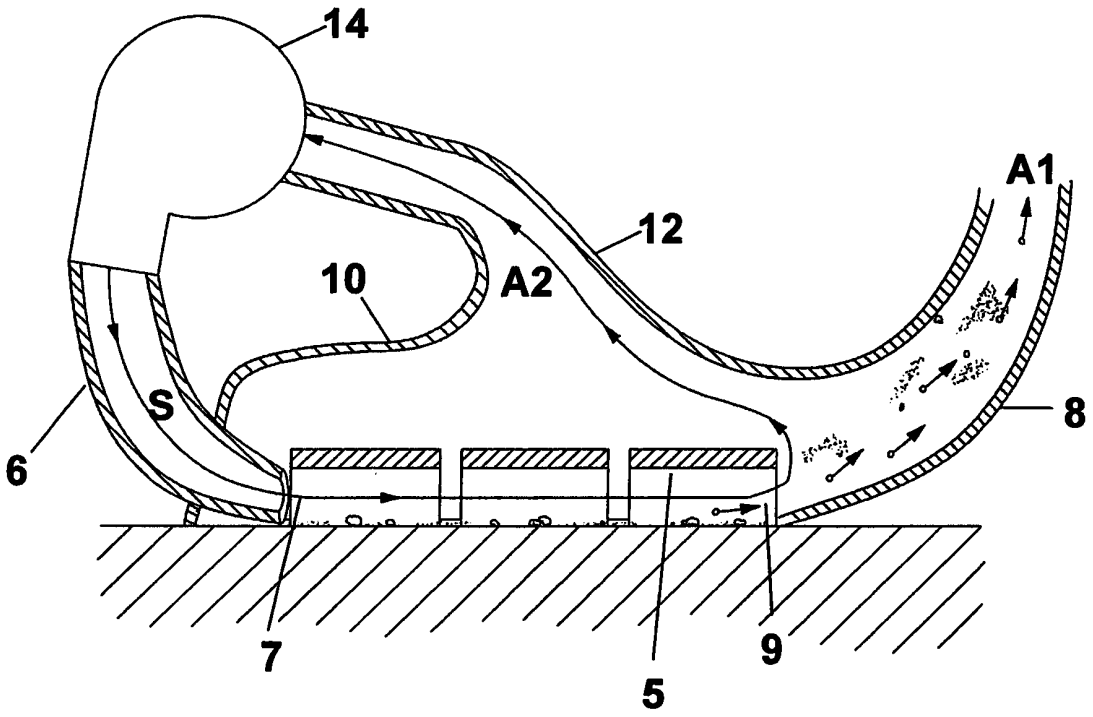

Fig. 5

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Description

Technical field of the invention.

[0001] The present invention relates to a device for cleaning tunnel kiln cars. More particularly, the invention relates to a device for cleaning under the over-floor layer cylinder blocks placed on the floor of a car in such a way that, by themselves or together with the surface of the floor which supports them, they habitually form a set of contiguous grooves of axes visibly parallel to the direction of forward movement of the cars.

[0002] The device of the invention is advantageously applicable both to over-floor layer cylinder blocks consisting of parts configured as a bridge or letter n, and over-floor layer cylinder blocks consisting of parts of closed configuration as singular or multiple tubes.

Background of the invention.

[0003] In the industrial sector of the ceramic material manufacture, the parts being manufactured are normally supported and transported by using cars which move around the production floor, on which access is gained to the parts and they undergo the different phases of the process. In general, an over-floor layer is placed on top of the floor of the car, made from heat resistant blocks, which support the parts in the process of manufacturing, piled up in one or several layers.

[0004] Said groups of over-floor layers, along with the surface of the floor which supports them, usually form a set of contiguous grooves of axes visibly parallel to the direction of forward movement of the cars.

