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(54) Title: DRIFT SHIELD

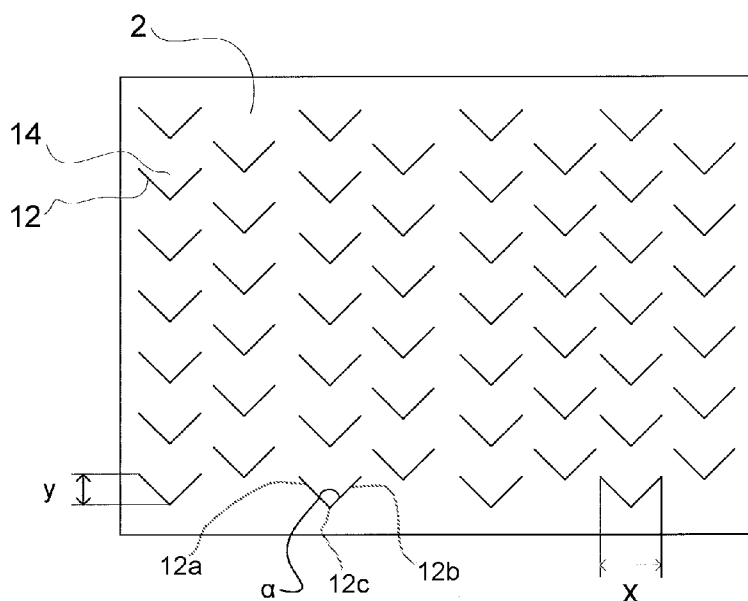


FIG. 4

(57) Abstract: The present invention relates to a drift shield which is adapted to be fastened to essentially vertical posts (6) arranged in the ground. The wind shield comprises a plastic sheeting (2) and at least two longitudinal stiffening strips (4) which are essentially parallel in relation to the ground and which are joined to the plastic sheeting (2) along the whole length of the plastic sheeting (2). Several dynamic wind dampers (12) in the form of V-shaped cuts are arranged in the plastic sheeting (2) in such a manner that they allow wind to pass through. The V-shaped cuts of the dynamic wind dampers (12) are arranged in columns, the dynamic wind dampers in the same column being located vertically straight under each other and the dynamic wind dampers in two adjacent columns being vertically offset in relation to each other.

DRIFT SHIELD

FIELD OF THE INVENTION

- 5 The present invention relates to a drift shield for protecting road sections or other objects against drifting snow, sand or other airborne material.

PRIOR ART

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Many different types of drift shields are described in the patent literature. A drift shield of classic type is disclosed in the American patent US 3 966 172, which describes a fence with sections consisting of transverse ribs or posts which can be fastened to each other and leaned against each other so that the fence will get a triangular shape when seen from the side. The main purpose of this fence is to create a portable fence which can be erected and demounted in a simple manner.

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- 20 US 4 932 634 discloses a snow fence of classic type with broad and horizontally extending plastic elements which are fastened to vertical and uniformly spaced fence posts.

A fence for protection against wind and snow consisting of a canvas provided with vent holes is described in the Japanese patent document JP 2010-216095. Each vent hole is quadratic and is at most 144 mm². The vent holes constitute at least 40% of the area of the canvas in order to prevent a turbulent flow on the side of the canvas facing away from the wind.

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- Snow fences consisting of metal plates mounted between fence posts are described in the Japanese patent documents JP 2007-315135 and JP 2006-169770. The metal plates are provided with holes which are uniformly distributed over the surface and which constitute 40-60% of the total area. A disadvantage with this solution is that the plates are heavy and opaque.

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A snow fence consisting of transparent plastic elements is described in the Japanese patent document JP 7-259020, each plastic element being fastened between two fence posts. Each
5 plastic element is provided with a number of holes which allow wind to pass through.

The drift shields described above are all based on solutions which have fixed slits, i.e. a construction with fixed and given
10 openings through which the wind is allowed to pass. When it comes to fixed slits, it is possible to use Huygens' Principle, which describes how a wave motion arises and propagates. According to Huygens' Principle, two types of nodes are obtained, one node where the waves cancel each other out and
15 another node where the waves instead amplify each other. This implies that areas with a wind that is stronger than the wind on the windward side may ensue on the leeward side of a fence or snow shield with fixed slits. In total, there will however be less wind on the leeward side owing to the fact that half of the wind
20 that is allowed to pass through will dies out. In addition, the fixed material around the fixed slits will also remove a lot of wind. It is however a problem that areas with very strong wind may ensue on the leeward side.

