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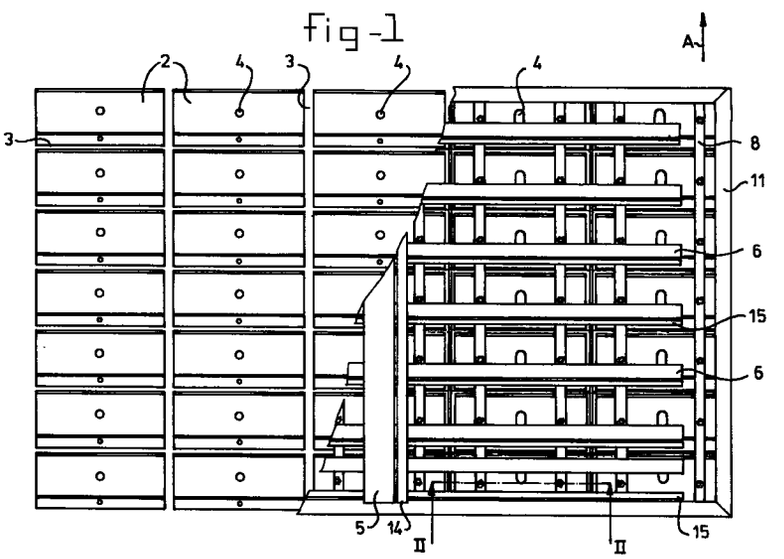
(54) Asphalt road treatment apparatus

(57) Asphalt road treatment apparatus having a treatment element (1) in order, with the road deck (26), to form a pressure chamber (2) so as to direct a treatment medium under pressure towards the road surface within said pressure chamber (2). According to the invention, provision is made that said treatment element (1) is composed of sub-elements with removal elements between them in order to allow treatment medium to be able to escape from the pressure chamber and/or the surface towards said removal elements.

Fig-1



EP 0 704 576 A1

Description

The invention relates to an asphalt road treatment apparatus in accordance with the preamble of Claim 1.

In particular, the invention relates to the treatment of so-called very open asphalt concrete (VOAC). Said VOAC is nowadays increasingly being used as the top layer of a asphalted road. Good drainage of rainwater and noise suppression are achieved as a result of its open pore structure. An example of VOAC is given in FR-A 2 688 808.

German Offenlegungsschrift (3 142 264) describes a hood which is open on its underside and is placed with its lower edge tightly against a road surface. The feed line for a pressurised medium opens inside said hood. The pressurised medium is able to leave the hood via a discharge duct which opens into said hood at the top. This known device is intended for treating materials, such as residues of adhesive, adhering to the road deck.

In practice it has been found that this known device is unsuitable for treating a relatively large road surface area in a single operation, whilst it has also been found that the penetration of the treating material into a porous road surface, such as VOAC, is inadequate.

EP-A 0 556 921 deals with a road deck treatment method and device with which there is no question of a pressure chamber subdivided into sub-pressure chambers in order thus to introduce a treatment medium by this means into the road surface, with the result that the effect envisaged with the present invention is not achieved.

The aim of the present invention is to provide an apparatus with which a relatively large road surface area can be treated in a single operation, intimate contact between the treatment medium and the road surface and also reliable penetration of the treatment medium into a porous road surface being guaranteed.

To this end, the treatment apparatus of the type referred to in the introduction is characterised by the measures summarised in the characterising clause of Claim 1.

The invention is based on the insight that the efficacy of the treatment medium is increased by allowing said treatment medium to escape at the periphery of the treatment element, in particular in the vicinity of the transition between the treatment element and the road surface, said efficacy being further increased by deliberately increasing the size of the relevant peripheral surface of the treatment element, around which the treatment medium escapes, by suodividing the treatment element into sub-elements between which the treatment medium is able to escape. Moreover, there is the insight that the use of individual sub-elements permits better adaptation to the inevitable unevenness in the road deck. Trials have shown that the effect according to the invention is greatest if a treatment element is surrounded by removal elements on all sides.

