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(54) **EMERGENCY LIGHTING DEVICE FOR TUNNELS**

(57) It has a low power consumption and constitutes a simplification of emergency installations in tunnels. It comprises a hollow bar (1) adapted to be attached to a sidewall (2) of a tunnel, at an ergonomically appropriate height for its use as a support by the users of the tunnel, the bar (1) additionally comprising a plurality of LEDs (5) to illuminate the inside of the tunnel, said LEDs being insulated from moisture and dirt by being contained inside longitudinal cavities (7, 8) of the bar (1).

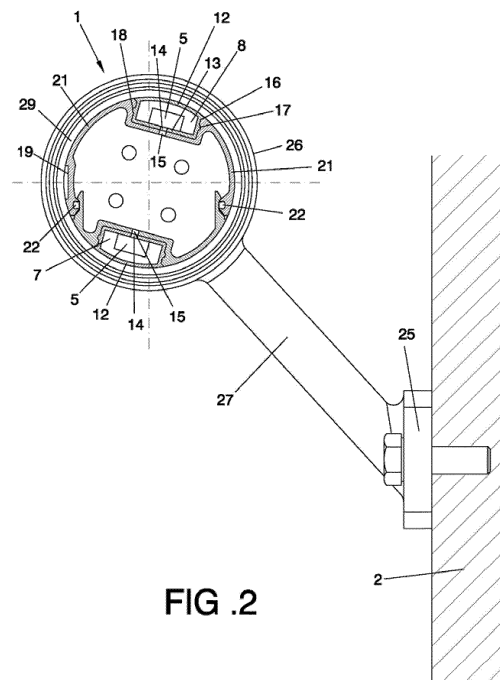


FIG. 2

Description

OBJECT OF THE INVENTION

[0001] The present invention can be included in the field of lighting, specifically that of lighting transportation tunnels, specifically railway tunnels.

[0002] The object of the invention relates to a device for emergency lighting of tunnels.

BACKGROUND OF THE INVENTION

[0003] Tunnels are conceived and designed with evacuation passageways distributed throughout said tunnels to ensure the safety of people.

[0004] Tunnels incorporate means for signalling the path towards these evacuation passageways. In addition, these paths and the evacuation passageways themselves are provided with railings on which the users can lean to increase safety during the escape in case of emergency.

[0005] To comply with the lighting requirements for evacuation passageways and the paths leading to said evacuation passageways, there are different lighting devices that comprise fluorescent or incandescent luminaires.

[0006] The need has been detected for an emergency lighting device in tunnels with a lower power consumption compared to known devices, constituting a simplification of the emergency facilities provided in tunnels without reducing their performance.

DESCRIPTION OF THE INVENTION

[0007] The present invention solves the technical issue described above by an emergency lighting device for tunnels that comprises a bar meant to be attached to the sidewall of the tunnel, all the way to an evacuation passageway and along said evacuation passageway, at an ergonomically appropriate height to provide support to users in case of malfunction or accident.

[0008] The bar additionally comprises a plurality of LEDs to illuminate the evacuation passageway as well as the sidewalls of the tunnel indicating the path to the evacuation passageways. The tunnel sidewalls are usually provided with photoluminescent signals that are charged with the light received from the LEDs and subsequently emit this light.

[0009] The bar comprises two cavities open towards the outside, as well as corresponding lids to provide a watertight seal for a plurality of LEDs. Preferably, the lids are made of self-extinguishing polycarbonate (the structure of which stops flame from spreading in case of fire), adapted to provide the LEDs with an IP65 sealing level.

[0010] Preferably, the bar is composed of segments joined consecutively in a longitudinal direction, each segment comprising two profiles joined to each other by clipping means.

[0011] Preferably, the bar is attached to the sidewall by a support that allows regulating the distance between the bar and the sidewall. The support can also be used to join segments to each other.

[0012] The use of LEDs provides considerably lower power consumption compared to incandescent or fluorescent devices.

[0013] In addition, placing the bar at a height that allows its use as a handrail to assist tunnel users in case of malfunction or accident allows solving two problems: illuminating the path to the evacuation passageway and providing support to tunnel users.

