(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 243 882 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.10.2010 Bulletin 2010/43

(51) Int Cl.:
E01F 8/00 *(2006.01)*

(21) Application number: **10161066.5**

(22) Date of filing: **26.04.2010**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA ME RS

(30) Priority: **24.04.2009 NL 2002801**

(71) Applicants:
- **ID-NL Groep - tbv BAM Infra**
  3011 AA Rotterdam (NL)
- **Koninklijke BAM Groep N.V.**
  3981 AZ Bunnik (NL)
- **ID-NL Patents & Licensing B.V.**
  3011 AA Rotterdam (NL)

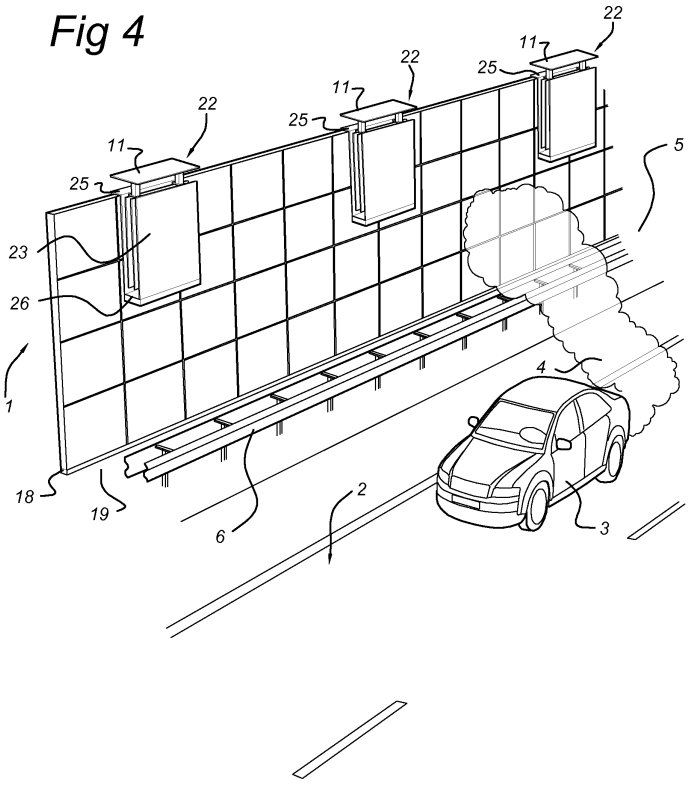
(72) Inventor: **van 't Zelfde, Willem David Anthony**
2807 SG Gouda (NL)

(74) Representative: **Ketelaars, Maarten F.J.M.**
Nederlandsch Octrooibureau
J.W. Frisolaan 13
2517 JS Den Haag (NL)

(54) Screen installation with air cleaning modules

(57) A screen installation for a traffic route comprises a vertical carrier and an electrostatic collecting device connected to the carrier to collect particles, such as fine dust, contained in the environment. The collecting device comprises at least one module with a collecting material which is electrostatic or can be induced into an electrostatic state. The module and the carrier arc detachably connected to one another by means of detachable fixing means. The module can be fitted in a simple manner at a required position along the carrier. Once the electrostatic cleaning means have become contaminated, the module can be quickly and simply exchanged.

Fig 4



EP 2 243 882 A1

Description

[0001] The invention relates to a screen installation for a traffic route, comprising a vertical carrier and a device connected to the carrier with collecting material or cleaning material for the removal of particles, such as fine dust, from ambient air. As is known, particles of this type can adversely affect public health, particularly in the case of persons located in the immediate vicinity of a road or railway.

[0002] A screen installation of this type is known from WO 2007/100254. In this known screen installation, particles such as smut and fine dust are removed from the air by means of an electrically charged surface. The electrical charge can be obtained by creating a static electrical field with the aid of a generator. Under the influence of this electrical charge, particles contained in the air are deposited on the electrically charged parts concerned. The particle-laden air which originates, for example, from a roadway or railway line can thus be cleaned.