Although the aim is primarily to use a large number of at least three treatment elements arranged both alongside one another and one behind the other in order to achieve a sufficient increase in the surface area of the boundary between treatment element and removal element, it will be clear to a person skilled in the art that the effect of the invention can also be achieved with smaller numbers of treatment elements, albeit to a somewhat lesser degree.

A further improvement is achieved according to Claim 3, by making the gap between a sub-element and the respective removal element, within the design limits, as large as possible by insertion of a sealing element which locally covers the road surface and at this location interacts therewith to provide an essentially medium-tight seal. In this context, the invention is based on the further insight that the depth to which the treatment medium penetrates into the road deck becomes greater as the treatment medium is forced to travel a greater path through the road deck between the treatment element and the removal element.

A further aim of the invention is a road deck treatment method, to which end treatment medium is injected into the sub-pressure chambers in order, via the porous top layer of the road deck, to reach the removal elements.

The treatment medium used can be, for example, compressed air in order to clean the pores of the porous road surface, such as VOAC. In addition, the treatment medium can be steam or another hot gas, or nitrogen gas adiabatically expanded from the liquid phase, or another cryogenic gas, in order to achieve a softening or embrittlement for the purpose of removal of the top layer. Instead of a gaseous treatment medium, it is also possible to use a liquid. In connection with the treatment of, for example, VOAC, the sub-elements can sealingly abut the road surface located below them, with the result that the treatment medium escapes sideways via the pores in said road surface at the periphery of the sub-elements. By this means yet a further additional effective flow through the pores in the road surface is achieved.

The sub-elements can also be produced by constructing an integral treatment element with, for example, slits.

Further advantages and characteristics of the present invention will become apparent from the following description of a non-limiting illustrative embodiment, with reference to the appended drawings. In said drawings:

Figure 1 shows a top view of a first embodiment of the asphalt road treatment apparatus according to the invention, with partially exposed components;
Figure 2 shows a view along the line II-II in Figure 1, partially exposed;
Figure 3 shows a side view in cross-section according to the line III-III in Figure 2;
Figure 4 shows a side view in cross-section along the line IV-IV in Figure 6 of another embodiment of the asphalt road treatment apparatus according to the invention, with partially exposed components;

Figure 5 shows a view along the line IV-IV in Figure 1, partially exposed; and

Figure 6 shows a top view of the treatment elements of Fig. 4, with notional representation of facilities located above these.

Figure 1 shows an asphalt road treatment apparatus 1. Said apparatus essentially consists of various pressure boxes 2 (Figure 3) which are arranged alongside and one behind the other, a gap 3 being maintained between every two boxes. As can be seen more particularly in Figure 3, the term pressure box is used to define a chamber which, with the exception of the underside facing towards the road deck, is closed on all sides and which can be supplied, via a feed, with a medium under pressure. A feed duct 4 for pressurised medium opens into the pressure box 2 at its top. A pressurised medium is supplied via a central feed duct 5, which feed duct 5 runs centrally in the longitudinal direction of the apparatus 1. Branch ducts 6 run transversely from said central feed duct 5, the respective stub ducts 4 to the individual pressure boxes being connected to said branch ducts 6. As shown, baffles 7 are arranged between the pressure boxes 2. Strips 8 run in the longitudinal direction of the apparatus 1 over the top of the baffles 7; there are two strips 8 for every row of pressure boxes 2. The suspension pins 9 for the pressure boxes 2 extend through said strips 8. Said pressure boxes 2 are prestressed in the downward direction by means of helical springs 10, so that they are held pressed firmly against a road surface (not shown) located beneath the pressure boxes. In Figures 2 and 3, the unstressed state of the springs 10 is shown. During use, the springs 10 will be compressed, in such a way that the bottom edge of the pressure boxes 2 is essentially in line with the bottom edge of the baffles 7. Sufficient gap is maintained between the baffles 7 and the bottom edge of the respective pressure box 2 to permit unimpeded escape of pressurised medium from the chamber in the pressure box 2.

