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(54) **Method and apparatus for treating synthetic playing surfaces having particulate material spread on it**

(57) A device for treating synthetic playing surfaces having particulate material spread on it, is provided with a frame, which frame is movable in a direction of propulsion. An air block connected to the frame substantially transverse to the direction of propulsion, has an inlet for compressed air and downwardly directed air exhaust means (2;12) longitudinally spaced along the length of the air block, the air exhaust means being adapted to be displaced as to their operation in longitu-

dinal direction of the air block and therefore transverse to the direction of propulsion with the aid of operating means (3,4;13,14,17;24,30,31). The air block is substantially stationary and the operating means (3,4;13,14;24,30,31) are equipped with passage means (4;14,17;24,31) for alternatively, in transverse direction, opening and closing of different parts of the air exhaust means (2;12) transverse to the direction of propulsion. The invention also includes a method of treating synthetic playing surfaces.

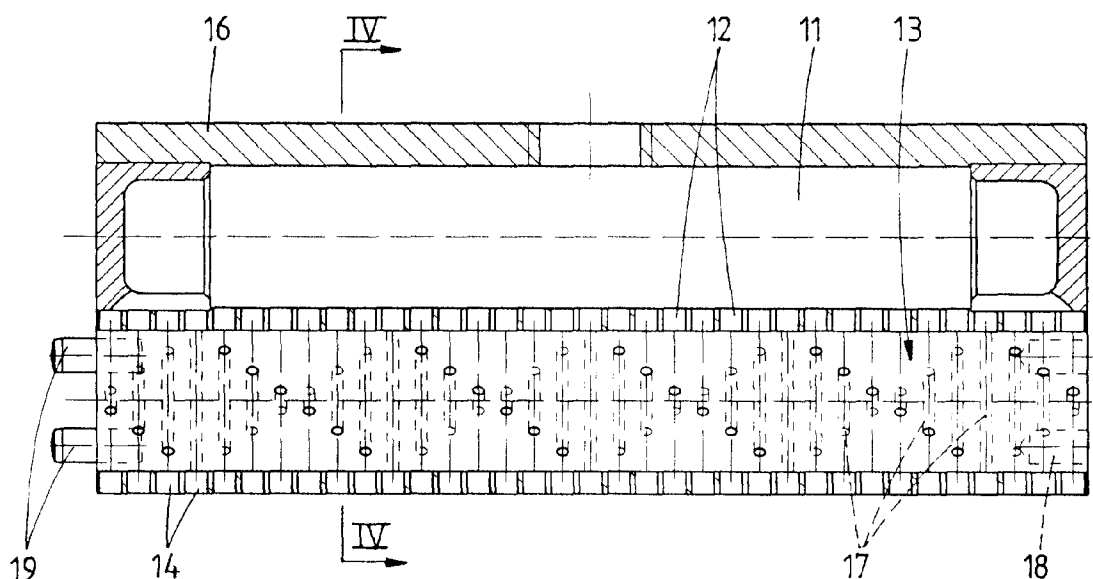


fig. 3

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Description

The invention relates to a device according to the preamble of claim 1.

In a prior art device of this kind, the air block, which is reciprocable by a driving means, is provided with a number of longitudinally spaced nozzles and is formed as an air chamber, such that air can be ejected along the full length of the air chamber if the displacement stroke is at least equal to the distance between adjacent nozzles.

The invention aims at improving the device of the kind mentioned in the preamble.

For this purpose, the device according to the invention has the characterizing features of claim 1.

By providing these measures the periodically reciprocating movement is being avoided and replaced by the opening and closing of parts of the air exhaust means. Thus, for example by means of a large number in transverse direction closely spaced nozzles, the full length of the air block can be covered on the one hand, while the air consumption is being kept limited without a reciprocating movement of the air block on the other hand.

Advantageous embodiments of the invention are defined in the independent claims.

The invention also comprises a method for treating synthetic playing surfaces having particulate material spread on it, whereby by means of air exhaust means compressed air is being ejected onto the playing surface from an air block at the desired angle, and whereby the particulate material is being blown upwardly and is being caught, whereby the air is being ejected during propulsion of the air chamber transverse to the direction of propulsion and alternatively on different places, which method according to the invention is characterized in that the air block is held substantially still in transverse direction, while each time, with the aid of the operating means, the air is being ejected on other places transverse to the direction of propulsion of the air block by alternately opening and closing parts of the air exhaust means.

