(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 August 2010 (05.08.2010)

PCT

(10) International Publication Number
WO 2010/087697 A1

(51) International Patent Classification:
F21V 33/00 (2006.01) *F21S 8/08* (2006.01)
E04H 17/20 (2006.01)

(21) International Application Number:
PCT/NL2010/000013

(22) International Filing Date:
27 January 2010 (27.01.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1036465 27 January 2009 (27.01.2009) NL

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2010/087697 A1

(54) Title: FENCE POST AND FENCE FOR TERRAIN LIGHTING

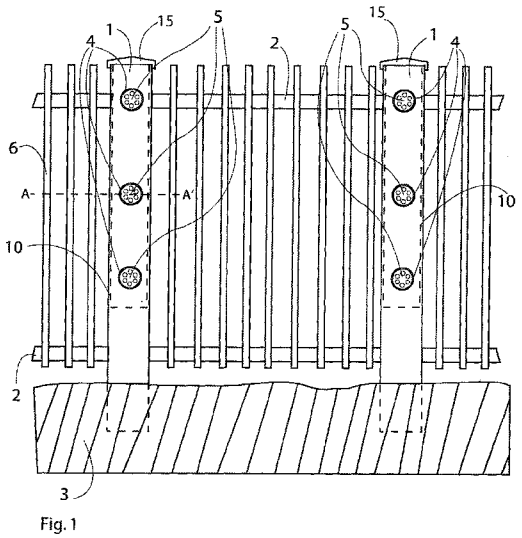

Fig. 1

(57) Abstract: A fence post placeable on or in the ground for supporting a fence, the fence comprising at least one horizontal member connected to the fence post, between the fence post and at least one other fence post. The fence post has a cavity within the fence post, the cavity holding at least one LED lighting module whereby the fence post is provided with at least one irradiation opening in a wall of the fence post, corresponding with a radiating surface of the LED lighting module whereby the LED lighting module is arranged within the cavity of the fence post.

FENCE POST AND FENCE FOR TERRAIN LIGHTING.

DESCRIPTION

FIELD OF THE INVENTION

The invention relates to terrain lighting in general and to fences incorporating lighting.

BACKGROUND

For lighting of terrains and large open spaces such as parking lots, switch-yards, but also gardens or public squares, generally overhead lighting systems are used comprising lamp structures or lamp posts, placed in strategic positions within the terrain carrying a lighting device arranged to illuminate the terrain directionally or omnidirectionally. Although lighting schemes can be infinitely varied using the overhead lamp structures to provide adequate lighting of the underlying terrain, such structures may be costly and may limit the use of the terrain where the lighting is required. Furthermore lamp structures may be used for local lighting such as a garden where the range of the terrain to be lighted is limited.

From United States patent US 7,461,942 B1 it is known that a lighting device can be provided attached to a fence post. The light source of this lighting device is arranged on the outside of the fence post and has a shell attached to the outside of the fence post covering the lighting system, as a consequence of which light emitted from the light source is directed downwards, thereby limiting the use of the lighting device to an area in close vicinity to the fence post. Furthermore such a lighting system may be vulnerable to vandalism or burglary.

SUMMARY

It is therefore an object of the invention to provide robust terrain lighting while preserving space within the terrain, providing sufficient light on the terrain.

The object is achieved in a fence post placeable on or in the ground for supporting a fence, the fence comprising at least one horizontal member connected to the fence post, such that it is placed between the fence post and at least one other fence post. The fence post has a cavity within the fence post, the cavity holding at least one Light Emitting Diode (LED) lighting module whereby the fence post is provided with at least one irradiation opening in a wall of the fence post, corresponding with an irradiating surface of the LED lighting module whereby

the LED lighting module is arranged within the cavity of the fence post.

With the arrival of LED lighting modules which require only very little space, low heat loss, durability and longevity it is now possible to create terrain lighting systems using such lighting modules in limited spaces.

By placing the LED lighting module within the cavity of the fence post, located such that the LED lighting module corresponds to a irradiation opening in the wall of the fence post it is possible to create a surprisingly robust and cheap to manufacture terrain lighting system for lighting terrain surrounded by the fence or for lighting the terrain by an outside of the fence, or a combination of both.