Both the baffles 7 and the strips 8 are coupled to a surrounding frame 11, so that the apparatus 1 forms a whole.

Viewed in the direction of movement (arrow A), a suction duct 12 is located immediately behind each pressure box 2. By this means materials which, for example, have become detached from the road surface, sand removed from any pores in the road deck, and the like, can be removed by suction. In the case, for example, of steam injection into the pressure box 2, any condensate formed can also be removed via the suction duct 12. The suction duct 12 runs virtually over the full width of the pressure box 2 and has a central connecting stub 13 for connection to a suction apparatus (not shown). A central suction duct 14 runs parallel to and a short distance away from the feed duct 5 (Figure 1). Branch ducts 15 which run transversely are connected to said central suction duct 14. The stubs 13 are connected to said respective ducts 15. As is shown in more detail in Figure 3, a slit 16, which optionally can be omitted, is located between the pressure box 2 and the suction duct 12.

Pressurised medium present in the pressure box 2 is now able, as is shown by the arrows B, to escape beneath the bottom edge of the pressure box 2, if applicable through the porous road surface, into the surroundings. A hood (not shown), in which the treatment medium which has escaped from the pressure boxes 2 is collected, can, for example, be arranged over the apparatus 1. The important feature in this context is that the pressure in said collection hood is lower than the pressure prevailing in the pressure boxes 2.

Because the relatively large surface area of the apparatus 1 is subdivided into individual part surface areas, defined by the pressure boxes 2, said pressure boxes 2 being individually mounted in a frame 11, the apparatus 1 is better able to adapt to unevenness in the road deck, with the result that reliable interaction between the pressure boxes 2 and the road surface is ensured.

The frame 11 can, for example, be of mobile construction. The frame 11 can also be fixed to a boom on a further mobile vehicle.

Figure 4 shows the alternative asphalt road treatment apparatus 1. The latter essentially consists of various pressure plates 22 (Figure 6) which are arranged alongside and one behind the other, a gap 23 being maintained between every two pressure plates. As in the case of the embodiment according to Figs 1-3, this construction can be regarded as a series of essentially uniform elements of essentially equal size. Although said correspondence in shape and dimensions is not required in order to achieve the effect of the invention, it is found that under these conditions an optimum combination of effective construction and operation is achievable at low costs. Each pressure plate 22 has a resilient elastic underlayer 28 of, for example, rubber or rubber-like material. For steam injection, said underlayer 28 is able to withstand temperatures of at least 100 °C. As is shown, each underlayer has an edge cut-out in which an angle section 27 welded to the pressure plate 22 engages. Each pressure plate 22, with the underlayer 28, lies with its full surface on the road deck 26, with the exception of a central feed cavity 29 for the treatment medium. A feed duct 24 for compressed treatment medium opens into the central feed cavity 29 of the pressure plate 22 at its top. The treatment medium is supplied via a central feed duct 25, which feed duct 25 runs centrally in the longitudinal direction of the apparatus 1. Branch ducts (not visible), to which the respective stump ducts 24 to the individual pressure plates 22 are connected, run transversely from said central feed duct 25. Baffles (not shown) can be arranged in the gap 23 between the pressure plates 22, in order to keep the operation of the individual pressure plates 22 separate from one another as well as possible. The pressure plates 22 can be prestressed in the downward direction by means of (helical) springs or equivalent pretensioning

elements, in order to maintain intimate contact with the road deck 26.

A surrounding frame 11 connects all components to one another, so that the apparatus 1 forms a whole.

Viewed in the direction of movement (arrow A; Figure 6) a suction duct (not shown), for example constructed in the same way as in the alternative embodiment according to Figs 1-3, can be located immediately behind each pressure plate 22. By this means it is possible, for example, to remove, by suction, materials which have become detached from the road surface, sand removed from any pores in the road deck, and the like. In the case of, for example, steam injection beneath the pressure plate 22, any condensate formed can also be removed via said optional suction duct. Said optional suction duct can run over virtually the full width of the pressure plate 22 and can have a central connecting stub for connection to a suction apparatus (not shown).