Hereafter the invention will be elucidated further, while reference is being made to the drawings showing very schematically embodiments of the invention.

Fig. 1 is a very schematic transverse section of the air chamber of a first embodiment of the device according to the invention.

Fig. 2 is a perspective view of the element which is rotatable around the air chamber of Fig. 1.

Fig. 3 is a very schematic section of the air chamber having nozzles according to a second embodiment of the device according to the invention.

Fig. 4 is a section along the line IV-IV in Fig. 3.

Fig. 5 is a schematic longitudinal section of a third example of an embodiment of the device according to the invention.

Figs 6 and 7 are sections along the line VI-VI, VII-

VII respectively in fig. 5.

The present invention is intended for cleaning synthetic playing surfaces, such as for example tennis courts or hockey fields or the like, where a particulate material, such as sand or gravel is spread on a plastic fibre mat between the filaments. After some time this material sticks and sets causing the field to become hard and impervious to water and less good usable. In order to make the playing field better usable air is being ejected against the surface in small jets and with great force, causing the particular material to loosen, the material thereby being blowing upwards. If the particulate material is now being caught, it can be cleaned and a separation can for example be made between possibly reusable coarse particles and finer dust and dirt particles, which particles are being collected and discharged. If thereupon clean, new or cleaned particulate material is spread on the playing surface, the playing surface is again good usable.

Not shown in the drawing is, that the device is provided with a frame of a self riding vehicle or a towed vehicle, which frame is provided with a chassis. This vehicle is provided with an air compressor or is connected to an air compressor through a long hose of for example 120 meters for supplying compressed air of for instance approximately 10 bar. This compressed air is supplied to the inlet of an air block, which is shown in Fig. 1, and which is embodied as an air chamber 1 mounted substantially horizontally and more or less transverse to the direction of movement of the vehicle. The air chamber 1 has a circular cross section and is in this case provided with a slit-like air exhaust 2 pointed downwards and preferably at an angle of approximately 15 degrees relative to the vertical. The air chamber 1 can have a length of for example 100 cm and can be of a diameter of approximately 2 inch. One or more air chambers can operate next to each other in order to improve the working width.

Around the air chamber 1 there is provided a rotatably drivable element, which is provided with plurality of nozzles 4, acting as air passage means spaced along both the length and the circumference of the air chamber 1, or as the case may be extended along the rotating element 3, for example in one or more rows along a helical line across the wall of the rotatable element 3 (see Fig 2.). By the rotation of the rotatable element 3 along the center line of the air chamber 1, every time only those nozzles 4 are being used which are aligned with the air exhaust 1. Upon the further rotation, the circumferentially next nozzles 4 are brought in line with the air exhaust, and these nozzles 4, as seen in axial direction of the air chamber, and thus transverse to the direction of movement, are slightly offset relative to the preceding nozzles, in this way enabling a full treatment of the playing surface A to be treated if the vehicle is moved forward at a relatively low speed transverse to this air chamber 1.

Naturally a sufficient sealing on both sides of the air exhaust 2, between the air chamber 1 and the rotatable

element 3 has to be provided, such that only air can pass out through the nozzles 4 which are in line with the air exhaust 2. This causes the air consumption to be relatively low and a relatively small compressor is sufficient. Starting from a compressor having a capacity of 10,5 m³/min. at a pressure of 10 bar, only 47 nozzles 4 having a section of 1,5 mm can operate simultaneously as a maximum. The rotatable element 3 can for example rotate with 300 rpm.

In Fig. 1 it is further shown that, as seen in the direction of movement of the vehicle (right in Fig. 1), an inclined catching surface 5 is placed behind the air chamber, which catching surface catches the particulate material being ejected therein, and which further discharges it, for example through a flexible conveyer belt or shutter conveyer bringing the material through the unit to a point of discharge. From there on a further transport can take place through a vacuum hose or a motorized car.