[0005] The over-floor layers, in theory, are placed contiguously in the longitudinal direction. In reality, there are always separations between them, either due to bad positioning, as a consequence of movements induced by firing operations (thermal expansions and contractions) or due to product loading and unloading operations (lateral reactions of thrust of the loading or unloading pins), or because of the very shape of the contiguous ends, which sometimes are not in square.

[0006] Suction cleaning is well known and widely used, which produces optimum results when it is applied to open surfaces, directly accessible for the suction nozzles.

[0007] But the effectiveness of suction cleaning in open field strongly diminishes when the distance of the nozzle from the particles to be picked up, since the velocity of the air diminishes proportionally to the second power of the distance to the suction point. It also diminishes inside the grooves formed by the over-floor layers and the surface of the floor, as a consequence of two superimposed effects:

- The air inlets through the gaps between parts, which increase the section of the suction groove, which leads to a progressive decrease in the average air velocity in the section of the groove at points increasingly further from the suction point.
- The distribution of air velocities in every section of the groove, as it is well known that, in accordance with aerodynamic science, at certain flows the velocity inside a tube is at its maximum in the centre, decreasing parabolically until it is zero next to the walls of the tube. It is next to one of these walls, the lower one, where the particles which are to be cleaned and extracted are, usually of sizes varying between 0 and more than 8x40x80 mm, because of which the low air velocity hinders the setting in motion of said particles.

[0008] It is also well known that the airstream at the outlet of a tube is opened following an expansion cone with a very small angle, due to which the velocity of said air in relation to the distance from the nozzle decreases much less quickly than in a suction nozzle, and as a result, the accelerating effect of particles which the airstream has is maintained until a considerable distance therefrom, the cleaning capacity being well known (accelerating of particles previously at rest) of a well directed narrow airstream. But this cleaning method, when used without any other precautions, has the drawback that dust is discharged to the atmosphere, which can be incompatible with the hygiene and security regulations in the job.

[0009] The problem with the cleaning in grooves under over-floor layers is solved with the object of the present invention.

Explanation of the invention.

[0010] The device for cleaning under over-floor layer cylinder blocks for tunnel kiln cars object of the present invention, is essentially characterized in that it comprises a first blow tube, capable of being connected to a first end of at least one hollow groove; a second suction tube, capable of being connected to the second end of the hollow groove or grooves connected simultaneously to the first tube by its first end; and a cover by way of a bell which completely or partially covers the floor and the over-floor layer, the lower sides thereof are somewhat separated from the surface of the floor and/or of the floor and over-floor layer, to enable the movement of the set of covers, first blow tube and second suction tube, a third suction tube being hermetically applied to an opening made in the cover.

[0011] According to another characteristic of the invention, the total volume of flow of the air sucked through the second tube and the third suction tube is always greater than the volume of flow of air blown through the first blow tube.

Brief description of the drawings

[0012] Below is a description of a particular unrestrictive embodiment, of the fixing device object of the present

invention, for whose better understanding drawings are attached by way of example, wherein:

Fig.1 is a perspective schematic view of a car;
Fig.2 represents a schematic and sectional view of the functioning of an embodiment of the device for cleaning floors and over-floor layer cylinder blocks;
Figs.3 and 4 show respective views similar to that of Fig. 2 of another two embodiments of the device of the invention; and
Fig. 5 is a view, also schematic, of another embodiment of the device according to the invention.

Detailed description of the drawings

[0013] In Fig. 1 one can observe a simplified tunnel kiln car 4, composed of a floor 2 and of two types of over-floor layer cylinder blocks 3 and 3'. The first type of over-floor layer cylinder blocks 3 consist of parts configured as a bridge or letter π. The second type of over-floor layer cylinder blocks 3' consists of closed parts configured by way of multiple tubes. In both cases, and as can be seen in Fig.1, the over-floor layer cylinder blocks 3 and 3' are placed contiguously in the longitudinal direction so that, by themselves or in combination with the upper surface of the floor 2 which supports them, they form a set of adjacent hollow grooves 5, of axes visibly parallel to the direction of forward movement of the cars 4, represented by an arrow in Fig. 1. Although only one type of over-floor layer cylinder block in the same car is normally used, in Fig. 1 the two types have been represented to make it clearer. In the rest of the drawings only the first type of over-floor layer cylinder blocks 3 has been represented, although it is implied that the use of the second type of over-floor layer cylinder blocks 3' is envisaged, as well as any other type of configuration of over-floor layer cylinder blocks not described but essentially similar.