The placement of the LED lighting module inside the fence post provides protection against vandalism, whilst minimal constructional modifications to the fence post are necessary. Using a plurality of fence posts according to the invention, and/or a multiple LED lighting modules per fence post, lighting of the terrain illuminated by the fence posts is better safeguarded by the number of light sources. Even if a perpetrator would succeed in destroying a single fence post including its light source, it would take too much effort to destroy a whole fence provided with fence posts according to the invention. Since it is commonly known that terrain lighting prevents vandalism and burglary, the fence post according to the invention provides a good safeguard against vandalism and or burglary.

An advantageous application of the fence post according to the invention is the use of the fence post as part of a gate, which gate may be placed in a drive way. The LED lighting module may be integrated in a gate opening and closing control system whereby the LED lighting module is illuminated while the gate is being operated. The light intensity of the LED lighting module may be controlled or dimmed according to a state of the control system.

Furthermore, since LED lighting module are available in various colours or can be controlled such that the colour and light intensity can be varied, the terrain lighting effect of the fence post according to the invention can be extended to mood or atmosphere creation within the terrain to be lighted.

Furthermore the longevity or life span in the order of tens of thousands hours and high durability enable application of LED lighting modules in fence posts since the modules need scarcely be replaced, which makes application in remote areas such as switch-yards possible.

In an embodiment of the invention the LED lighting module is

attached to an elongated carrier which is insertable in the cavity of the fence post, whereby the carrier has a length less than or equal to the length of the cavity. This allows easy assembly of the LED lighting modules in the fence post. Furthermore the carrier provides support for the LED lighting module in an inward direction of the fence post cavity, thereby enhancing the robustness of the lighting capability of the fence post against vandalism or burglary. In this embodiment, as opposed to a construction where a LED lighting module would be placed within the irradiation opening, it is more difficult to damage or remove a LED lighting module.

According to a preferred embodiment of the invention, the carrier is provided with two flexibel outwardly curved sidewalls for engaging the wall of the fence post and clenching the carrier into the cavity of the fence post. This is advantageous because this was the carrier may be inserted and hold itself in place allowing easy manufacture or installation of the fence post.

In a further embodiment, the carrier has a flange on one end suitable for cooperating with the wall on the upper side of the fence post such that the carrier is insertable into the cavity of the fence post up to the flange. This way is is achieved that no support or rest has to be provided into the fence post cavity to rest the carrier. Now the carrier is in place after complete insertion enabling correct placement of a LED lighting module with respect to a corresponding irradiation opening in the wall of the fence post. Thus enabling cheap and quick installation of the carrier.

In another embodiment of the invention the cavity of the fence post extends to the ground. The LED lighting module can be electrically supplied via a electrical supply cable reaching from the ground into the cavity, being connected to the LED lighting module. This way it is achieved that the power supply cable of the LED lighting modules can only be reached from within the ground, thereby minimizing the risk of damage to the supply from external sources such as vandalism, burglary, etc..

In an alternative embodiment the LED lighting modules can be supplied by an electrical supply cable which enters the cavity by means of a feed-through in the wall of the fence post, whereby the feed-through is located near or at the facility of attachments means for the horizontal member. The feed-through may be part of the attachments means for the horizontal member such that the electrical supply cable is arranged within the horizontal member. This may be advantageous

in cases where it is impossible or very costly to supply the LED lighting modules within the fence post via de ground. This may for example be the case where the ground is comprised of rock.

The object is also achieved in a fence having at least one fence post as described above.

The object is also achieved in the use of a LED lighting module in a fence post as described above.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further explained according the accompanying drawings.

Figure 1 shows a section of a fence having two fence posts according to an embodiment of the invention.

Figure 2 shows a LED lighting module according to the state of the art.

Figure 3 shows a cross section of a fence post shown in figure 1 according to an embodiment of the invention.

Figure 3A shows a cross section of the fence post shown in figure 1 according to a preferred embodiment of the invention.

Figure 4 shows a section in perspective view of a carrier having LED lighting modules according to the embodiment of the invention of figure 3.

Figure 4A shows a section in perspective view of a carrier having LED lighting modules according to the preferred embodiment of the invention of figure 3A.

Figure 5 shows a further embodiment of the carrier according to the invention.

DETAILED DESCRIPTION

Embodiments of the invention will now be described in more detail using the accompanying drawings.