Figs 3 and 4 show a second example of an embodiment of the device according to the invention, whereby the housing 16 of the air block is provided with an air chamber 11, air exhausts 12, a rotatable element 13 and nozzles 14. In this case the rotatable element 13 is not journaled concentrically around the air chamber 11, but next to it in a bearing chamber of the housing 16. The rotatable element 13 is constructed as a roller and is rotatable around an axis parallel to the air chamber 11. The nozzles 14 are provided stationary in the housing 16 of the air block and are in line with the air exhausts 12 of the air chamber radially relative to the rotatable element 13. This rotatable element 13 is provided with air passage channels 17, whereby adjacent air passage channels are turned through an angle around the axis of rotation, such that along the circumference of the rotatable element 13 the channels 17 show a helical line path. In two 180 degrees shifted rotational positions every channel comes in line with the air exhausts 12 of the air chamber 11 and the nozzles 14, causing air in those positions to be ejected through the nozzles. Because adjacent air passage channels 17 are angularly offset, air is ejected sequentially and it is also possible here to cover the whole surface to be cleaned without excessive air consumption. In each winding of the helical line of the channels 17 two nozzles 14 can be active simultaneously. A number of the housings 16 as shown can be coupled to each other, whereby the rotation of the rotatable elements 13 can be transferred through coupling means 18, 19.

The Figs. 5-7 show a third variant of the invention, whereby the air block for alternately opening and closing of a row of nozzles 24 is provided with or is formed as a valve block 30. Recognizable are now an air chamber or air supply channel 21, nozzles 24 and a catch surface 25. The valve block, which is positioned at an angle of 15 degrees has a number, in this case 12, of valves 31, shifting valves or other kinds of shutters which are included in channels 24' of the nozzles 24. In

the case as shown each two channels 24' are connected to a valve 31 in order to reduce the number of valves 31. In a row of 6 adjacent nozzles each time a nozzle 24 is being opened sequentially, while the other five are closed. The position of the ejection of air then moves itself through this row. Naturally, all kinds of arrangements of valves, channels and nozzles are possible.

From the foregoing it will be clear, that the invention provides a device and method, with the aid whereof air can be ejected every time on different closely spaced positions transverse to the direction of movement, thereby obtaining a good and reliable cleaning effect. The operating means for this selectively ejecting air or a similar medium thereby act as valves or shutters which, like in the first two embodiments, can be constructed both as rotatable elements for a large number of ejection openings, and be constructed as real valves, shutters or the like.

The invention is not limited to the embodiments as shown and elucidated. So the air block can also be positioned not precisely transverse to the direction of propulsion. Naturally further variations are possible.

Claims

1. Device for treating synthetic playing surfaces having particulate material, like sand, spread on it, provided with a frame, which frame is movable in a direction of propulsion, an air block connected to the frame substantially transverse to the direction of propulsion, the air block having an inlet for compressed air and downwardly directed air exhaust means (2; 12) longitudinally spaced along the length of the air block, the air exhaust means being adapted to be displaced as to their operation in longitudinal direction of the air block and therefore transverse to the direction of propulsion with the aid of operating means (3, 4; 13, 14, 17; 24, 30, 31), **characterized in that** the air block is substantially stationary and the operating means (3, 4; 13, 14; 24, 30, 31) are equipped with passage means (4; 14, 17; 24, 31) for alternatively, in transverse direction, opening and closing of different parts of the air exhaust means (2; 12) transverse to the direction of propulsion.
2. Device according to claim 1, whereby the passage means (4; 14, 17; 24, 31) are provided with a large number of nozzles (4; 14, 24) spaced along the length of the air block, only an alternating portion of the nozzles being supplied with compressed air.
3. Device according to claim 1 or 2, whereby the operating means (3, 4; 13, 14; 24, 30, 31) are constructed as shutters, and possibly as valves (31) capable of alternatively opening and closing the channels (24') of associated nozzles (24).