[0003] The electrical charge is applied to metal parts provided specifically for this purpose, such as in the form of a grid, projections and the like. Electret material can also be used. A dielectric medium of this type is continuously electrified and requires no generator to create the electrical field. The electrically charged parts are normally disposed in a distributed manner on and are integrated into the vertical carrier. This means that the carrier is designed specifically for this purpose, and in this sense differs from other carriers such as those in the form of a standard noise barrier or standard central reservation protection.

[0004] This makes a facility of this type additionally expensive. Not only must costs be incurred for the collecting device, but also an adapted noise barrier or central reservation protection must be developed. The known design has the additional disadvantage that existing carriers cannot easily be fitted with cleaning means of this type. A further disadvantage is that it is difficult to take account of traffic intensity and therefore of the extent of contamination of the air, given that the collecting device normally extends over the entire length of the noise barrier and the like.

[0005] The object of the invention is therefore to produce a screen installation of the aforementioned type which has a simpler and more flexible design. This object is achieved in that the device comprises at least one module which is provided with the collecting material or the cleaning means, and that detachable fixing means are provided by means of which the module and the carrier interwork detachably with one another.

[0006] By installing one or more modules, the screen installation can be designed in a simple manner, and in a manner which is geared towards local circumstances. The module has the cleaning means or collecting means required for this purpose. Depending on the contamination expected locally, more or fewer modules of this type with electrostatic material and/or possibly filters can be disposed.

[0007] The module may comprise a housing on which the collecting material is provided, said housing interworking with the fixing means. A housing of this type can protect the cleaning material against the effects of weather, such as wind and rain. Here, it must be ensured that the contaminated air can be brought into contact with the electrostatically charged material. If the electrostatic material is freely accessible on the outside of the housing and is therefore not entirely enclosed, the contaminated air can flow along it, whereby a cleaning effect then simultaneously occurs. Instead of electrostatically charged cleaning material, filter material can be used, such as fibrous material and non-woven material.

[0008] An optimum protection of the cleaning material is achieved if this is enclosed. In this case, it is provided that the housing defines a flow path for air mixed with particles, the collecting material being located along or in said flow path. In this case, the contaminated air must flow through the housing, which can be achieved in different ways, as will be explained below.

[0009] According to a first possible embodiment, the flow path can extend between the carrier and the housing. In this case, the housing may comprise only a single panel located at a distance from the carrier, said panel having fixing means, such as hooking means, by means of which the panel is suspended from the carrier. A flow channel for the contaminated air is thus formed between the carrier and the panel of the housing which is suspended from the carrier. A very simple housing is thus obtained, which has a low cost price and can be attached in a simple manner at the required location along the carrier.

[0010] According to a second embodiment, the housing may comprise two panels located opposite one another, between which the flow path extends. These two panels located opposite one another may be attached to one another by means of transverse panels, in such a way that a laterally enclosed flow channel is obtained.

[0011] As already mentioned, the module can be disposed on different types of carrier. As an example, a carrier is cited which comprises two walls enclosing an intermediate space, of which at least one is permeable to air with particles, and the module is accommodated in this intermediate space. A carrier of this type may have a porous wall facing the traffic route, which may extend to the ground or base. It is also possible to design both walls as porous. The contaminated air is then forced to flow through the porous wall, whereafter it flows through the module in the intermediate space. The porous wall may, for example, contain a catalyst such as titanium dioxide for the conversion of NOx.

[0012] As already mentioned, the contaminated air must flow through the housing. This may occur under the influence of the vortices which are generated by the passing traffic and the wind. Additionally or alternatively, a flow of this type may be encouraged if the upper side of the housing defines a discharge opening and a cover is located at a distance above the discharge opening. A

reduction in pressure occurs between the discharge opening and the cover if wind strikes a cover along the opening. The suction which is thereby created in the flow channel produces a draught which results in the introduction of contaminated air.

[0013] As already mentioned, a filter can be used in addition to or instead of the electrostatically acting cleaning means. In particular, the underside of the housing may comprise an inlet which is covered by a filter. Other positions for the filter are also possible, for example higher in the flow channel.

[0014] The collecting material may comprise an electret, i.e. a material with a permanent charge. However, as already mentioned, the collecting material may also be statically charged under the influence of a generator.