Figure 1 shows a section of a fence having two fence posts 1 according to an embodiment of the invention, the fence further comprising at least one horizontal member 2 which may be connected to the fence post 1 using attachment means (not shown) such as bolts and nuts, clamps or any other means known in the art such as welding suitable for attaching the horizontal member 2 to the fence post 1. The horizontal members 2 may be constructed by a beam of any

suitable material in the art, wires or a wire mesh tensioned between fence posts. It is clear that the horizontal members 2 may be attached to the fence post 1 according to the invention on one side and on the opposite side be attached to another fence post 1 according to the invention or to a fence post according to the state of the art. Vertical cross bars 6 may for example be attached to the horizontal members 2. The horizontal member 2 may also be constructed by a wire mesh, bars or wires, or wooden planks may be used as vertical cross bars 6.

The fence post 1 is placable in the ground 3 as is known in the art. Alternatively the fence post may have a ground plate to attach the fence post 1 to a solid surface such as concrete. The fence post has a cavity 7 extending in vertical direction within the fence post 1. The fence post 1 could for example be made of steel, aluminium, wood or plastic having a suitable cross section such as square, oval or round. To create the cavity 7 the fence post 1 may be made of a hollow member such as a pipe. The cavity 7 may also be a bore through the fence post 1 extending in vertical direction from the lower end of the fence post 1 upwards into the fence post 1. The cavity 7 may also be closed on top by means of a cap 15 on top of the fence post 1.

Through the wall 14 of the fence post 1 irradiation openings 4 may be provided in the fence post wall 14 extending from the interior cavity 7 of the fence post 1 to the exterior of the fence post 1. Such an irradiation opening 4 may have a round shape or a shape corresponding to the outer edge of the irradiation surface of the LED module. There may be multiple irradiation openings 4 in the fence post 1 facing different directions, such as facing to the inside of the terrain inside the fence, or outside.

Within the fence post 1at least one LED lighting module 5 is placed in the cavity 7 of the irradiation opening 4 such that light from the LED lighting module 5 can radiate to the outside of the fence post 1 via irradiation opening 4 in the wall 14 of the fence post 1, thereby illuminating the terrain facing the irradiation opening 4.

Figure 2 shows an example of a LED lighting module 5 according to the state of the art. The LED lighting module 5 has a body containing a plurality of LED's 9, for example six LED's. The LED lighting module 5 has a surface 12 for mounting the LED lighting module 5 onto a supporting surface and an at least partially transparent irradiation surface 8 from which the LED lighting module 5 can

irradiate it's light. For terrain lighting the LED lighting module 5 may have a light intensity of 40 lumen, which is currently commercially available, such that the light production is for example sufficient for lighting the terrain extending more than several metres away from the fence depending on specific application and circumstances. Variations to the construction of the LED lighting module 5 may be made, provided a disc like shaped construction is maintained. The disc shape may include a round, a rectangular or multi-angular cross section.

Due to the disc like or modular shape and its plurality of LEDs 9 of high light intensity the LED lighting module 5 is particularly suitable for placement in a hollow member such as a fence post, such that it is suitable for terrain lighting. The plurality of LED's 9 spread the light produced in the LED lighting module 5 allowing a terrain user to directly look into the LED lighting module 5 without being blinded, whereas a single high power LED for terrain lighting could actually blind a viewer.

Figure 3 shows a cross section of the fence post 1 from figure 1, along the dashed line A-A'. The fence post 1 has an outer wall 14, thereby creating a cavity 7, in which a carrier 10 is placed. On the carrier 10 the LED lighting modules 5 are placed having their irradiation surface 8 facing corresponding irradiation holes 4 in the fence post wall 14, such that a LED lighting module 5 can irradiate it's light 11 through the associated irradiation opening 4 in the wall 14 to the outside of the fence post 1.

The carrier 10 may be bar made of wood, synthetic material of metal. The carrier 10 has an elongated shape with a cross section fitting the cross section of the cavity 7 of the fence post. It may fill the cross section of the cavity leaving space only for the at least one LED lighting module 5, such that the carrier and the at least one LED lighting module 5 form a lighting assembly that can be inserted into the cavity 7 in a single action. The carrier 10 may also be hollow 17, such as a pipe member.