4. Device according to claim 1,2 or 3, whereby the air block is constructed as an air chamber (1;11), while the operating means are constructed as a movable element, in particular a rotatable element (3;13) capable of being rotated around an axis transverse to the direction of propulsion, which element is equipped with passage means (4;17) for alternatively, in transverse direction, opening and closing different portions of the air exhaust means (2;12) transverse to the direction of propulsion. 5 10
5. Device according to claim 4, whereby said passage means (4;17) are spaced along the circumference and along the length of the rotatable element (3;13), which passage means can be aligned with separate axial portions of the air exhaust means (2;12), and possibly open into the open air through stationary nozzles (14). 15
6. Device according to claim 5, whereby the passage means (4;17) are divided into one or more spiral shapes around the rotatable element (3;13) 20
7. Device according to claim 6, whereby the rotatable element (13) consists of a roller, which roller is closely fitted in a bearing chamber of a housing (16), which bearing chamber is in connecting with the air chamber (11), while the passage means (17) exist of channels, which channels are substantially radially arranged in the roller, whereby each adjacent channels are angularly turned around the axis of rotation, and whereby the air exhaust means (12) and the nozzles (14) aligned therewith are provided in the wall of the housing (16). 25 30 35
8. Method of treating synthetic playing surfaces having particulate material, like sand, spread on it, whereby by means of air exhaust means compressed air is ejected onto the playing surface from an air block at the desired angle, and wherein the particulate material is ejected and is caught, the air being ejected during propulsion of the air chamber transverse to the direction of propulsion and alternatively on different places, 40
- characterized in that** in transverse direction the air block is substantially kept still, while with the aid of the operating means the air is being ejected each time on other places transverse to the direction of propulsion of the air block by alternately opening and closing of portions of the air exhaust means. 45 50
9. Method according to claim 8, whereby as an air block an air chamber is selected and whereby an element, rotating substantially continuously relative to the air chamber, enables air to be ejected through circumferentially and longitudinally spaced air passage means each time on different places transverse to the direction of propulsion of the air cham- 55