25 A fence having a grid consisting of fence posts and transverse bars is described in the Japanese patent document JP 2000-257025. A flexible sheet is fastened to each square in three of the four sides of the square. In this manner, an opening is formed at the side of the square where the flexible sheet is not
30 fastened. This solution will not give fixed slits, since the material is flexible. However, it takes a lot of time to mount the fence, since each square in the grid has to be mounted individually.

In view of what has been described above, there is a need for a
35 drift shield which in a better manner avoids the formation of wave motions that amplify each other on the leeward side of the

drift shield and thereby causes problem areas with occasionally very hard wind. There is also a need for a drift shield which can be mounted in a simple manner and which can be used on a large scale, for instance along long stretches of roads or the similar and not only for private use around houses or the similar.

SUMMARY OF THE INVENTION

The object of the present invention is to achieve an efficient drift shield for airborne material which can be produced, mounted and transported in a simple manner.

According to the invention, this object is achieved by means of a drift shield having the features defined in claim 1.

The drift shield according to the invention is adapted to be fastened to essentially vertical posts arranged in the ground. The drift shield comprises a plastic sheeting and at least two longitudinal stiffening strips which are essentially parallel in relation to the ground and which are joined to the plastic sheeting along the whole length of the plastic sheeting. Furthermore, dynamic wind dampers in the form of several V-shaped cuts are arranged in the plastic sheeting in such a manner that they allow air (wind) to pass through. The V-shaped cuts of the dynamic wind dampers are arranged in columns, the dynamic wind dampers in the same column being located vertically straight under each other and the dynamic wind dampers in two adjacent columns being vertically offset in relation to each other. It has appeared that such an arrangement of the dynamic wind dampers entails that the effect with amplifying wave motions according to Huygens' Principle on the leeward side of the drift shield is eliminated to a large extent. Hereby, the arising of areas with local hard wind on the leeward side of the drift shield is consequently avoided.

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In a preferred embodiment, the plastic sheeting is transparent and made of a weatherproof plastic material, such as polyethylene, polyethylene terephthalate or the like. The thickness of the plastic sheeting is suitably in the interval of 0.1 to 1 mm, preferably between 0.2 to 0.6 mm.

In another preferred embodiment, the number of dynamic wind dampers in the plastic sheeting is between 25 and 75 per m², preferably between 40 and 60 per m². The distance between the upper ends of the two legs of the V-shaped cuts of the dynamic wind dampers is suitably between 5 and 15 cm, preferably between 8 and 12 cm, and the angle between the two legs of the V-shaped cuts of the dynamic wind dampers is suitably in the interval between 45 and 135°, preferably between 75 and 105°.

In a preferred embodiment, the at least two longitudinal stiffening strips are joined to the plastic sheeting, for instance by using a joining technique such as welding, gluing etc.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will in the following be more closely described by means of embodiment examples, with reference to the appended drawings, in which:

Fig 1 shows a section of a drift shield according to an embodiment of the present invention in a front view, perpendicularly to the plastic sheeting included in the drift shield,

Fig 2 shows the drift shield in a lateral view,

Fig 3 shows how the drift shield is mounted between two posts,

Fig 4 shows in detail how the V-shaped cuts are arranged in the plastic sheeting, and

5 Fig 5 shows the drift shield from the side when there is a wind blowing and how the dynamic wind dampers co-operate with the wind.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

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The drift shield according to the embodiments described below is suitable to be used for protecting objects against drifting snow or sand. However, the invention is not limited to snow shields or sand shields. On the contrary, the invention can also be used in
15 order to protect objects against other drifting airborne materials.