[0015] The collecting material may be designed accordingly in different ways. It may, for example, comprise a gauze, or projections which are connected to a current source. Alternatively, the collecting material may be in the form of a sheet or strip and may comprise an electret.

[0016] The invention furthermore relates, in combination, to a traffic route and a screen installation extending along the traffic route, as described above. Here, the carrier may be a noise barrier extending along the traffic route, a central reservation protection, a wall of a building and the like.

[0017] Finally, the invention relates to a module for a screen installation as described above. The term "module" is understood to refer to a unit which is self-supporting. This self-supporting unit may offer internal or external space to a collecting device, by means of which particles can be removed from contaminated air. A module of this type may also have gripping points on which hoisting means can grip for the installation, removal or replacement of the module. The process of removal of the particles may be based on electrostatic attraction, and/or may involve the step of filtering. The carrier may be a noise barrier, a central reservation protection, a wall of a building, or a wall of a tunnel. The detachable fixing means by means of which the module is attached to the carrier may be designed in many different ways. As an alternative to the aforementioned support flanges and hooks, fixing means may comprise screw connections, connections by means of corresponding forms such as dovetail joints, mortise and tenon joints and the like. The module housing may be single-walled or double-walled. The housing may be enclosed all round, insofar as a continuous channel is also provided through which the contaminated air can flow. The housing may comprise any suitable material, such as metal, plastic, wood and combinations thereof. Electrostatic material is understood to refer to a material which is designed to generate a static electrical field. This may involve, for example, conductive material formed in such a way that electrical field lines can be concentrated, as a result of which deposition of charged particles can be expected. This may involve, for example, gauze, tapered elements and the like.

[0018] The invention will now be explained in detail with reference to an example embodiment presented in the figures.

Figure 1 shows a perspective view of a part of a traffic route with a screen installation according to a first embodiment.

Figure 2 shows a cross-section through the screen installation shown in Figure 1.

Figure 3 shows a cross-section through a second embodiment.

Figure 4 shows a perspective view of the embodiment shown in Figure 3.

[0019] In the situation shown in Figure 1, the screen installation 1 is installed along a traffic route 2 with a safety barrier 6. The traffic 3 moving along said route emits exhaust gases 4, which combine with the air 5. The screen installation 1 is composed of a wall 7 facing the traffic route and a wall 8 located behind it, facing away from the traffic route 2. An intermediate space or flow space 9 is located between these walls. On the upper edge of the walls 7, 8, the intermediate space is connected to the open air via the passages 10 which are located between the upper edge of the walls 7, 8 and the cover 11. This cover is supported at a distance above the walls 7, 8 by means of supports 12.

[0020] The wall 7 facing the traffic route 2 has a permeable structure as a result of the fact that it is composed of substances 13, for example lava stones, which are accommodated in the gabions 14. These gabions 14 comprise metal wire with a mesh width which is such that the substances 13 are retained in the gabions 14. Jagged-shaped fissures 15, via which the air can enter the intermediate space 9 over the entire surface of the permeable wall 7, are present between the substances 13. In particular, this involves the component 6 of the air 5 which is directed transversely towards the screen installation 1.

[0021] The surface of the permeable wall 7 facing the traffic route 2 is provided with titanium dioxide 16 in such a way that, under the influence of light, a catalytic conversion of NOx is achieved. Coarser particles are absorbed in the jagged-shaped fissures 21 of the permeable wall 7.

[0022] Modules 22 containing sheets, strips or wires 17 made of electrostatic or electret material are present in the intermediate space 9. Each of the modules comprises a housing 23 with two panels 24, on the upper side of which the flanges 25 are located. The underside of the housing has an inlet 26 which is covered by a filter 27, providing access to the flow channel 30. The air which has entered the intermediate space 9 can now be further cleaned if it flows up via the inlet 26 and the filter 27 along the electrostatic or electret material 17 under the influence of the funnelling effect which occurs between both walls 7, 8 and between the panels 23, and finally the air flows out through the discharge opening 31 of the housing. Particles with a dipole character and/or charged par-

ticles become attached to the electrostatic or electret material.