DESCRIPTION OF THE DRAWINGS

[0014] To complete the description being made, and in order to aid a better understanding of the characteristics of the invention, according to an example of a preferred embodiment thereof, a set of drawings are provided that form an integral part of this description where, for purposes of illustration and in a non-limiting sense, the following is shown:

Figure 1 shows a cross-sectional view of a lid.

Figure 2 shows a cross-sectional view of the object of the invention.

Figure 3 shows a longitudinal sectional view of a first preferred embodiment of a support.

Figure 4 shows a perspective view of the device of the invention, including a second preferred embodiment of a support.

PREFERRED EMBODIMENT OF THE INVENTION

[0015] A preferred embodiment of the invention is described below with the help of the accompanying figures 1 to 4.

[0016] As shown in figures 2 and 4, the emergency lighting device for tunnels according to the invention comprises a bar (1) adapted to be attached to a sidewall (2) of a tunnel (not shown) as far as an evacuation passage (not shown) and along said evacuation passage, at an ergonomically appropriate height to provide support to tunnel users, wherein said bar (1) comprises a plurality of LEDs (5) for lighting both the evacuation passageway and the tunnel sidewalls (2) that indicate the path to the evacuation passageways. The sidewalls (2) of the tunnels are normally provided with photoluminescent signals (not shown) that are charged with the light received from the LEDs (5) and emit said light subsequently.

[0017] The bar (1) comprises a first longitudinal cavity (7) and a second longitudinal cavity (8) open to the outside and adapted to house and attach the corresponding lids (9) (as shown in figure 1) in which the LEDs (5) are enclosed. In this way, the LEDs (5) are not subjected to

weather conditions, and are protected from dirt and moisture, as the lids (9) are made of self/extinguishing polycarbonate adapted to provide IP65 level watertightness.

[0018] The bar (1) is hollow to allow housing inside it the wiring (not shown) needed for the power supply and control of the LEDs (5). This allows reducing the infrastructure needed for the electrical installation of tunnels. The lids (9), as shown in figure 1, have an outer wall (12), preferably made of polycarbonate, to allow the light from the LEDs (5) to illuminate the tunnel. An inner wall (13) made in the lids (9) is provided with some first orifices (14) or grooves to allow connecting the LEDs (5) to the internal wiring, in correspondence with second orifices (15) or grooves provided in the bar (1).

[0019] The outer wall (12) of the lids (9) is curved and has rounded ends (16) to prevent the presence of sharp edges in the outline the bar (1).

[0020] The lids (9) are provided with longitudinal protrusions (17) in correspondence with recesses (18) made in the bar (1), in order to attach each lid (9) to the bar (1) by form fitting, either by frontally pressing each lid (9) against the bar (1) or by longitudinally sliding each lid (9) with respect to the bar (1).

[0021] The first cavity (7) is oriented such that the LEDs (5) in said first cavity (7) can illuminate the floor of the tunnel and/or the evacuation tunnel, while the second cavity (8) is oriented such that it allows the LEDs (5) in said second cavity (8) to illuminate a sidewall (2). If applicable, the LEDs (5) in the second cavity (8) can be facing some luminescent signals that are normally provided in the sidewalls (2) and are adapted to capture energy from light and, by means of a chemical reaction, to emit light.

[0022] The bar (1) is provided with a luminescent strip (19) (photoluminescent or electroluminescent) to guiding users in finding the bar (1). The luminiscent strip (19) is adapted to resist an IK 07 hardness. Preferably, said luminescent strip (19) is disposed in a third cavity (not shown), preferably about 10 mm in height by 1 mm in depth.

[0023] The bar (1) is conceived to preferably have an uninterrupted configuration with an undefined length according to the dimensions of the tunnel. For this reason, the bar (1) is composed of a plurality of segments (not shown) consecutively joined.

[0024] In order to aid transporting the segments and mainly laying out the wiring, the segments can consist of two or more (preferably two) profiles (21) provided with joining means based on clipping elements (22).