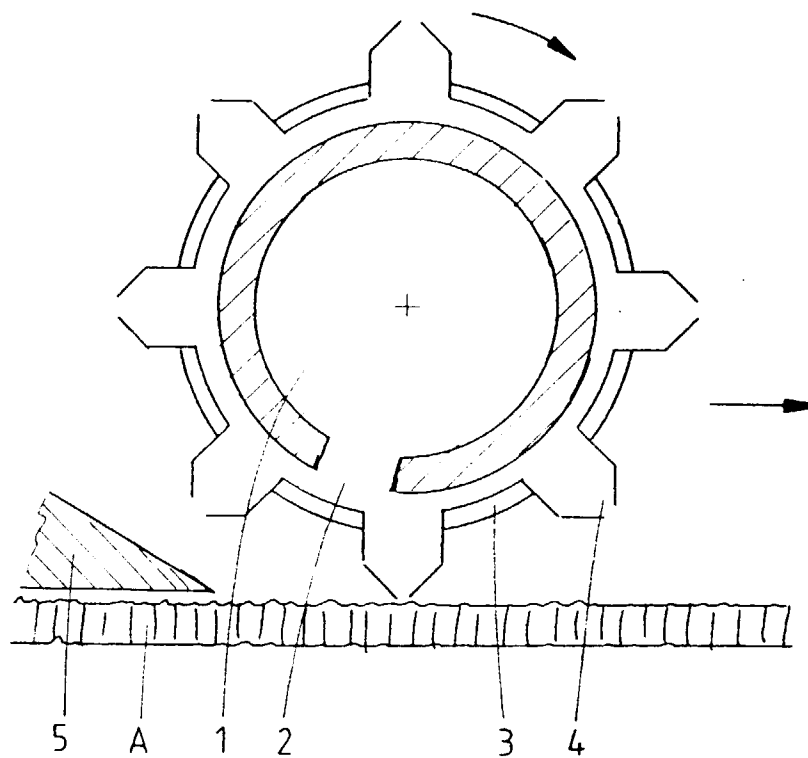


fig. 1

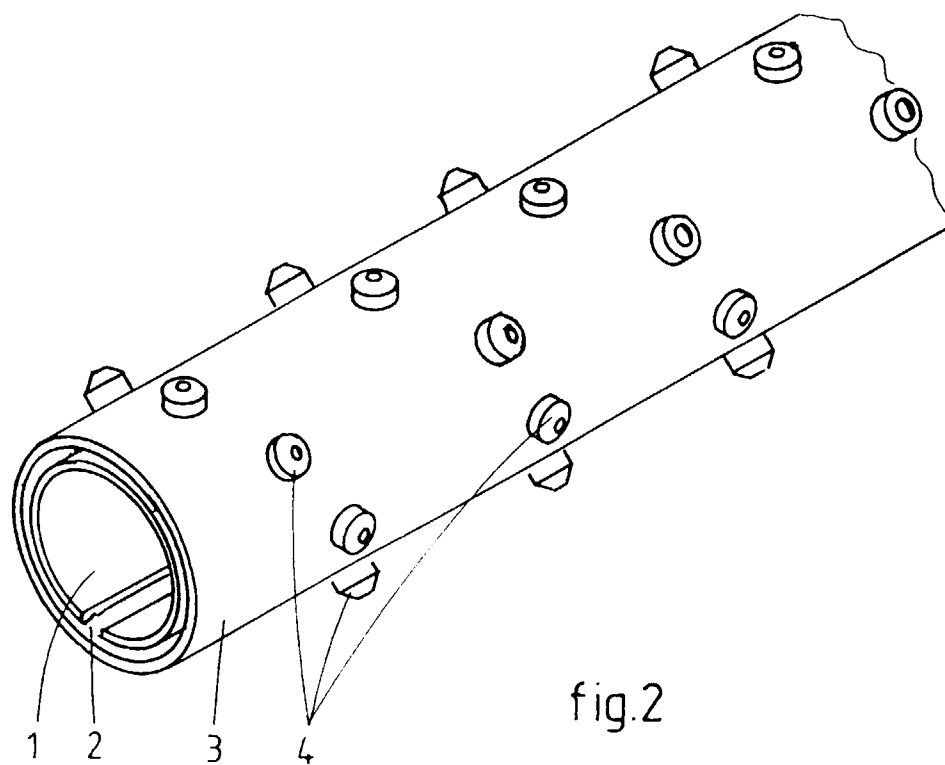


fig. 2