A part of a drift shield according to an embodiment of the invention is shown in Figure 1. The drift shield may have a length of 20-100 metres and can be rolled up into a roll for simple transportation. The drift shield comprises a plastic sheeting 2 and
20 longitudinal stiffening strips 4. The number of longitudinal stiffening strips 4 depends on the height of the drift shield, but they are at least two in number. In a preferred embodiment, the drift shield has a height of about 1.5 m and is provided with four
25 longitudinal stiffening strips. The height of the drift shield and the number of longitudinal stiffening strips 4 is chosen depending on the prevailing conditions at the place where the drift shield is to be mounted and the desired stability of the drift shield. The longitudinal stiffening strips 4, the function of which
30 is to make the drift shield stable, are preferably made of a weatherproof and flexible plastic material, such as polyethylene, polyethylene terephthalate or ethene-vinyl acetate. The longitudinal stiffening strips 4 are preferably joined to the plastic sheeting 2 by means of a suitable joining technique, for instance
35 welding or gluing. The joining technique used is not critical and it is up to the person skilled in the art to choose and adapt the

joining technique depending on the materials used for the plastic sheeting 2 and the longitudinal stiffening strips 4.

5 Figure 2 shows an embodiment example where four longitudinal stiffening strips 4 are arranged alternately on both sides of the plastic sheeting 2. However, the longitudinal stiffening strips could as an alternative be arranged on one and the same side of the plastic sheeting 2.

10 The plastic sheeting 2 is preferably of a transparent material so as to not obstruct the visibility for road-users or the like when the drift shield for instance is used as a snow shield along a road. Suitable materials for the plastic sheeting 2 can be all types of weatherproof plastic materials, since the drift shield is
15 used in outdoor environments and is to stand i.a. chilliness, heat, moisture and UV radiation. Examples of suitable materials can be polyethene or polyethene terephthalate, but other plastic materials with weatherproof properties may also be used. The thickness of the plastic sheeting 2 is normally in the interval of
20 0.1 to 1 mm depending on the prevailing weather and wind conditions at the place where the drift shield is to be mounted. In most of the normal cases, it is sufficient with a thickness of the plastic sheeting between 0.2 to 0.4 mm.

25 The plastic sheeting 2 is shown completely smooth and without any cuts or other openings in Figures 1 and 3. The purpose of this is to make the figures clear. In reality, several dynamic wind dampers 12 in the form of V-shaped cuts are arranged on the plastic sheeting 2 in such a manner that they are capable of al-
30 lowing air to pass through the plastic sheeting 2, as illustrated in Figure 4. Each V-shaped cut has two legs 12a, 12b, which are angled towards each other and meet in a tip 12c which is directed downwards. Each wind damper 12 will open more and more when the wind increases and the opening available for the
35 wind to pass through will consequently become larger and larger when the wind increases. This consequently implies that the

wind dampers 12 are dynamic and have a wind permeability which varies in dependence on the wind-force. The V-shaped cuts forming the dynamic wind dampers 12 may for instance be achieved by punching or by means of laser. An example of how the dynamic wind dampers 12 are arranged in the plastic sheeting 2 appears from Figure 4. The dynamic wind dampers 12 are arranged in columns, all dynamic wind dampers 12 in a column being located vertically straight under each other. The dynamic wind dampers 12 of two adjacent columns are vertically offset in relation to each other, i.e. the dynamic wind dampers 12 form zigzag-like rows. In pilot tests, it has appeared that this manner of arranging the dynamic wind dampers 12 results in that Huygens' Principle, as mentioned above, is eliminated to a large extent, which will be described in closer detail below. The number of dynamic wind dampers 12 is in the interval of 25 to 75 per m², preferably between 40 and 60 per m². If hard winds are occurring at the place where the drift shield is to be mounted, it can be of an advantage if the number of dynamic wind dampers 12 are more in number than if the winds are weak. Also the distance between the mounting posts 6 can be adapted in order to endure extreme conditions. The size of the dynamic wind dampers 12 may vary, but they preferably have a width x, i.e. the distance between the upper ends of the two legs 12a, 12b of the V-shaped cuts, which is in the interval between 5 to 15 cm, preferably between 8 and 12 cm. The height y of the V-shaped cuts is preferably in the interval of 2 to 8 cm and the angle α between the two legs 12a, 12b of the V-shaped cuts is suitably in the interval between 45 and 135°, preferably between 75 and 105°.