[0025] As stated above, the bar (1) is adapted to be attached to a sidewall (2) of a tunnel. This can be done using conventional supports, although the invention preferably incorporates some supports (23, 24) that comprise the following elements, as shown in figures 3 and 4:

- A flat union piece (25) adapted to be attached to the tunnel sidewall (2), such as by screwing;
- A substantially cylindrical clamp (26) with an internal

diameter slightly greater than the external dimensions of the bar (1), to hold the bar (1) in a substantially horizontal position; and

- An arm (27) that communicates the union piece (25) with the clamp (26).

[0026] The support (23, 24) can additionally comprise a gasket (29) of a deformable material, such as self-extinguishing rubber, to adjust the bar (1) inside the clamp (26).

[0027] The arm (27) of the bar (1) allows adjusting the distance between the clamp (26) and the union piece (25). To do so, the arm (27) comprises a first body (30) connected to a union piece (25), a second body (31) connected to the clamp (26), and an intermediate piece (32, 33) connected to the first body (30) and the second body (31), adapted to adjust the distance between the first body (30) and the second body (31).

[0028] According to a first example shown in figure 3, the intermediate piece (32) is a stem (32) that is threaded on both ends, adapted to be connected by screwing to the first body (30) and the second body (31), and provided with an actuation element (34) that protrudes from the stem (32), so that actuating said actuation element (34) allows turning the stem (32) with respect to the first body (30) and the second body (31) and separating or approximating said first body (30) and second body (31) to adjust the distance between the clamp (26) and the union piece (25).

[0029] According to a second example shown in figure 4, the intermediate part (33) is a third body (33) provided with a plurality of first orifices (35) corresponding to second orifices (36) placed on the ends of the first body (30) and the second body (31) to join them with pins (not shown) or the like.

[0030] In order to control the lighting system, each evacuation tunnel is provided with a master control cabinet (not shown) that controls a plurality of (generally six) remote cabinets (not shown) disposed on the sidewalls (2) at appropriate distances (for example, one hundred meters). Said cabinets are connected to the bar (1) by connections (40) that run from connections boxes (39) disposed on the bottom part of the bar (1) to avoid hindering users.

[0031] The supports (23, 24) can be used to join the segments with the clamps (26).

Claims

1. Emergency lighting device for tunnels, **characterised in that** it comprises a hollow bar (1) adapted to be attached to a sidewall (2) of a tunnel at an ergonomically appropriate height to provide support to users of the tunnel, wherein the bar (1) additionally comprises a first longitudinal cavity (7) and a second longitudinal cavity (8) that are open to the outside and adapted to house and attach corresponding lids