[0023] Although two sheets of electrostatic or electret material are shown in the figures, the number can be varied, for example a single sheet or more than two sheets. Similarly, the electrostatic or electret material does not have to be in the form of a sheet; electret material in the form of a strip or wire can be envisaged as an alternative. Similarly, the electrostatic or electret material does not have to hang in the module, but can also be attached to the outside of the module or against the rear wall 8. Air which flows into the higher parts of the porous wall 7 is first forced to flow down along the electrostatic means located on the outside of the housing, whereby a part of the contamination is already removed. The air can then flow up in the manner described above. The air which finally emerges on the upper edge from the screen installation is thus partially cleaned of NOx and fine dust.

[0024] The screen installation 1 has a base 18, by means of which the screen installation is embedded in the side-strip 19 along the traffic route 2. The permeable wall 7 extends fully to this base 18. The air is thereby forced to flow through the permeable wall 7, to achieve a maximum cleaning effect. However, a cutting may possibly be provided near the underside of the permeable wall 7.

[0025] In the example embodiment shown, the internal space 9 is divided into compartments by the partitions 20 which extend transversely at regular intervals from one another between the walls 7, 8. However, this is not necessary.

[0026] The modules can be installed in a simple manner in the intermediate space 9 and can be fitted with the flanges. This can be carried out, for example, with a hoisting crane (not shown), which can grip on the hoisting eyes 31. Once the electret and the filter have become contaminated, the complete modules can be removed and replaced with new modules. It is not necessary to dispose the modules at specific fixed intervals from one another. Depending on the expected level of contamination, more or fewer modules can be disposed per length unit along the traffic route. In this connection, it is also possible to suspend more or less electret material from the modules.

[0027] In the variant shown in Figures 3 and 4, a module 22 is provided which has only one single panel 23, and is suspended against the wall 8 by means of the flange 25, on the end of which the hook 28 is located. On the underside of the panel 23, a support 29 is provided to offer support against the wall 8. The flow channel 30 is now defined between the surface 21 of the wall 8 and the panel 23. The upper side has a discharge opening 31, at a distance above which the cover is 11 is mounted.

[0028] List of reference numbers

1. Screen installation
2. Traffic route
3. Traffic
4. Exhaust gases
5. Air
6. Safety barrier
7. Wall
8. Wall
9. Flow space between walls
10. Passage in wall
11. Cover
12. Cover support
13. Substance, such as lava stone
14. Gabion
15. Fissure
16. Titanium dioxide
17. Electret material
18. Base
19. Side-strip
20. Partition
21. Surface of wall 8
22. Module
23. Housing
24. Panel
25. Housing flange
26. Housing inlet
27. Filter
28. Hook
29. Housing support
30. Flow channel in housing
31. Gripping means

Claims

1. Screen installation for a traffic route, comprising a vertical carrier (8, 9) and a device (22) connected to the carrier with collecting material (17, 27) or cleaning means for the removal of particles, such as fine dust, from ambient air, **characterized in that** the device comprises at least one module (22) which is provided with the collecting material (17, 27) or the cleaning means, and that detachable fixing means (25) are provided, by means of which the module (22) and the carrier (7, 8) interwork detachably with one another.

2. Screen installation according to claim 1, wherein the module (22) comprises a housing (23), on which the collecting material (17, 27) is provided, said housing interworking with the fixing means (25).

3. Screen installation according to claim 2, wherein the housing (23) defines a flow path (30) for air mixed with particles, the collecting material being located along or in said flow path.

4. Screen installation according to claim 3, wherein the flow path (30) extends between the carrier (7, 8) and

the housing (23).

5. Screen installation according to claim 4, wherein the housing (23) comprises a panel (24) which is located at a distance from the carrier (7, 8), said panel (24) having fixing means, such as hooking means (25, 28), by means of which the panel (24) is suspended from the carrier (7, 8).

6. Screen installation according to claim 3, wherein the housing (23) has two panels (24) located opposite one another, between which the flow path (30) extends.

7. Screen installation according to claim 6, wherein the carrier comprises two walls (7, 8) enclosing an intermediate space (9), of which at least one is permeable to air with particles, and the module (22) is accommodated in this intermediate space (9).