Treatment medium (compressed) now passes from the feed duct 24 into the cavity 29. From here said medium is forced beneath the pressure plate 22 and into the road deck 26 and flows in the direction of the arrows B towards the side of the apparatus 1 and towards the gaps 23 which are in open connection with the surroundings. As can be seen from Fig. 6, the shape of the cavity 29 is matched to the shape of the pressure plate 22. However, this is not a requirement. The important feature is that the distance between the boundary of the cavity 29 and the boundary of the pressure plate 22 is as large as possible. Furthermore, it is preferable that the distance is approximately the same at each point along the periphery of the pressure plate 22. In the case of rectangular pressure plates 22, the distance over the diagonal will always be greater. In order to keep the distance as uniform as possible, it is optionally possible to choose circular pressure plates 22 or, for example, hexagonal pressure plates 22 with sides of equal length, which latter pressure plates can be arranged such that, when multiple plates are used, they abut one another closely (with the gap 23). Other multi-angular pressure plates can also be considered. For the embodiment according to Figs 1-3, corresponding shapes which deviate from the rectangular can be used for the pressure boxes 2. A hood (not shown), in which the treatment medium which has escaped from the pressure plates 22 is collected, can, for example, be arranged over the apparatus 1. The important feature in this context is that the pressure in said collection hood is lower than the pressure prevailing below the pressure plates 22.

By arranging for the surrounding skirt 30 to abut the road surface such that it is medium-tight, it is possible, for example, also to collect and to remove the medium which escapes at the outermost sides of the apparatus 1, as in the case of the removal cavity 3.

Instead of injecting medium via the cavities 29 or 4 it is also possible to apply suction via said cavities, in order, for example, to suck air from outside through the road deck.

Because the relatively large surface area of the apparatus 1 is subdivided into individual part surface areas, defined by the individual pressure plates 22, said pressure plates 22 optionally being individually (resiliently) mounted in a frame 11, the apparatus 1 is better able to adapt to unevenness in the road deck, with the result that reliable interaction between the pressure plates 22 and the road surface 26 is ensured. Moreover, the peripheral surface along which the treatment medium is able to escape beneath the pressure plates 22 into the surroundings is increased by means of the various pressure plates 22 of the apparatus 1 arranged with gaps 23 between them, which makes the injection pressure in the cavity 29 not too high in order, nevertheless, to achieve sufficiently deep penetration into the road deck 26.

The frame 11 can be, for example, of mobile construction. The frame 11 can also be fixed to a boom on a further mobile vehicle. The apparatus 1 can, of course, have only one pressure plate 22 of a relatively large surface area. In the embodiment shown, there are two square pressure plates 22 alongside one another and, behind these, two rectangular pressure plates, each extending over the full width of the square pressure plates alongside one another. In this arrangement the rearmost pressure plate 22 is the shortest. However, other combinations and shapes are also conceivable, for example with at least three pressure plates both alongside and one behind the other, or with, for example, five pressure plates alongside one another and seven pressure plates one behind the other, as in the case of the embodiment according to Figs 1-3. In the case of the elongated, rectangular pressure plates 22 in the illustrative embodiment, the cavity 29 is likewise elongated, and in each case a duct 24 opens at both ends into a cavity 29. Said cavity 29 can, of course, also be subdivided over its length.

Claims

1. Asphalt road treatment apparatus (1) having a treatment element in order, with the road deck, to form a pressure chamber so as, by this means, to force a treatment medium under pressure through the road deck, characterised in that said treatment element is composed of sub-elements (2), arranged alongside one another and/or one behind the other, to form sub-pressure chambers having removal elements (3) between them in order to allow treatment medium to escape from a sub-pressure chamber via the road deck sideways towards said removal elements.

2. Asphalt road treatment apparatus according to Claim 1, wherein the sub-elements abut a respective removal element at both their longitudinal and their transverse sides.