[0014] Figs. 2 and 4 show three preferred embodiments of the device 1 for cleaning floors 2 and over-floor layer cylinder blocks 3 of the same type as those previously described. In them it can be observed that the device 1 for cleaning comprises a first blow tube 6 which pushes a flow of compressed air, symbolized by the letter S, as it is connected to a first end 7 of the hollow groove 5. A second suction tube 8 simultaneously sucks a volume of flow, represented by the symbol A1, as it is connected to the second end 9 of the groove or grooves 5 connected to the first tube 6 by its first end 7. The majority of the particles that are moved from inside the groove 5 by the volume of flow of compressed air blown by the blow tube 6 are extracted through the aforementioned suction tube A1,.

[0015] The device also comprises a cover 10 like a bell, which partially covers the over-floor layer 3, the lower sides 11 of which are somewhat separated from the surface of the floor 2 and/or over-floor layer 3, to enable the movement of the set formed by said cover 10 and the first and second tubes 6 and 8 horizontally, in a direction perpendicular to the forward movement of the car to successively clean all and every one of the adjacent grooves along the breadth of the car. A third suction tube 12 is hermetically applied to said cover 10, through an opening 13, represented by a discontinuous line in Figs. 2 and 3, made in the same cover 10. Said tube 12 sucks a volume of flow, represented by the symbol A2, which drags and sucks part of the finest dust which is moved from inside the groove 5, thus preventing its expulsion to the atmosphere through the gaps between the over-floor layer parts. For this reason, the cover 10 must cover at least the portion of over-floor layer which the groove object of the cleaning contains.

[0016] For correct cleaning and to prevent particles of dust being discharged to the atmosphere, the magnitude of the sum of groove A1 plus groove A2 must be greater than that of groove S, so that the space semi-closed by the cover 10 is always in depression. In this way, an outlet of dusty air through the small openings left by the cover will never be possible, since as it is in depression only inlets of air through said openings are possible, as the lines of current of Figs 2 to 4 show.

[0017] Suctions A1 and A2 can be connected to two independent suction units or, as in the case of Figs. 3 and 4, come from a single source of suction or ventilator 14. In said figures, the sucked air passes through a filter 15 before the ventilator 14 which recycles the sucked air to push it and generate a blowing volume of flow. Of said flow of blown air, a part E is expelled towards the exterior, via an adjustable valve 16, and the rest is used as a blowing volume of flow S in the blow tube 6, in this way making sure that the volume of flow S is less than the sum of the volumes of flow A1 and A2.

[0018] Fig. 4 shows an embodiment of the device which is a clear derivation from that represented in Fig. 3, the difference being that for obvious reasons suction tube 8 and suction tube 12 have been joined together in a single tube 8'.

[0019] Fig. 5 shows another embodiment of the device according to the invention, wherein the volumes of flow A2 and S are the same and are generated by the same ventilator 14. This ventilator 14 is protected from wear, by interaction with the particles picked up, since the larger particles and the medium-sized particles are picked up through the volume of flow A1, so that only the fine dust reaches the ventilator 14. By equipping the suction tubes 12 and 8 in an appropriate way, a cyclonic effect is brought about which causes the evacuation of the heaviest particles through the suction tubes 8.

[0020] Although it is not represented in any of Figs. 1 to 5, the possibility of using certain geometries of tubes which make the cleaning process which the device 1 carries out easier is envisaged, as well as the filtering of the air of the particles which are picked up 17 before the ventilator.