The carrier 10 with LED lighting modules 5 can be inserted via an opening in the top end opposite of the end mounted in or on the ground 3 of the fence post 1 into the cavity 7, after which the opening can be closed by the cap. The carrier 10 with LED lighting modules 5 can also be inserted into the cavity 7 via an opening in the bottom end, the end mounted in or on the ground 3, of the fence post.

The cavity 7 may have a support for the carrier 10 to hold the carrier

10 in place and to allow the LED lighting modules 5 to stay in their position corresponding to the irradiation openings 4. Alternatively, the carrier 10 may for that purpose be fixed to the fence post wall 14 by screwing or an adhesive. Furthermore a LED lighting module 5 may be clamped onto the surface of the carrier 10. Yet furthermore, the carrier 10 may be provided with LED lighting modules 5 on opposite sides of the carrier 10, allowing to provide terrain lighting on both sides of the fence of which the fence post 1 is part of.

Figure 3A shows carrier according to a preferred embodiment of the invention. In this embodiment carrier 10 is hollow 18 and has two curved flexible side walls 17 extending outwards such that when the carrier 10 is inserted into the cavity 7 of fence post 1, the curved flexible side walls 17 engage the inner side of wall 14 of the cavity 7. By proper dimensioning of the carrier 10 and the side walls 17 as will be understood by the skilled person, the carrier 10 is stuck fitted or clenched within the fence post wall 14. The carrier 10 is preferably made of a suitable synthetic material such as poly vinyl chloride (PVC), poly ethyleen (PE), poly phenyl ether, (PPE), etcetera as will also be understood by the person skilled in the art.

Figure 4 shows a section of the carrier 10 having two LED lighting modules 5 mounted thereon. The LED lighting modules 5 may be attached to the carrier 10 using an adhesive or may be clamped onto the carrier 10, but any suitable attachment means known in the art may be used for this purpose. The LED lighting modules 5 may be interconnected using a cable 13 having electrical wires for the electrical power supply of the LED lighting modules 5. In practice LED lighting modules 5 may be commercially obtained with integrated cable 13 connections. The LED lighting modules 5 may thus be connected to a power supply cable which may be provided from the ground 3 where a fence post 1 according to the invention is placed. Burying the supply cable 13 deep enough will ensure that lighting is safeguarded against vandalism, burglary, accidents and the like.

Alternatively the supply cable 13 may be made available to the fence post 1 using the horizontal members 2, where the supply cable 13 may be embedded within the horizontal members 2. A cable feed-through in the wall 14 of the fence post 1 may enable the supply cable 13 to enter the cavity 7 of the fence post 1 to be connected to the LED lighting modules 5. This will allow for electrical supply to the fence post 1 according to the invention where it is not possible to have

a supply cable 13 from the ground 3, for example when the fence post 1 is to be placed on a rock or on a concrete foundation and where it is more practical to supply via the horizontal member 2.

Electrical supply may be provided directly via a power supply suitable for the LED lighting modules. This may be performed via a transformer connected to the mains on the primary side and to the LED lighting modules on the secondary side, the transformer placeable within the fence post cavity 7 or in the ground 3. Furthermore the fence post may be provided with solar panels for generating electrical power from solar rays. The generated electrical energy may be stored in a battery. A control system attached to the solar panels, the battery and the LED lighting modules may be arranged to allow the battery to be charged and when charged to supply the LED lighting modules when there is darkness.

Figure 4A shows a section of a carrier 10 according to the preferred embodiment of the invention, showing the curved flexible side walls 17

Figure 5 shows a cross section of the fence post 1 according to a further embodiment of the carrier of figure 4A. In this embodiment, the carrier 10 is insertable from the top of the fence post 1. The carrier 10 has a flange 16 allowing the carrier 10 to be inserted into the cavity of the fence post 1 such that the flange rests on top of the wall 14. This allows easy insertion of the carrier into the fence post 1 bringing the LED lighting module 5 in place before the irradiation opening 4 without the need for a projection into the cavity 7 of the fence post for supporting the carrier 10. The cap 15 may be arranged such that it fits over the flange 16 and over the top end of the wall 14 of the fence post and into the hollow part 18 of the carrier 10. The cap 15 may be fastened, clamped, welded or screwed onto the wall 14 by any suitable means. It will be clear that the flange 16 may also be a rim or an edge performing the function of resting the carrier 10 on the top of wall 14 of the fence post 1. Likewise the flange may also be formed by means of a plate attached to the carrier 10 in a perpendicular fashion where the edge of the plate performs the resting function.