3. Asphalt road treatment apparatus according to Claim 1 or 2, wherein each sub-pressure chamber is separated over a distance from its respective removal element by a sealing element which is suitable for interaction in an essentially fluid-tight manner with the road surface, which distance is such that, in the region of the road deck beneath the sealing element, the treatment medium is able to penetrate through essentially the thickness of the surface of the road deck which has an open pore structure, to which end said distance is preferably at least the width of the sub-pressure chamber, measured in the direction towards the respective removal element, and more particularly at least twice said width.

4. Asphalt road treatment apparatus according to one of the preceding claims, wherein the sub-elements are essentially box-shaped and arranged with the opening facing towards the road surface, and with slits between the sub-elements.

5. Asphalt road treatment apparatus according to one of the preceding claims, wherein the sub-elements are individually resiliently elastically prestressed towards the road surface.

6. Asphalt road treatment apparatus according to one of the preceding claims, wherein a suction element (12) is coupled to each sub-element and a slit (16) is maintained between a respective sub-element and suction element.

7. Asphalt road treatment apparatus according to one of the preceding claims, wherein the sub-elements are accommodated in a common housing, into which the pressure chambers open via the removal elements.

8. Asphalt road treatment apparatus according to one of the preceding claims, wherein each sub-element is surrounded, at least on its side facing towards an adjacent sub-element, by a delimiting element (7) running some distance therefrom.

9. Asphalt road treatment apparatus according to one of the preceding claims, wherein each sub-element is surrounded, at least on its side facing towards an adjacent sub-element, by a delimiting element or baffle running some distance therefrom.

10. Treatment method for an asphalt top layer having an open pore structure, such as very open asphalt concrete, of a road deck, wherein a stream of treatment medium through the top layer is produced by injection of treatment medium into discrete sub-pressure chambers which are arranged alongside one another and/or one behind the other and which cover at least part of the road surface, which sub-pressure chambers are separated from one another by medium removal elements.