[0021] It is also considered that the suction and blow-

ing functions can be reversed in tubes 6 and 8, so that if in one pass one sucks through an end 9 of groove 5 and blows through end 7 of the same groove 5, in another pass it is possible to suck through end 7 and blow through end 9.

Claims

1. Device (1) for cleaning under over-floor layer cylinder blocks (3) for tunnel kiln cars (4), wherein the cylinder blocks are placed in such a way that, by themselves or in combination with the upper surface of the floor which supports them, they form a set of adjacent hollow grooves (5), of axes visibly parallel to the direction of forward movement of the cars (4), **characterized in that** it comprises a first blow tube (6), capable of being connected to a first end (7) of at least one hollow groove; a second suction tube (8), capable of being connected to the second end (9) of the hollow groove or grooves connected simultaneously to the first tube by its first end; and a cover (10) like a bell, which completely or partially covers the floor and the over-floor layer, the lower sides whereof (11) are somewhat separated from the surface of the ground and/or from the floor and over-floor layer (3), to enable the movement of the set of covers (10), first blow tube and second suction tube, a third suction tube (12) being hermetically applied to an opening (13) made in the cover.

2. Device (1) according to claim 1, **characterized in that** the total volume of air sucked through the second tube (8) and the third suction tube (12) is greater than the volume of air blown through the first blow tube (6).