8. Screen installation according to one of the claims 2 to 7, wherein the upper side of the housing (22) defines a discharge opening (31) and a cover (11) is located at a distance above the discharge opening.

9. Screen installation according to one of the preceding claims, wherein the collecting material (17) is electrostatic or can be induced into an electrostatic state.

10. Screen installation according to one of the preceding claims, wherein the collecting material (11) comprises an electret.

11. Screen installation according to one of the preceding claims, in which the collecting material is in the form of a sheet.

12. Screen installation according to one of the preceding claims, wherein the collecting material comprises a filter material (27).

13. Screen installation according to claim 12, where dependent on one of the claims 2 to 8, wherein the underside of the housing (23) comprises an inlet (26) which is covered by a filter (27).

14. Screen installation according to one of the preceding claims, wherein the module (22) is provided with gripping means (31), such as a lifting eye, to allow a lifting device to grip on the module (22).

15. In combination, a traffic route and a screen installation (1) extending along the traffic route (2) according to one of the preceding claims.

16. Combination according to claim 15, wherein the carrier is a noise barrier (7, 8) extending along the traffic route.

17. Combination according to claim 16, wherein the noise barrier (7, 8) is double-walled, and the module (22) is accommodated between both walls (7, 8) of the noise barrier.

18. Combination according to claim 17, wherein at least one wall (7, 8), such as the wall facing the traffic route (7) or both walls (7, 8), is porous.