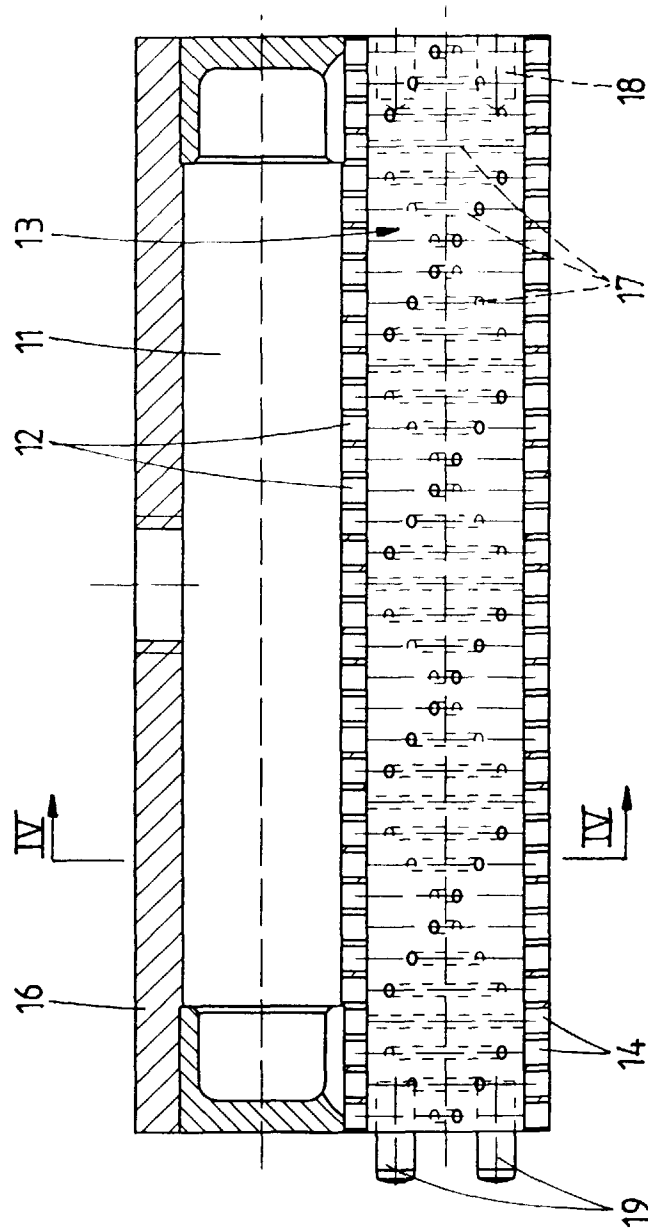


fig. 3

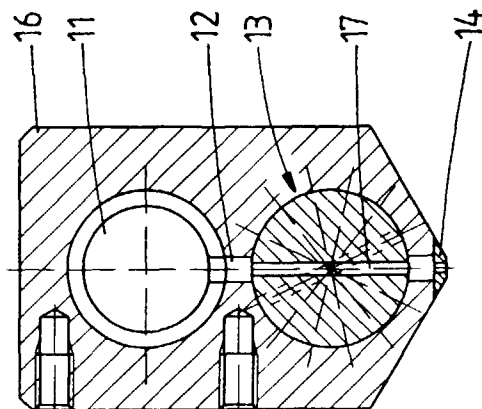


fig. 4

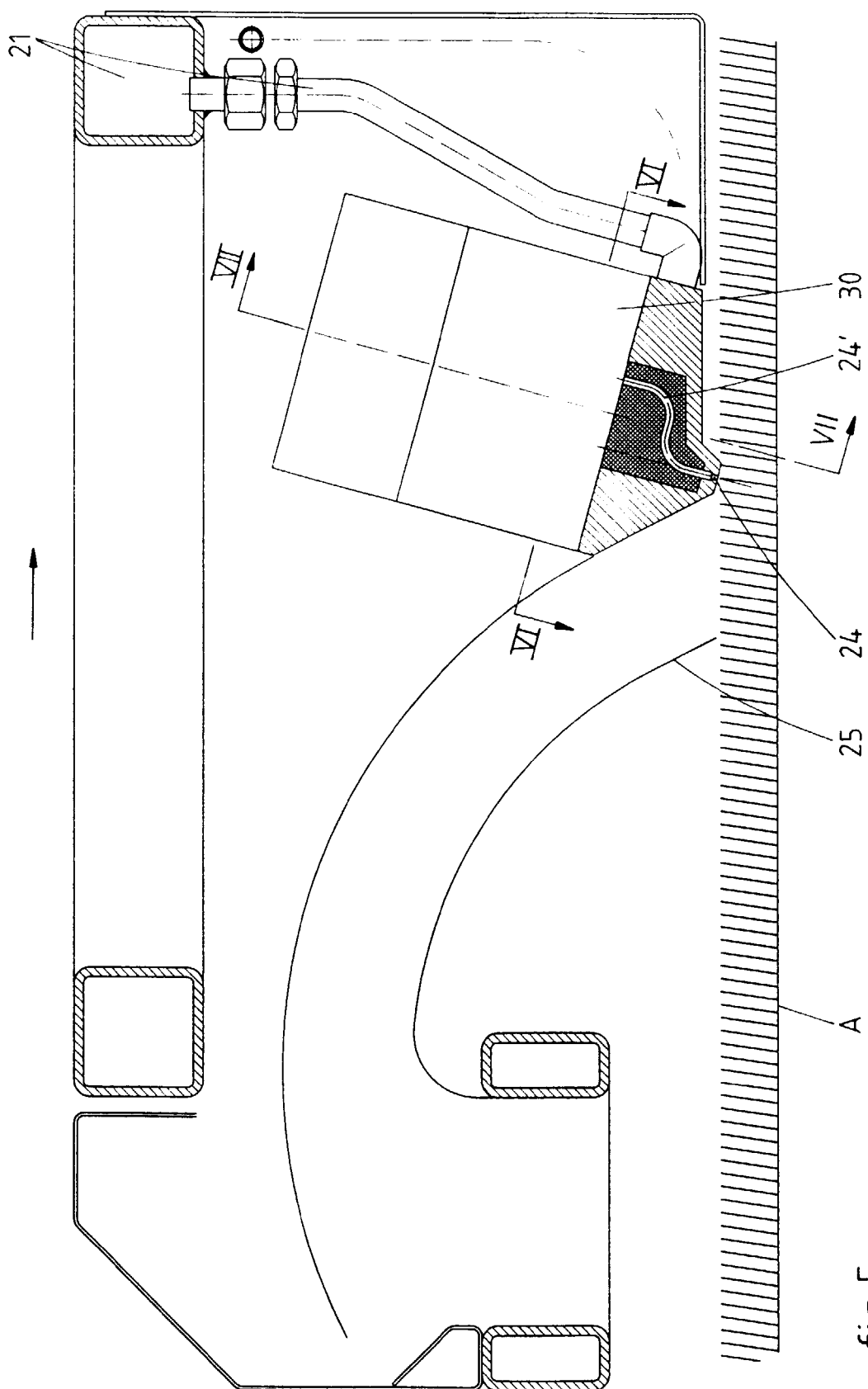