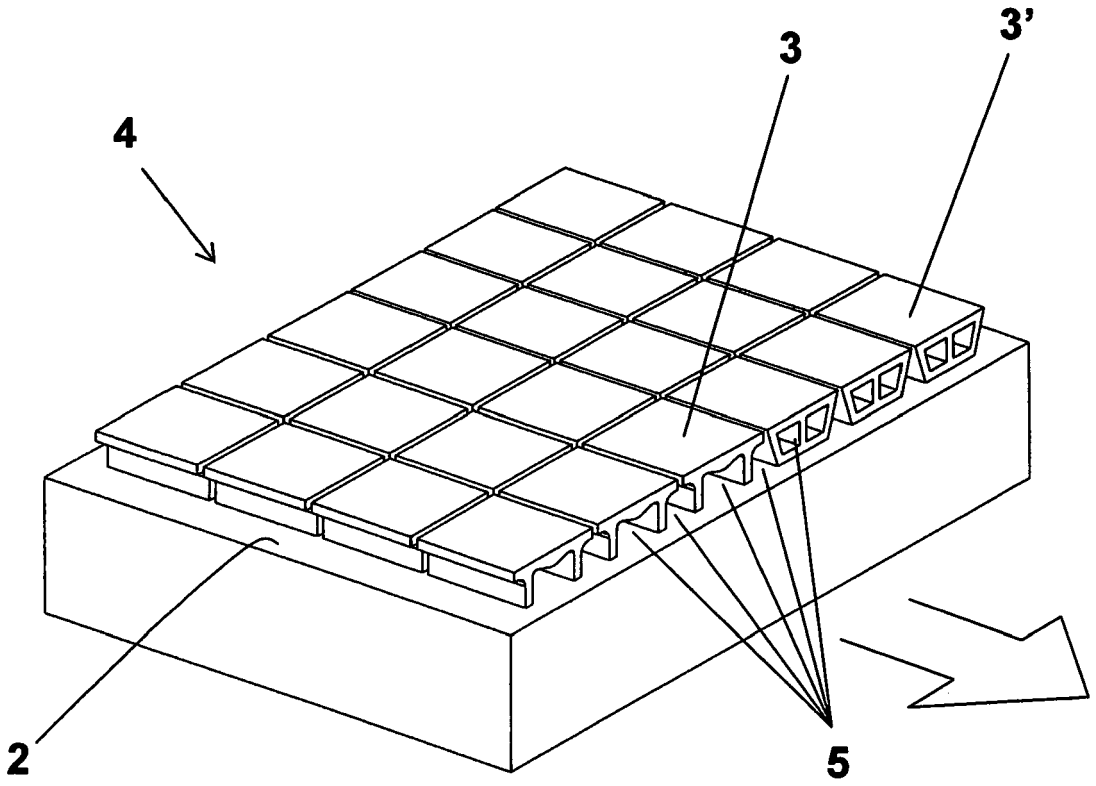

Fig. 1

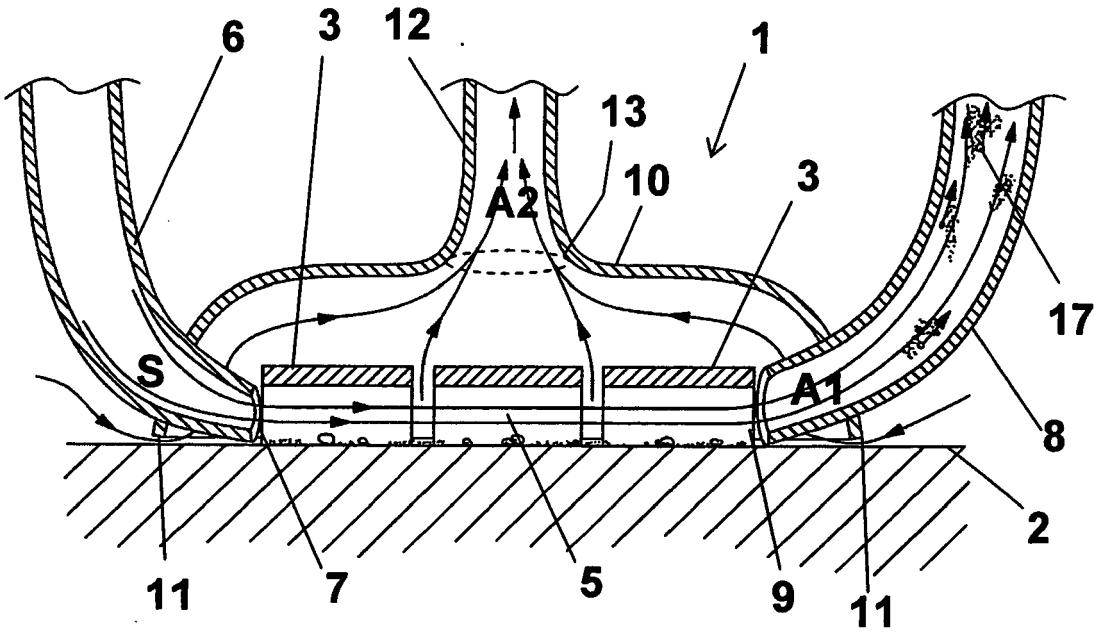

Fig. 2

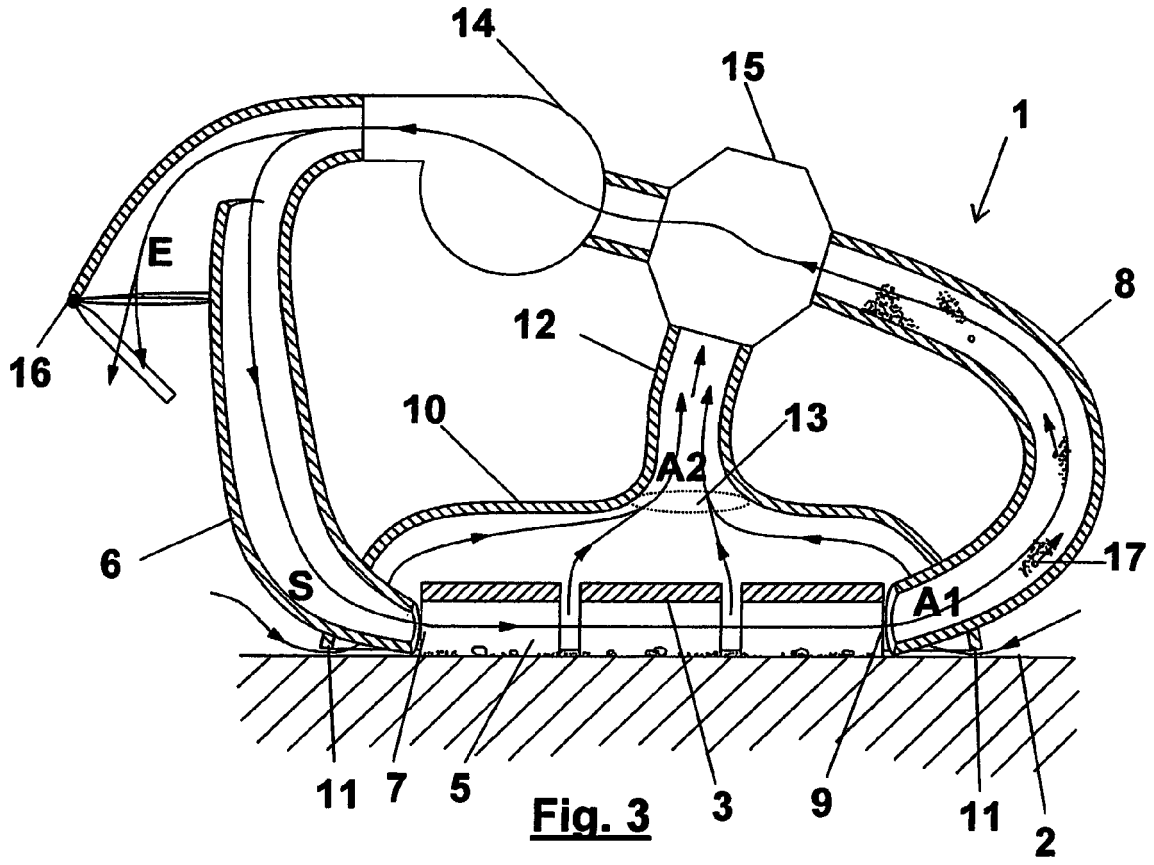