19. Module (22) for a screen installation according to one of the claims 1 to 14.

Fig 1

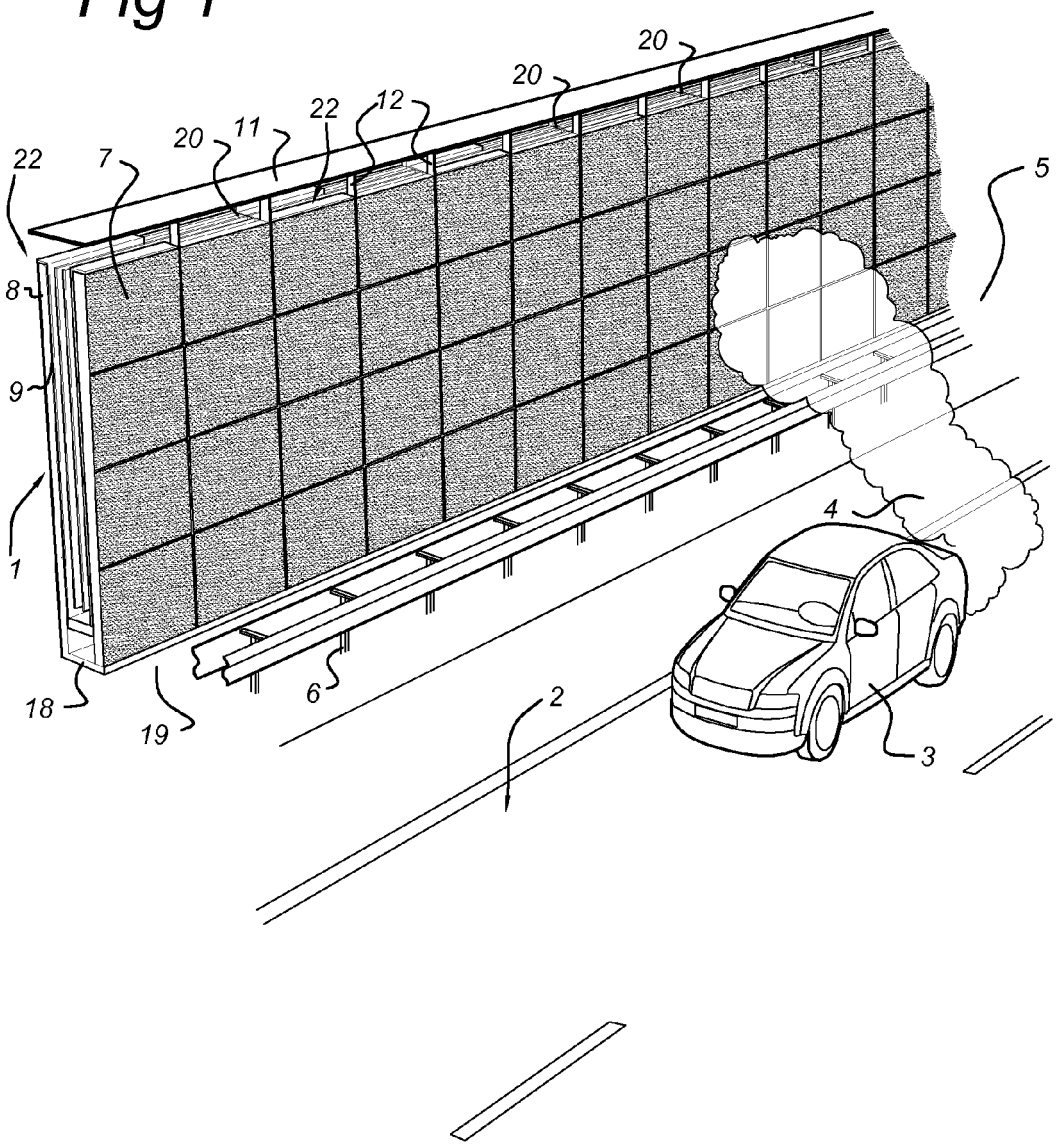


Fig 2

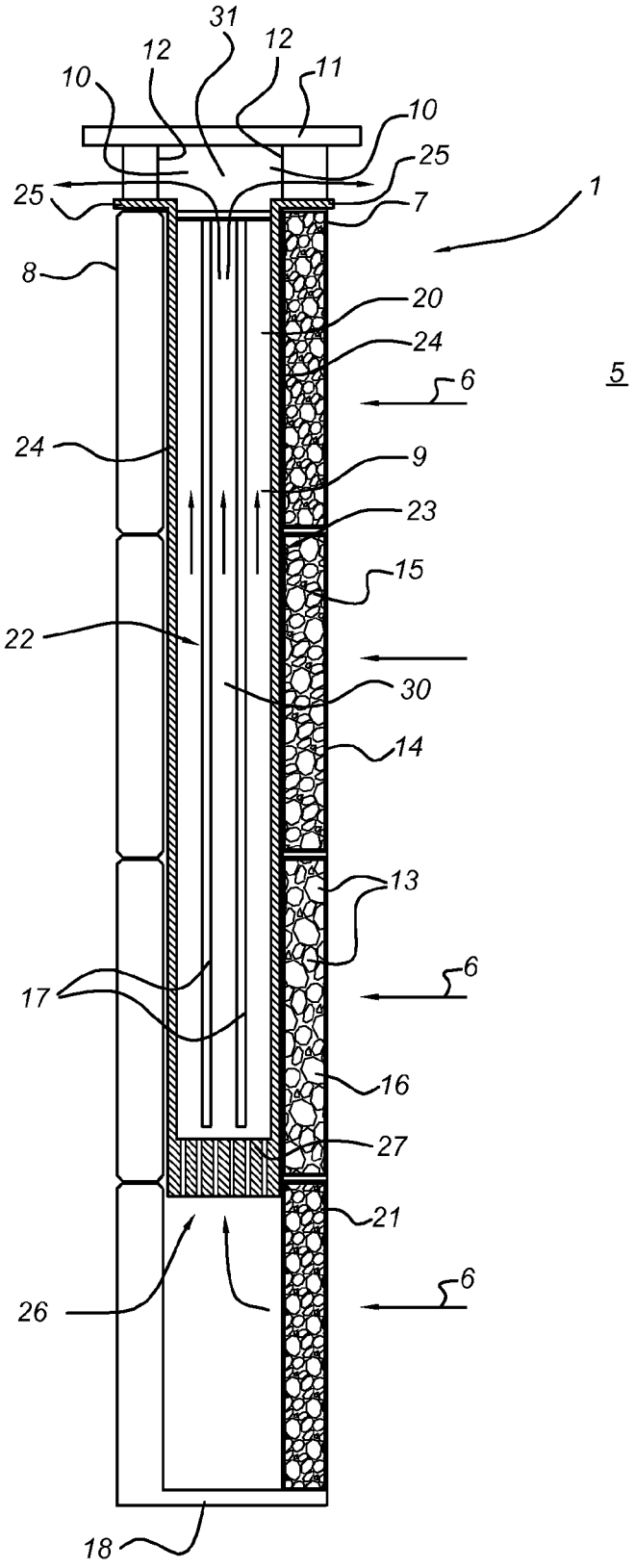

31
12
12
11
10
10
25
25
7
1
8
20
24
6
5
24
9
23
15
22
30
14
13
6
17
16
27
21
6
26
18