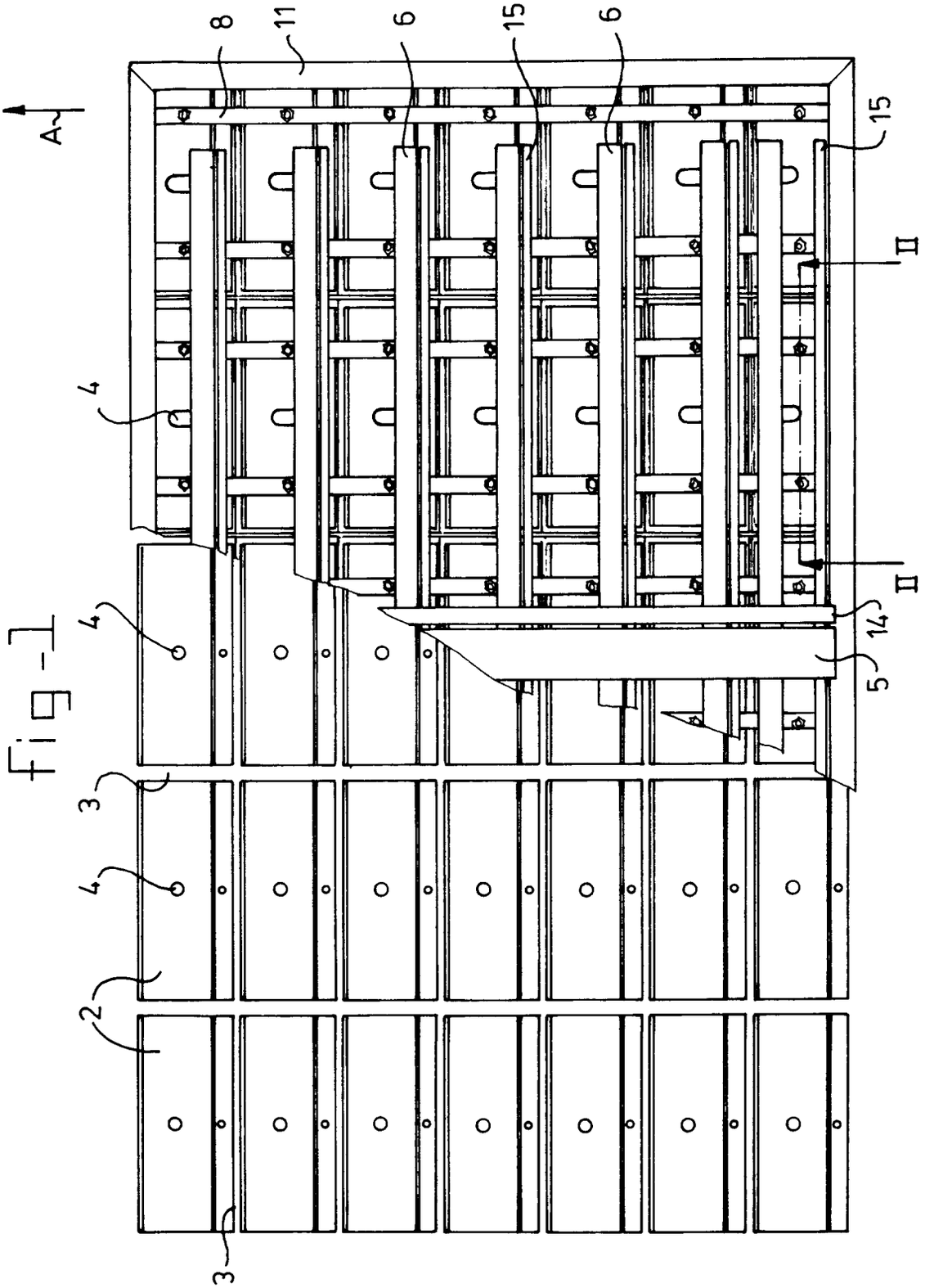


Fig-1

Fig-2

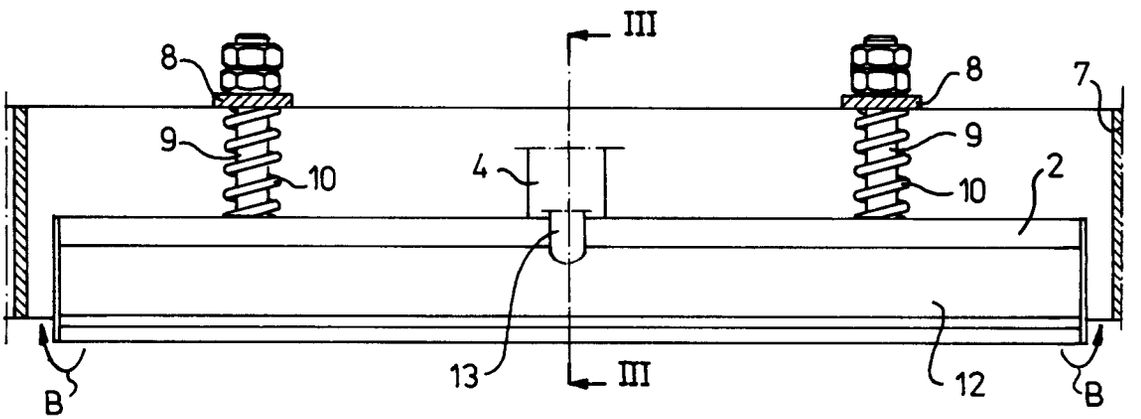
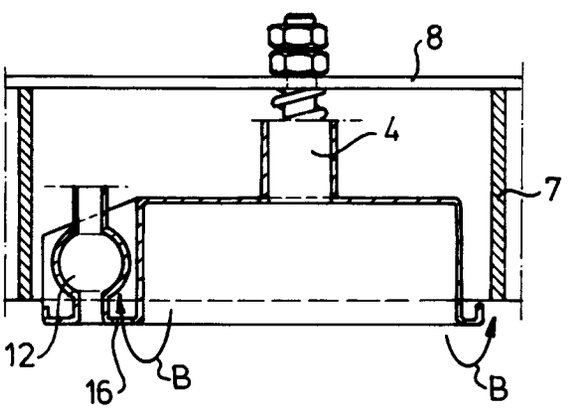