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Fig. 3

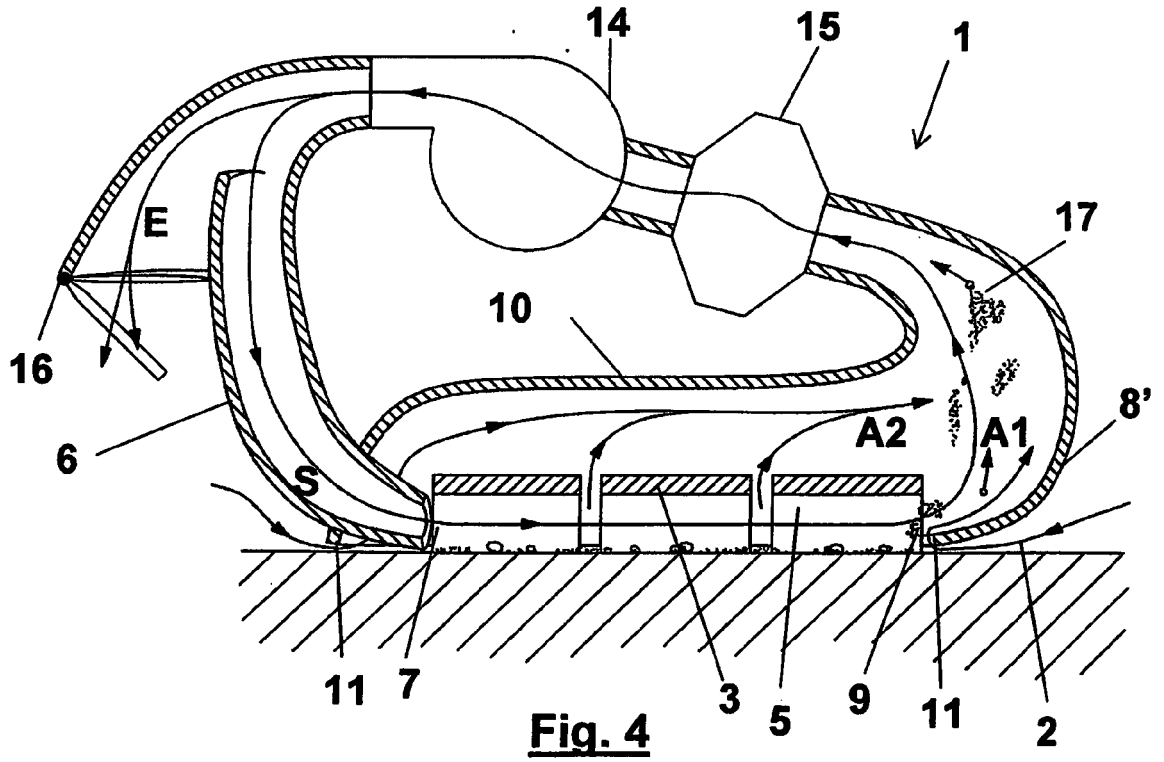
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Fig. 4