Fig 3

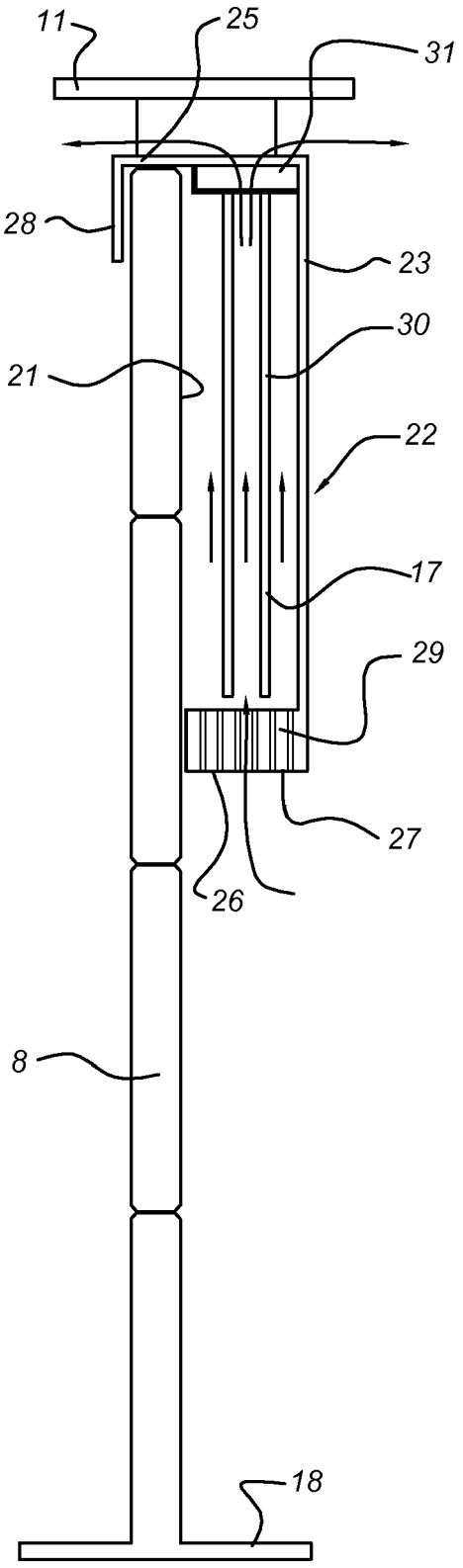
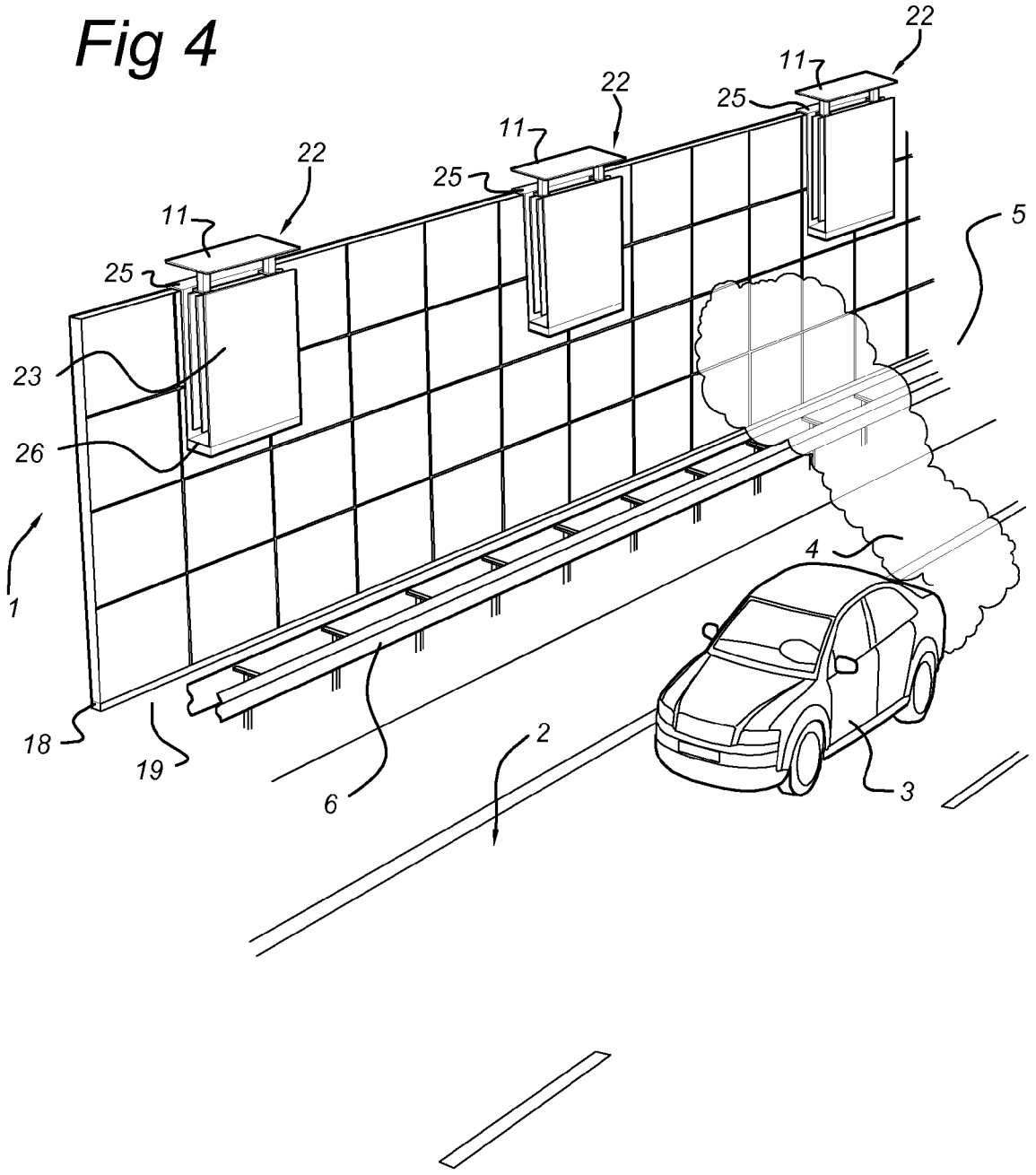