It must be understood that the above embodiments as described and shown in the figures are examples only and can be deviated from or changed without departing from the scope of the claims below.

CLAIMS

1. Fence post (1) placeable on or in the ground (3) for supporting a fence, the fence comprising at least one horizontal member (2) connected to the fence post (1), such that it is placed between the fence post (1) and at least one other fence post, characterised in the fence post (1) having a cavity (7) in longitudinal direction, having disposed therein at least one LED-lighting module (5), whereby the fence post (1) is provided with at least one irradiation opening (4) corresponding with an irradiation surface (8) of the LED-lighting module (5), whereby the LED-lighting module (5) is placed within the cavity of the fence post (1).

2. Fence post (1) according to claim 1, whereby the LED-lighting module (5) comprises a plurality of LEDs (9).

3. Fence post (1) according to claim 1 or 2, whereby the LED-lighting module (5) is being disposed on an elongated carrier (10), the carrier (10) being insertable into the cavity (7) of the fence post (1) whereby the carrier (10) has a length less than or equal to the length of the cavity (7).

4. Fence post (1) according to claim 3, whereby the carrier (10) is hollow and is being provided with flexible outwardly curved side walls (17) for engaging the wall (14) and clenching the carrier (10) into the cavity (7) of the fence post (1).

5. Fence post (1) according to claim 3 or 4, the carrier (10) being provided with a flange (16) cooperating with the upper rim of the fence post wall (14) such that the carrier is insertable into the cavity (7) of the fence post (1) up to the flange (16).

6. Fence post (1) according to one of the claims 1 to 5, whereby the cavity (7) extends to the ground (3) and whereby the LED-lighting module (5) is being supplied via een supply cable (13) reaching from the ground into the cavity (7) and whereby the supply cable is electrically connected to the LED-lighting module (5).

7. Fence post (1) according to one of the claims 1 to 5, whereby the fence post (1) is being provided with a feed-through located near or at attachment means of the the horizontal member (2), whereby the LED-lighting module (5) is being supplied via a supply cable (13) extending into the cavity (7) via the feed-through and whereby the supply cable is being electrically connected to the

LED-lighting module (5).

8. Fence having at least one fence post (1) according to one of the claims 1 - 7.

9. Use of a LED-lighting module (5) in a fence post (1) according to one of the claims 1 - 7.

10. Carrier (10) having at least one LED-lighting module (5), the carrier (10) being insertable into a cavity (7) of a fence post (1) according to one of the claims 1 - 7, the carrier (10) having a length less than or equal to the length of the cavity (7).

11. Carrier (10) according to claim 10, whereby the carrier (10) is hollow and is being provided with flexible outwardly curved side walls (17) for engaging the wall (14) and clenching the carrier (10) into the cavity (7) of the fence post (1).

12. Carrier (10) according to claim 10 or 11, the carrier (10) being provided with a flange (16), cooperating with the upper rim of the fence post wall (14) such that the carrier is insertable into the cavity (7) of the fence post (1) up to the flange (16).