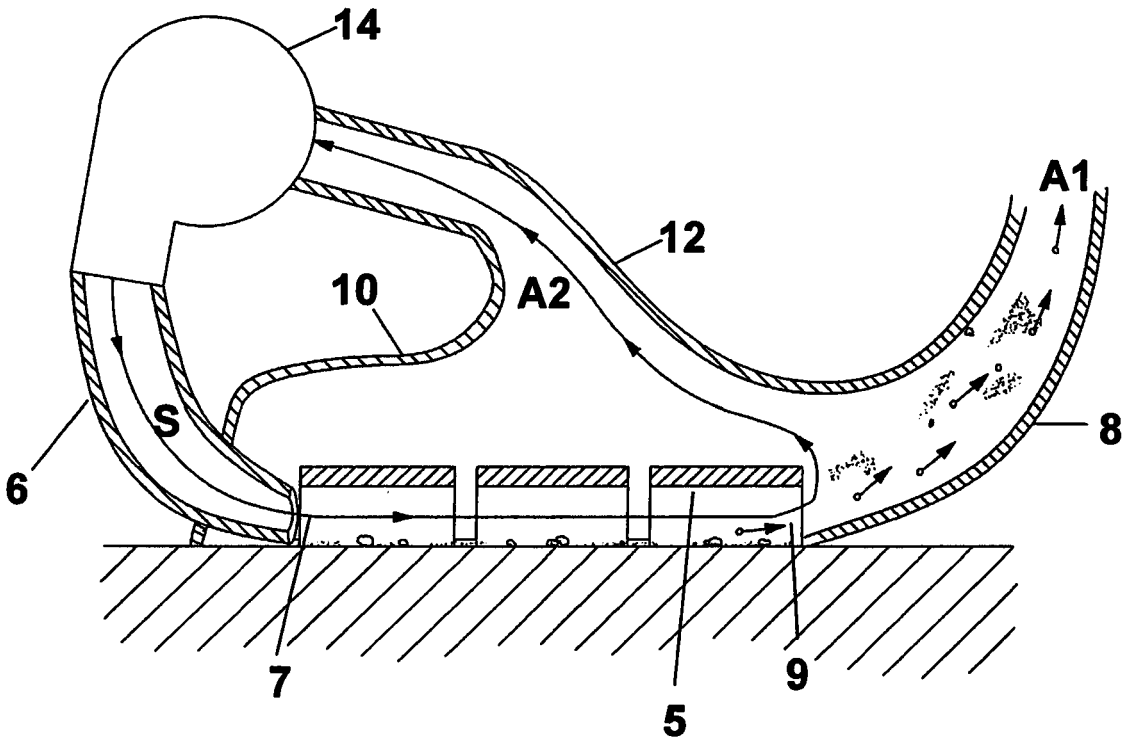

Fig. 5

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Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 November 2006	Gavriliu, Alexandru

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