The principle how the drift shield functions in order to essentially eliminate Huygens' Principle will be described with reference to Figure 5. By making V-shaped cuts, no material is removed from the plastic sheeting 2 and no fixed slits are consequently obtained as for many of the previously known drift shields. Instead of a fixed slit, the V-shaped cut will form a kind of dynamic wind damper. The dynamic wind damper 12 has a flap

14 with loose edges and an obtuse angle. Owing to the fact that the tip of the flaps 14 is directed downwards towards the ground, the wind passing through the plastic sheeting 2 is also guided down towards the ground. The ground constitutes a permanent physical obstacle for the wind and will cause the wind to die out. Each flap 14 above will assist in guiding down the wind that passes through a flap 14 located beneath. The drift shield will hereby in an efficient manner reduce and/or put out the wind that is allowed to pass through the plastic sheeting 2. Airborne material passing through the dynamic wind dampers 12 together with the wind is also guided down towards the ground and strongly slowed down. The airborne material will fall to the ground when the velocity of the air current has become sufficiently low.

Figure 5 shows how the dynamic wind dampers function in hard wind. The direction of the wind towards the drift shield is shown with an arrow in the figure. For the sake of clarity, only four flaps 14 are shown in the figure, but it should be realized that the flaps 14 are located much closer in preferred embodiments. It clearly appears from the figure how each flap 14 is pressed out from its neutral position flush with the plastic sheeting 2. The thickness and stiffness of the plastic sheeting 2 is so chosen that a substantial wind is required in order to press out a flap 14 and create an opening and that the flap 14 strives to return to its neutral position flush with the plastic sheeting when the wind decreases. It is the opening itself that constitutes the dynamic wind damper. The maximum opening is at the tip of the flap 14 and from there the opening varies along the entire flap edge down to zero highest up in the V-shape. The maximum opening will never be constant. On the contrary, it will vary with the force of the wind. Furthermore, different flaps 14 will at the same moment also have differently large openings due to the fact that the wind also varies over the surface of the drift shield. In comparison with fixed slits, each moment of time has to be locked in order to be able to take Huygens' Principle into ac-

count. In one situation there may sometimes be amplifying nodes at a certain physical place in relation to the flap 14, whereas there are quenching nodes at the same physical place at the next moment. Furthermore, this reasoning has to be performed along the entire flap edge with zero in opening highest up in the V-shape to the tip of the flap. Furthermore, the dynamic wind damper 12 has two flap edges on each flap 14, which implies that the two flap edges will get the same opening pattern only when the wind comes exactly 90°, i.e. perpendicularly to the drift shield and the plastic sheeting 2. In most cases, the flap 14 will be somewhat twisted, which implies that two different nodal systems will ensue at the two flap edges. This implies that a quenching node is often formed right in front of an amplifying node, which results in a considerable wind reduction. Practical tests have shown that a drift shield with dynamic wind dampers as described above often is very efficient in quenching amplifying nodes.

The drift shield has been described in closer detail above by means of a number of embodiments. To get a further understanding of the invention and notice further advantages, it will now be described how a drift shield can be mounted for instance along a road. Figure 3 shows a section of a mounted drift shield. The drift shield is mounted on posts 6, which are rigidly and stably arranged in the ground. The posts 6 may for instance be of pressure-treated wood, metal, plastic etc. The drift shield is normally delivered on a roll so as to be easy to mount. The drift shield is fastened to the posts 6 by means of mounting lathes 8, which are configured to extend along the posts 6. The drift shield is placed between the post 6 and the mounting lathes 8 and fastened by means of screws 10. The advantage of using mounting lathes 8 is that the longitudinal stiffening strips 4 then will be subjected to less pressure. If a screw 10 for instance would be fastened directly onto the longitudinal stiffening strip 4, there would be a large risk of the screw head breaking the longitudinal stiffening strip 4 by pressing. By using mounting

lathes 8, the pressure is instead distributed over a larger surface. The drift shield according to the invention can be mounted in a very simple manner. No complicated mounting work is required. On the contrary, the drift shield only has to be rolled out
5 and fastened to the posts 6 by screws.

The invention is of course not in any way limited to the embodiments described above. On the contrary, several possibilities to modifications thereof should be apparent to a person skilled in
10 the art without thereby deviating from the basic idea of the invention such as defined in the appended claims.