fig.5

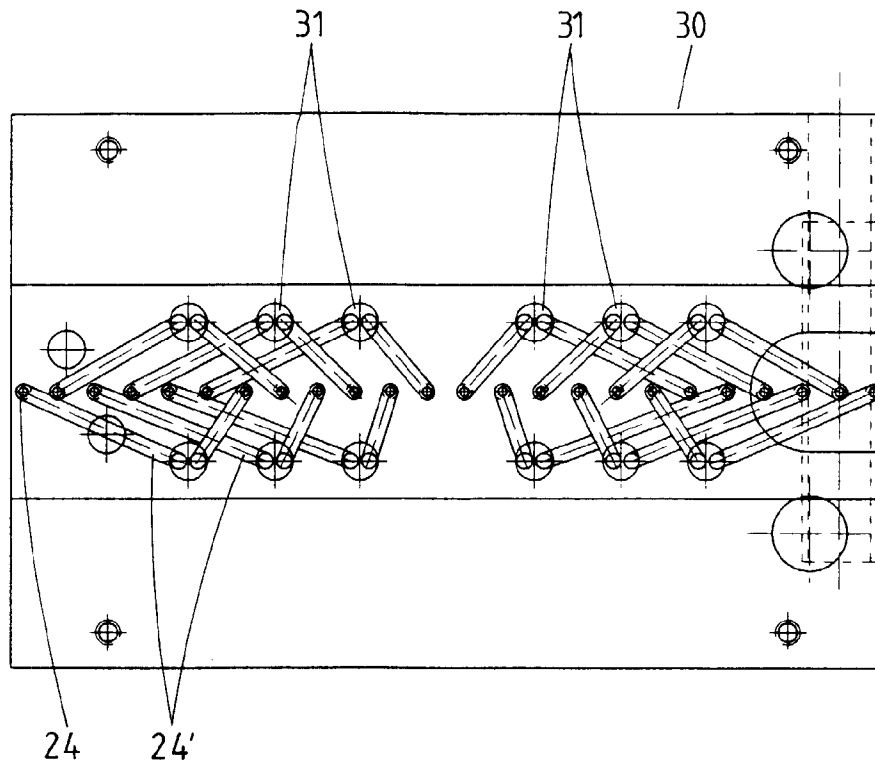


fig. 6

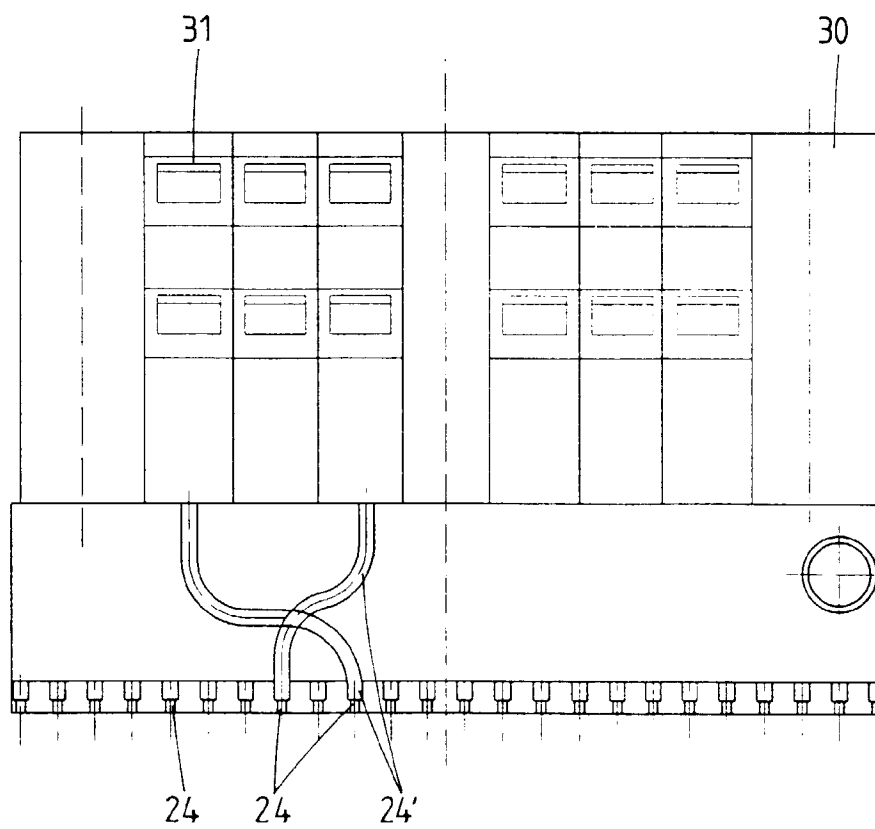


fig. 7