- (9), wherein in said lids (9) are enclosed some LEDs (5) for illuminating the interior of the tunnel and prevent contact of the LEDs (5) with dirt and moisture.
2. Emergency lighting device for tunnels, according to claim 1, **characterised in that** the lids (9) are made of self-extinguishing polycarbonate to prevent flames from propagating in case of fire.
 3. Emergency lighting device for tunnels, according to any of claims 1 and 2, **characterised in that** the lids (9) are provided with an external wall (12), to allow the light from the LEDs (5) to reach the tunnel, said external wall (12) has a curved shape with rounded ends (16) to avoid the presence of sharp edges in outline of the bar (1).
 4. Emergency lighting device for tunnels, according to any of claims 1 to 3, **characterised in that** the lids (9) additionally comprise an inner wall (13) provided with some first orifices (14) to facilitate the connection between the LEDs (5) and the internal wiring, in correspondence with some second orifices (15) provided in the bar (1).
 5. Emergency lighting device for tunnels, according to any of claims 1 to 3, **characterised in that** the lids (9) are provided with longitudinal protrusions (17) in correspondence with recesses (18) defined in the bar (1) to attach said lids (9) to the bar (1) by form fitting.
 6. Emergency lighting device for tunnels, according to any of claims 1 to 5, **characterised in that** the first cavity (7) is oriented such that it allows the LEDs (5) in said first cavity (7) to illuminate the tunnel floor, while the second cavity (8) is oriented such that it allows the LEDs (5) in said second cavity (8) to illuminate a sidewall (2) of the tunnel.
 7. Emergency lighting device for tunnels, according to claim 1, **characterised in that** the bar (1) is provided with a luminescent strip (19) oriented towards the inside of the tunnel in order to guide the users and allow finding the bar (1).
 8. Emergency lighting device for tunnels, according to claim 7, **characterised in that** the strip (19) is located in a third cavity made in the bar (1).
 9. Emergency lighting device for tunnels, according to claim 1, **characterised in that** the bar (1) is composed of a plurality of consecutively joined segments.
 10. Emergency lighting device for tunnels, according to any one of claims 1 or 9, **characterised in that** the bar is composed of two profiles (21) provided with clipping union means (22).
 11. Emergency lighting device for tunnels, according to claim 1, **characterised in that** it additionally comprises a support (23) to attach the bar (1) to the sidewall (22), said support (23) comprising:
 - a flat union piece (25) adapted to be attached to the tunnel sidewall (2);
 - a substantially cylindrical clamp (26) with an internal diameter slightly greater than the external dimensions of the bar (1), to hold the bar (1) in a substantially horizontal position; and
 - an arm (27) for connecting the union piece (25) to the clamp (26).
 12. Emergency lighting device for tunnels, according to claim 11, **characterised in that** the support (23) additionally comprises a gasket (29) to adjust the bar (1) inside the clamp (26).
 13. Emergency lighting device for tunnels, according to claim 11, **characterised in that** the arm (27) is adapted to adjust the distance between the clamp (26) and the union piece (25).
 14. Emergency lighting device for tunnels, according to claim 13, **characterised in that** the arm (27) comprises:
 - a first body (30) connected to the union piece (25);
 - a second body (31) connected to the clamp (26); and
 - an intermediate piece (32, 33) connected to the first body (30) and the second body (31), adapted to adjust the distance between said first body (30) and said second body (31).
 15. Emergency lighting device for tunnels, according to claim 14, **characterised in that** the intermediate piece (32) is a stem (32) that is threaded on both ends, adapted to be connected by screwing to the first body (30) and to the second body (31), and provided with an actuation element (34), so that by actuating said actuation element (34) the stem (32) can be turned with respect to the first body (30) and the second body (31), thereby separating or approximating said first body (30) and second body (31) to adjust the distance between the clamp (26) and the union piece (25).
 16. Emergency lighting device for tunnels, according to claim 14, **characterised in that** the intermediate part (33) is a third body (33) provided with a plurality of first orifices (35) corresponding to second orifices (36) located on the ends of the first body (30) and the second body (31) to join them with pins.