Claims

1. A drift shield adapted to be fastened to essentially vertical posts (6) arranged in the ground and comprising a plastic
5 sheeting (2), wherein at least two longitudinal stiffening strips (4), which are essentially parallel in relation to the ground, are joined to the plastic sheeting (2) along the whole length of the plastic sheeting (2) and dynamic wind dampers (12) in the form of several V-shaped cuts are arranged in the
10 plastic sheeting (2) in a such a manner that they allow wind to pass through, **characterized** in that the V-shaped cuts of the dynamic wind dampers (12) are arranged in columns, the dynamic wind dampers in the same column being located vertically straight under each other and the dynamic wind
15 dampers in two adjacent columns being vertically offset in relation to each other.
2. A drift shield according to claim 1, **characterized** in that the plastic sheeting (2) is made of a weatherproof plastic mate-
20 rial, such as polyethene, polyethene terephthalate or the like.
3. A drift shield according to claim 1 or 2, **characterized** in that the number of dynamic wind dampers (12) in the plastic sheeting (2) is between 25 and 75 per m², preferably be-
25 tween 40 and 60 per m².
4. A drift shield according to any of the preceding claims, **char-
acterized** in that the longitudinal stiffening strips (4) are
30 joined to the plastic sheeting (2).
5. A drift shield according to any of the preceding claims, **char-
acterized** in that the drift shield can be rolled up.
6. A drift shield according to any of the preceding claims, **char-
acterized** in that the drift shield comprises mounting lathes
35 (8), which are configured to extend along the posts (6) with

the plastic sheeting (2) arranged between the mounting lathes (8) and the posts (6).

- 5 7. A drift shield according to any of the preceding claims, **characterized** in that the width (x) of the V-shaped cuts of the dynamic wind dampers (12) is between 5 and 15 cm, preferably between 8 and 12 cm.
- 10 8. A drift shield according to any of the preceding claims, **characterized** in that the angle (α) between the two legs (12a, 12b) of the V-shaped cuts of the dynamic wind dampers (12) is in the interval between 45 and 135°, preferably between 75 and 105°.
- 15 9. A drift shield according to any of the preceding claims, **characterized** in that the plastic sheeting (2) is transparent.
- 20 10. A drift shield according to any of the preceding claims, **characterized** in that the plastic sheeting (2) has a thickness in the interval of 0.1 to 1 mm, preferably between 0.2 to 0.6 mm.

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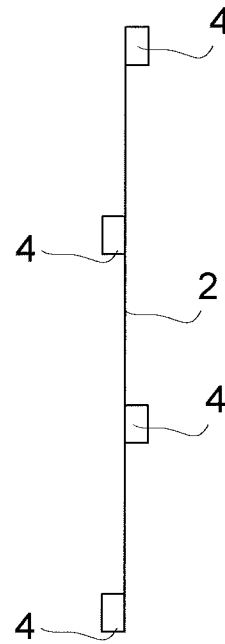
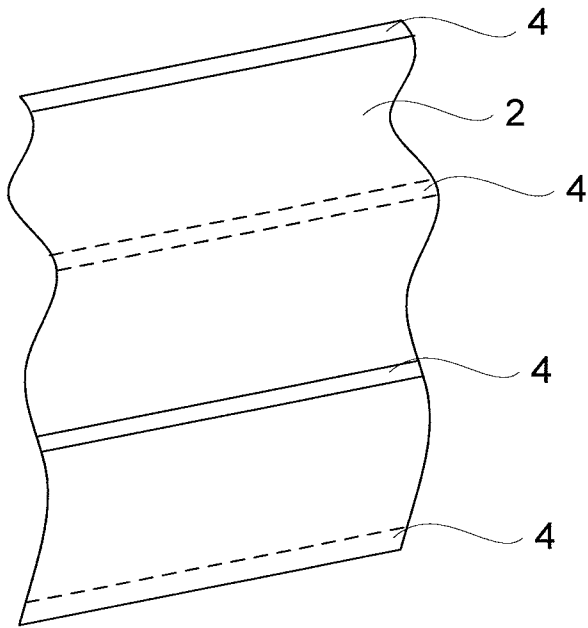