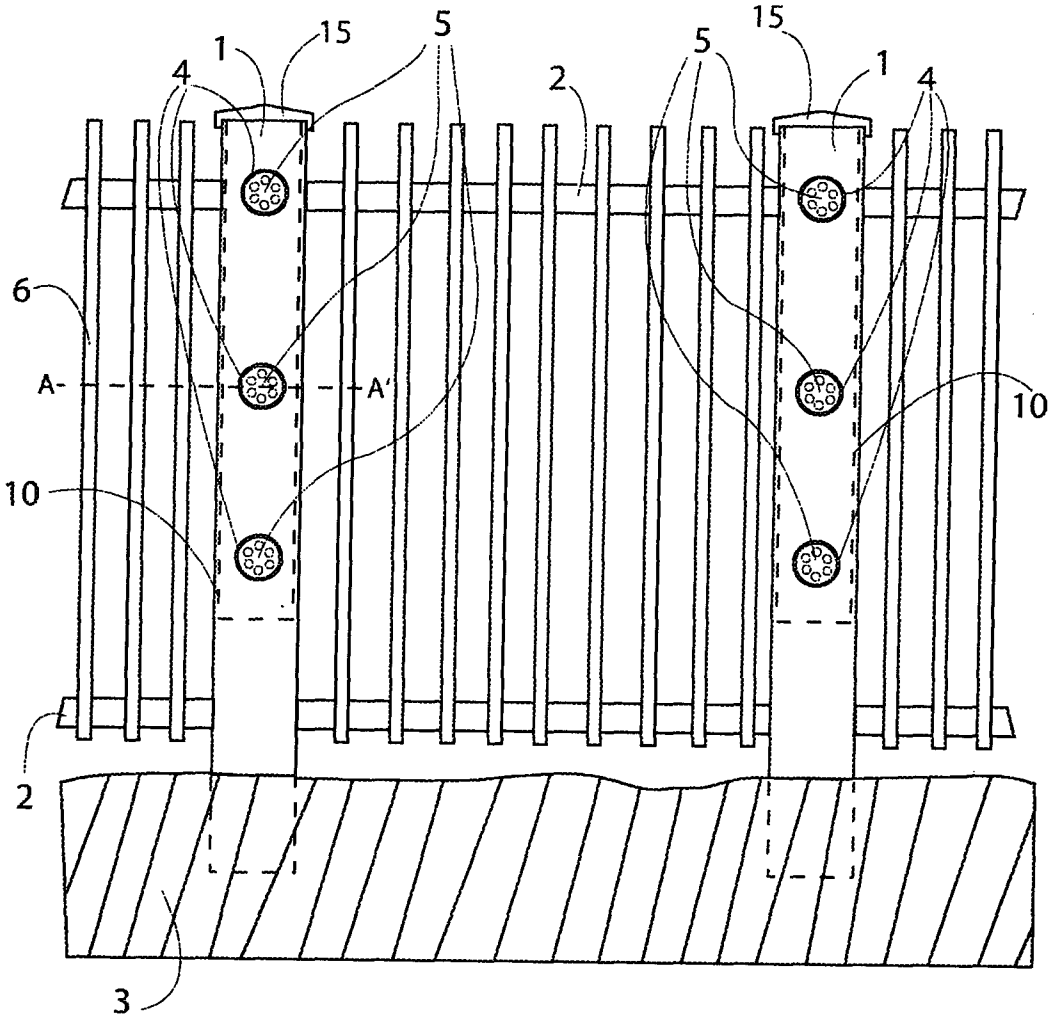

Fig. 1

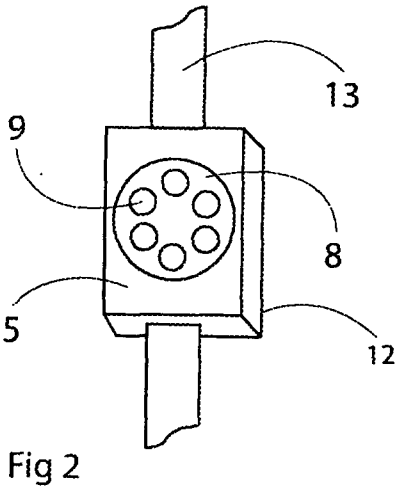

Fig 2

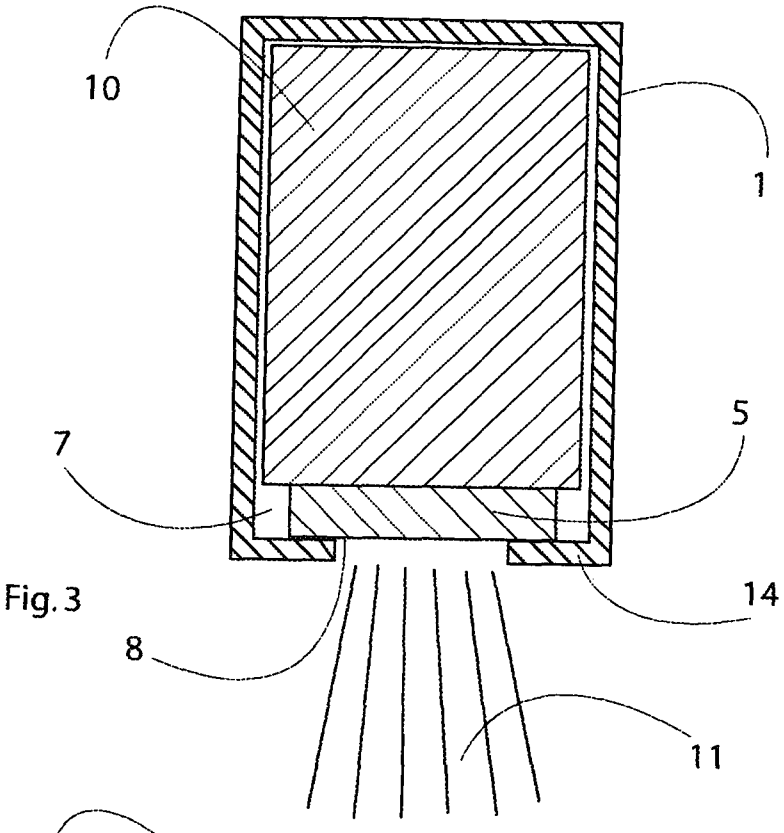

Fig. 3

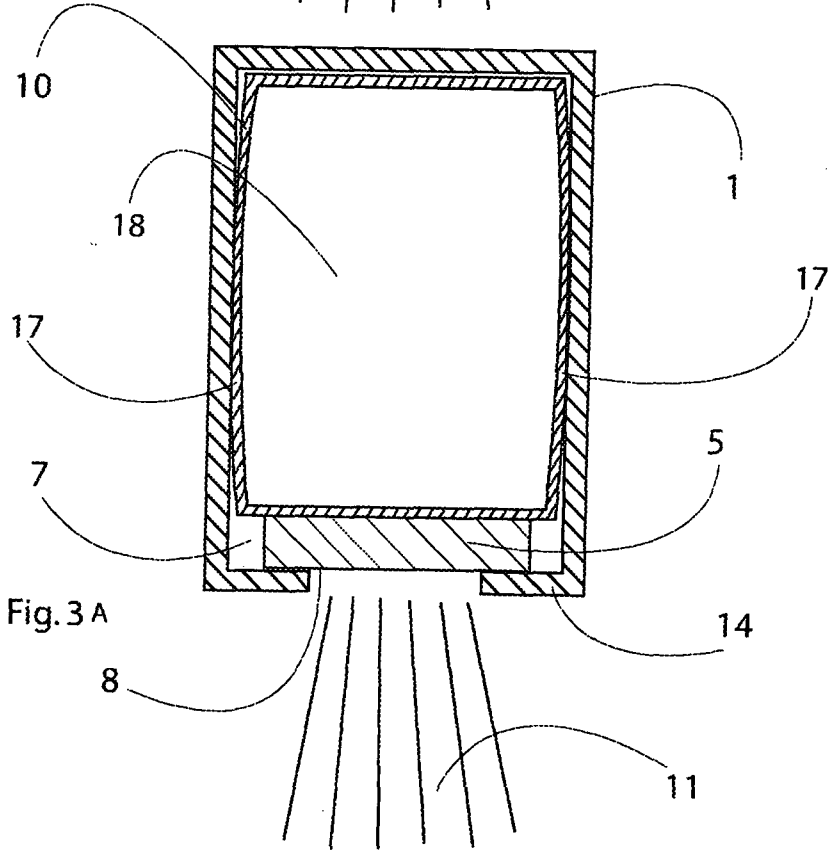

Fig. 3 A

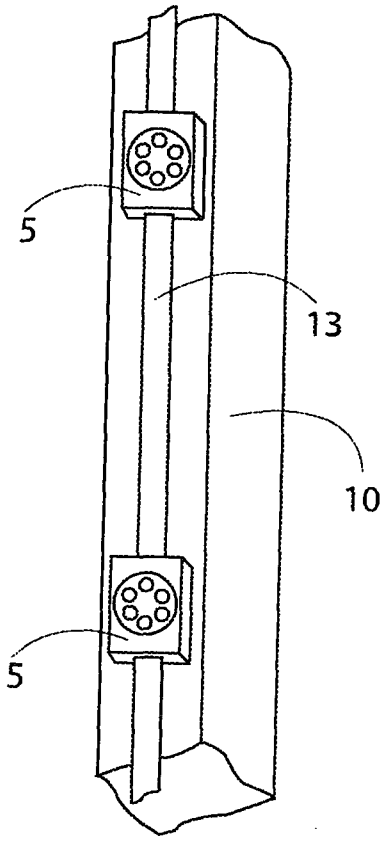

Fig. 4

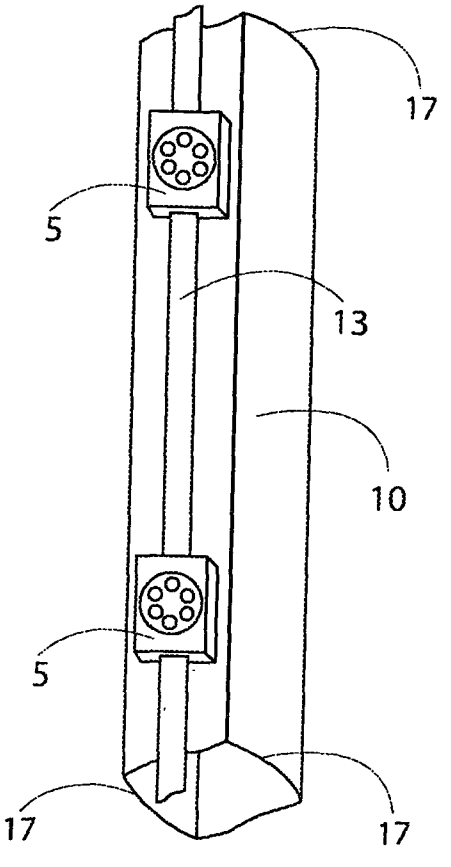

Fig. 4 A

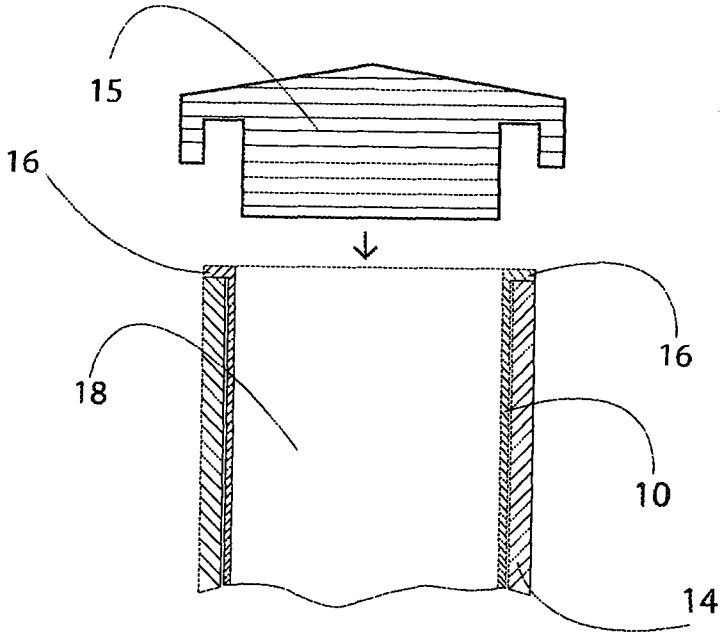

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2010/000013

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21V33/00 E04H17/20 F21S8/08
ADD.

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)
F21V E04H F21S

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 461 942 B1 (KOCHER MIKE [US]) 9 December 2008 (2008-12-09) the whole document figures 1,2	1-12
A	US 2008/099751 A1 (CHEN HSIEN-TE [TW]) 1 May 2008 (2008-05-01) paragraph [0037] - paragraph [0038] figure 9	1-12
A	DE 102 39 983 A1 (RUSLER THEODOR [DE]) 4 March 2004 (2004-03-04) abstract figure 1	1-12

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
9 April 2010	20/04/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Fax: (+31–70) 340–3016	Amerongen, Wim

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2010/000013

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 3 866 034 A (RUSSO MICHAEL T) 11 February 1975 (1975-02-11) abstract figures 1,2	1-12
A	US 3 222 509 A (THEDFORD RUSSELL E) 7 December 1965 (1965-12-07) figures 1,2	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

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