Amended claims under Art. 19.1 PCT

1. An emergency lighting device for tunnels, **characterised in that** it comprises a hollow rod (1) adapted to be fixed to a sidewall (2) of a tunnel, at an ergonomically appropriate height for use as a support by the users of the tunnel, wherein the rod (1) additionally comprises:
 - a first longitudinal cavity (7) and a second longitudinal cavity (8), both cavities (7, 8) being open towards the exterior;
 - caps (9), housed and fixed in the cavities (7, 8); and
 - LEDs (5) housed in the caps (5) to illuminate the interior of the tunnel and insulate the LEDs (5) from dirt and moisture.
2. An emergency lighting device for tunnels, according to claim 1, **characterised in that** the caps (9) are manufactured from self-extinguishable polycarbonate to prevent flame propagation in case of fire.
3. An emergency lighting device for tunnels, according to any one of claims 1 and 2, **characterised in that** the caps (9) are equipped with an outer wall (12) to allow light emitted by the LEDs (5) to reach the tunnel, the outer wall (12) having a curved shape, with rounded ends (16), in order to avoid introducing sharp edges onto the contour of the rod (1).
4. An emergency lighting device for tunnels, according to any one of claims 1 to 3, **characterised in that** the caps (9) additionally comprise an inner wall (13) having first holes (14) to facilitate the connection between the LEDs (5) and the internal wiring, in correspondence with second holes (15) disposed on the rod (1).
5. An emergency lighting device for tunnels, according to any one of claims 1 to 3, **characterised in that** the caps (9) are equipped with longitudinal protuberances (17) in correspondence with recesses (18) defined in the rod (1) for form-closure fixing said caps (9) with the rod (1).
6. An emergency lighting device for tunnels, according to any one of claims 1 to 5, **characterised in that** the first cavity (7) is oriented in such a manner as to allow the LEDs (5) of said first cavity (7) to illuminate the tunnel floor, while the second cavity (8) is oriented in such a manner as to allow the LEDs (5) of said second cavity (8) to illuminate a sidewall (2) of the tunnel.
7. An emergency lighting device for tunnels, according to claim 1, **characterised in that** the rod (1) incorporates a luminescent film (19) oriented towards the interior of the tunnel to guide users, allowing them to find the rod (1).
8. An emergency lighting device for tunnels, according to claim 7, **characterised in that** the film is disposed in a third cavity disposed on the rod (1).
9. An emergency lighting device for tunnels, according to claim 1, **characterised in that** the rod (1) is composed of a plurality of consecutively joined sections.
10. An emergency lighting device for tunnels, according to any one of claims 1 or 9, **characterised in that** the rod consists of two profiles (21) equipped with clippable joining elements (22).
11. An emergency lighting device for tunnels, according to claim 1, **characterised in that** it additionally incorporates a support (23) for fixing the rod (1) to the sidewall (2), the support (23) comprising:
 - a flat connecting piece (25) adapted for being fixed to the sidewall (2) of the tunnel;
 - a substantially cylindrical clamp (26), the inner diameter of which is slightly greater than the outer dimensions of the rod (1), for sustaining the rod (1) in a substantially horizontal position; and
 - an arm (27) that connects the connecting piece (25) to the clamp (26).
12. An emergency lighting device for tunnels, according to claim 11, **characterised in that** the support (23) additionally incorporates a gasket (29) for adjusting the rod (1) in the interior of the clamp (26).
13. An emergency lighting device for tunnels, according to claim 11, **characterised in that** the arm (27) is adapted to regulate the distance between the clamp (26) and the connecting piece (25).
14. An emergency lighting device for tunnels, according to claim 13, **characterised in that** the arm (27) comprises:
 - a first body (30) connected to the connecting piece (25);
 - a second body (31) connected to the clamp (26); and
 - an intermediate piece connected to the first body (30) and to the second body (31), adapted to regulate the distance between said first body (30) and second body (31).
15. An emergency lighting device for tunnels, according to claim 14, **characterised in that** the intermediate piece is a stem (32) threaded on both its ends, adapted to be connected by means of threading to the first body (30) and to the second body (31), and having

an actuation element (34) which allows, by actuating said actuation element (34), rotation of the stem (32) around the first body (30) and the second body (31), and to produce a distancing or separation between said first body (30) and second body (31) which allows adjustment of the distance between the clamp (26) and the connecting piece (25).

16. An emergency lighting device for tunnels, according to claim 14, **characterised in that** the intermediate piece is a third body (33) having a plurality of first holes (35) corresponding to second holes (36) disposed on the ends of the first body (30) and of the second body (31) for connection thereof by means of bolts.

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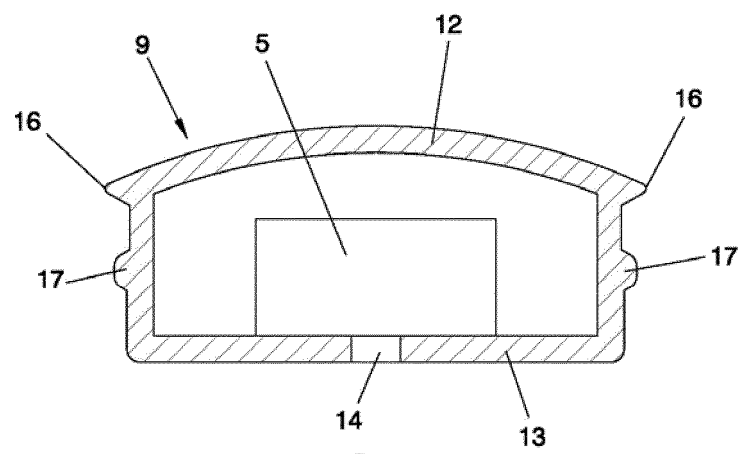