FIG. 1

FIG. 2

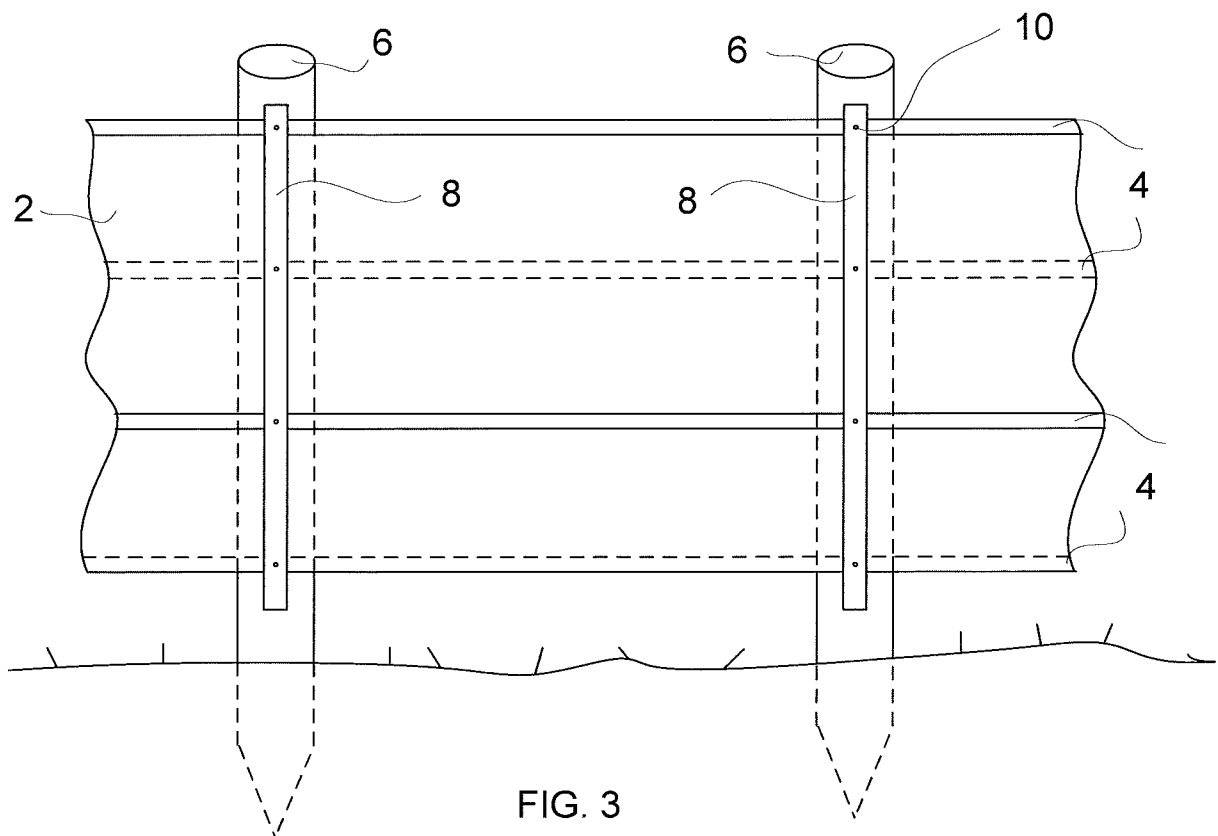


FIG. 3

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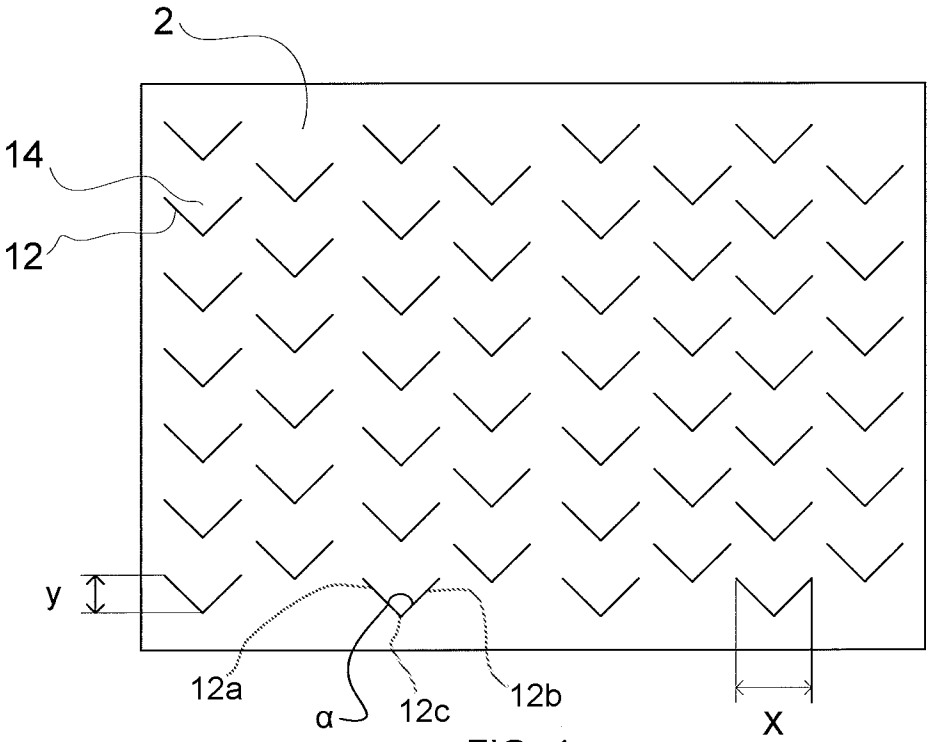


FIG. 4

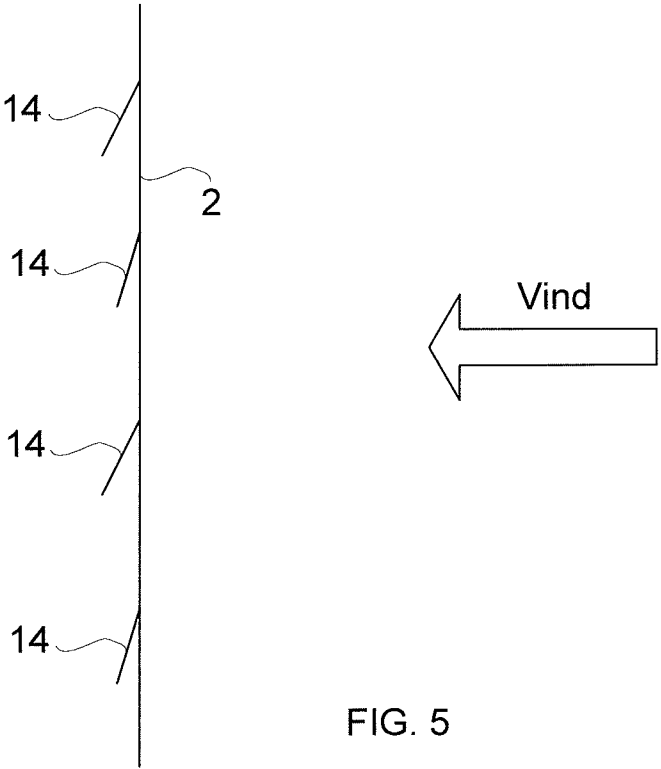


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/050676

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3913889 A (NUGENT WILLIAM A ET AL), 21 October 1975 (1975-10-21); abstract; column 3, line 42 - line 48; figure 11 --	1-10
A	DE 10000672 A1 (JONEN MANFRED ET AL), 12 July 2001 (2001-07-12); abstract; figures --	1-10
A	DE 2817015 A1 (ULLMANN KARL), 19 October 1978 (1978-10-19); whole document --	1-10
A	SU 1280079 A1 (DOROZH P I NII), 30 December 1986 (1986-12-30); whole document --	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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25-09-2013

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5795099 A (PARKER JAMES W), 18 August 1998 (1998-08-18); abstract; figures -- -----	1-10

Continuation of: second sheet

International Patent Classification (IPC)

E01F 7/02 (2006.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2013/050676

US	3913889 A	21/10/1975	NONE
DE	10000672 A1	12/07/2001	NONE
DE	2817015 A1	19/10/1978	NONE
SU	1280079 A1	30/12/1986	NONE
US	5795099 A	18/08/1998	NONE