Fig 4



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 10 16 1066

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	JP 6 248616 A (ICHINOSE HIROOMI) 6 September 1994 (1994-09-06) * paragraph [0012]; figures 1,3 * * abstract *	1-19	INV. E01F8/00
X	JP 2003 170015 A (SEKISUI JUSHI KK) 17 June 2003 (2003-06-17) * paragraphs [0009], [0030]; figures 9,10 * * abstract *	1-19	
A	WO 2008/146962 A (TAEGEON CORP [KR]; BONG YONG-BUM [KR]) 4 December 2008 (2008-12-04) * figure 3 *	1-19	
A	JP 10 331116 A (TAKENAKA KOMUTEN CO; KOBE STEEL LTD; TAKENAKA DOBOKU) 15 December 1998 (1998-12-15) * figures 6,7 *	1-19	
A	EP 0 567 040 A (WITTING GERHARD [DE]) 27 October 1993 (1993-10-27) * the whole document *	1-19	TECHNICAL FIELDS SEARCHED (IPC) E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 August 2010	Gruber, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 16 1066

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-08-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 6248616 A	06-09-1994	NONE	
JP 2003170015 A	17-06-2003	JP 4036639 B2	23-01-2008
WO 2008146962 A	04-12-2008	CN 101663438 A	03-03-2010
JP 10331116 A	15-12-1998	NONE	
EP 0567040 A	27-10-1993	AT 142730 T	15-09-1996

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2007100254 A **[0002]**