FIG .1

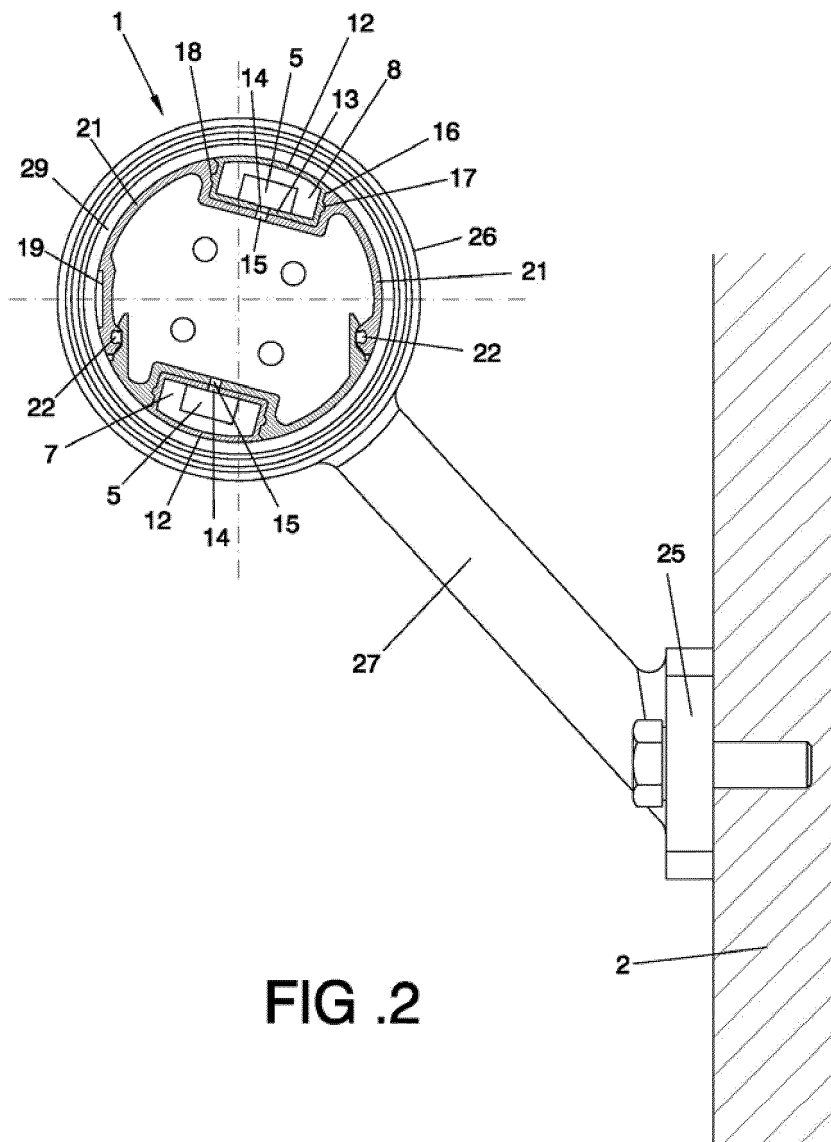


FIG. 2

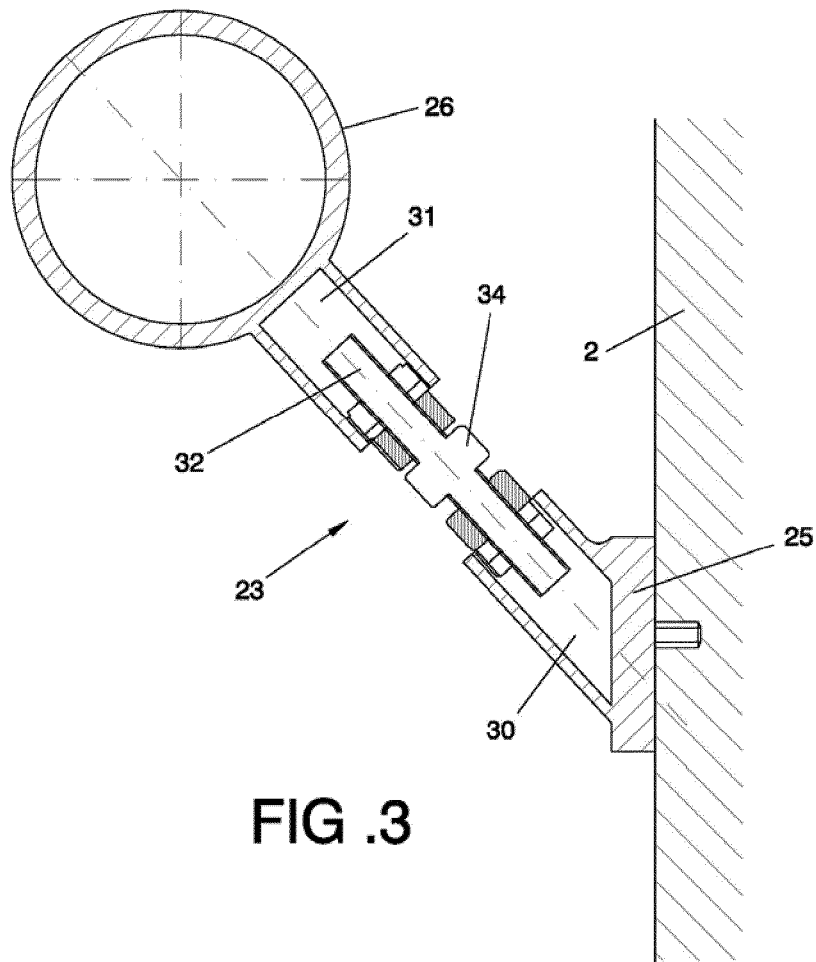


FIG .3

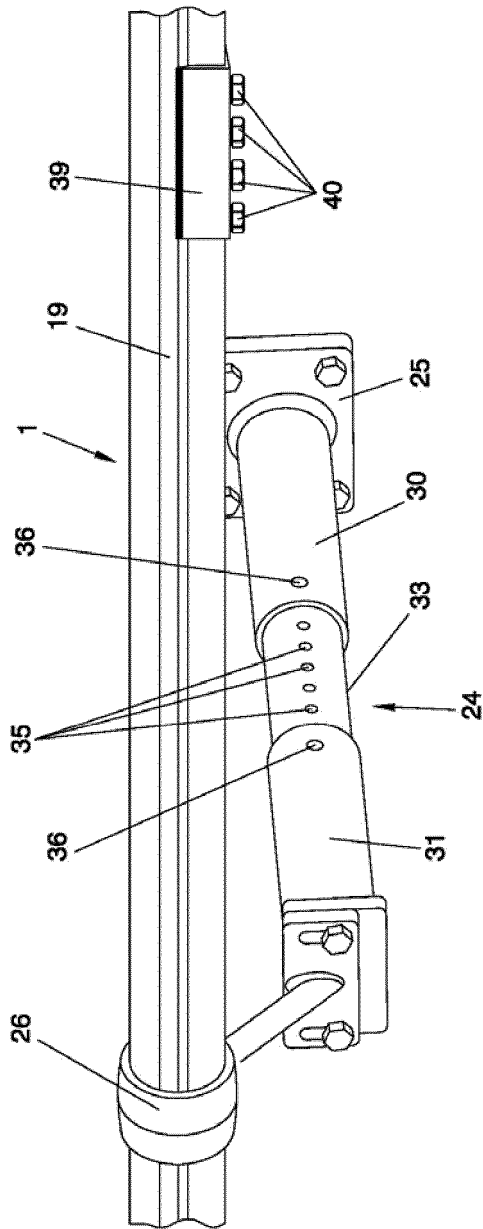


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No

PCT/ES2012/070214

A. CLASSIFICATION OF SUBJECT MATTER		
INV. F21S4/00	F21V33/00	F21W111/08 F21W131/101 F21Y101/02
ADD. E04F11/18	F21V17/16	F21V21/12 F21V21/22 F21V25/12
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) E04F F21S F21V F21W F21Y		
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 practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "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 "&" document member of the same patent family		
Date of the actual completion of the international search 20 August 2012		Date of mailing of the international search report 30/08/2012
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel: (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer von der Hardt, M

INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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