Fig-3



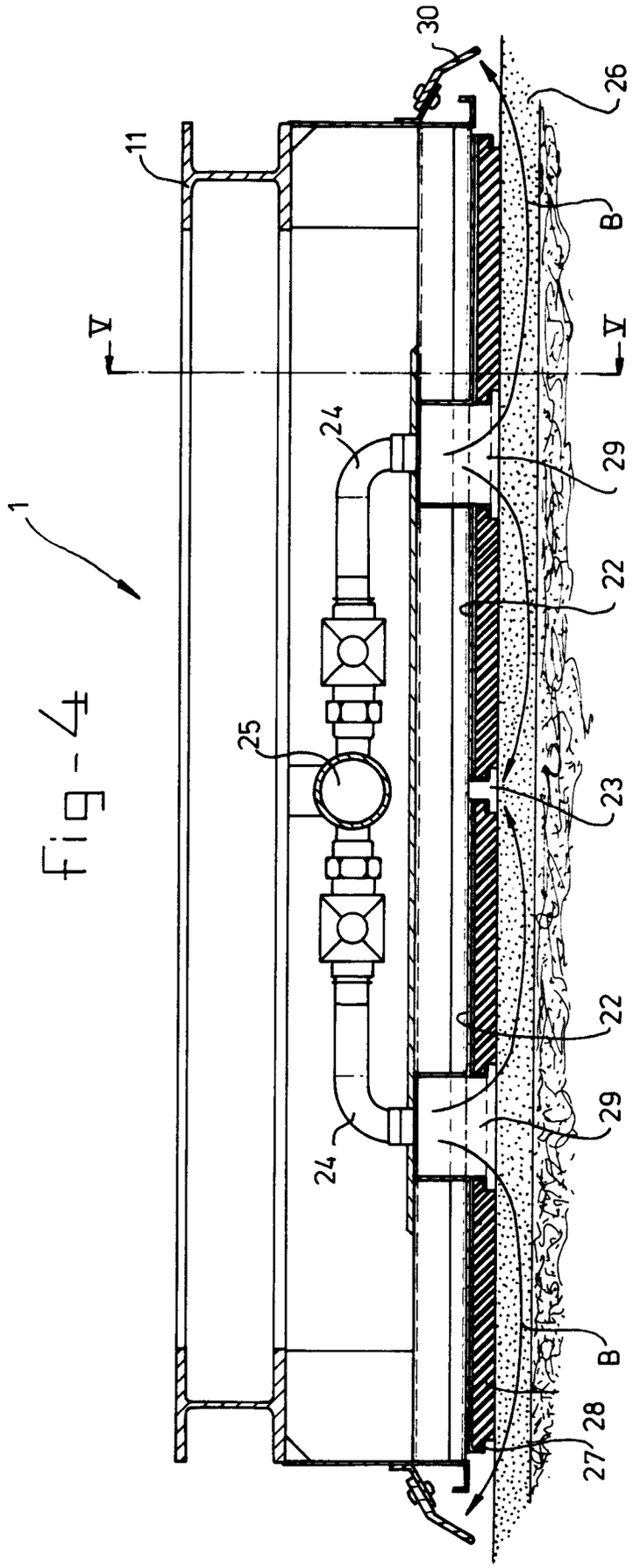


Fig-4

Fig-5

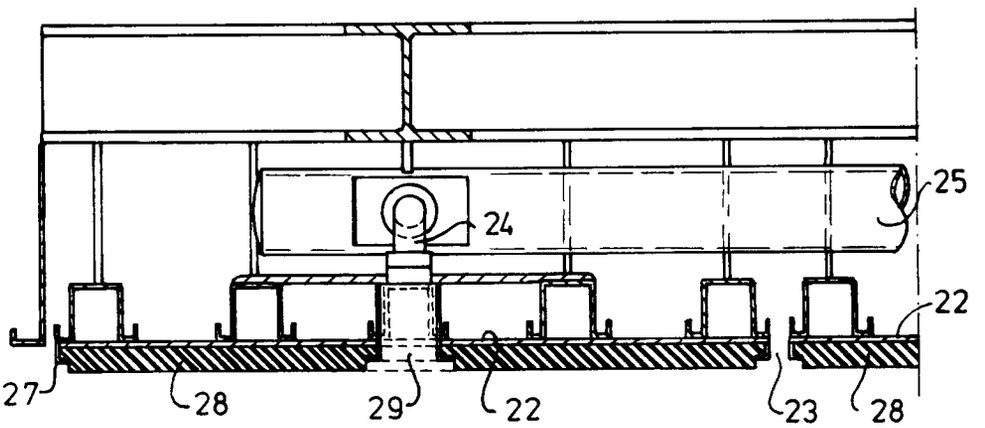
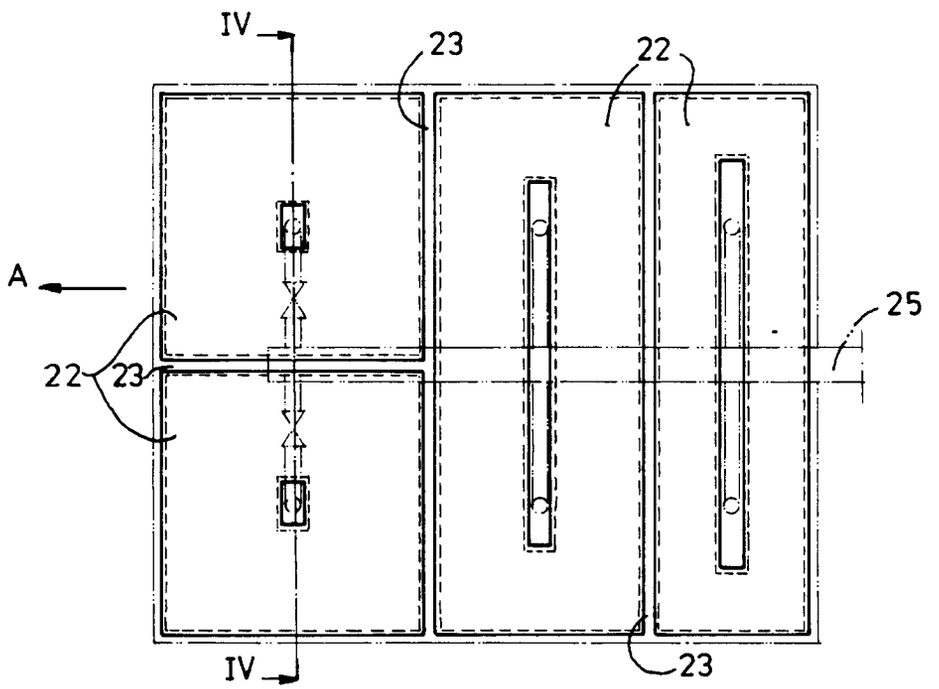


Fig-6



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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 2627

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,X	EP-A-0 556 921 (HEIJMANS WEGENBOUWMIJ) 25 August 1993	1,3,10	E01H1/08 E01H1/10
A	* claims 5-7; figures *	4	
A	EP-A-0 279 729 (COMMISSARIAT ENERGIE ATOMIQUE) 24 August 1988 * the whole document *	1	
A	GB-A-978 382 (SIMMS PARKIN)		
A	WO-A-92 10613 (HOLLANDSCHE BETON GROEP)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E01H
E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 January 1996	Dijkstra, G

CATEGORY OF CITED DOCUMENTS

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