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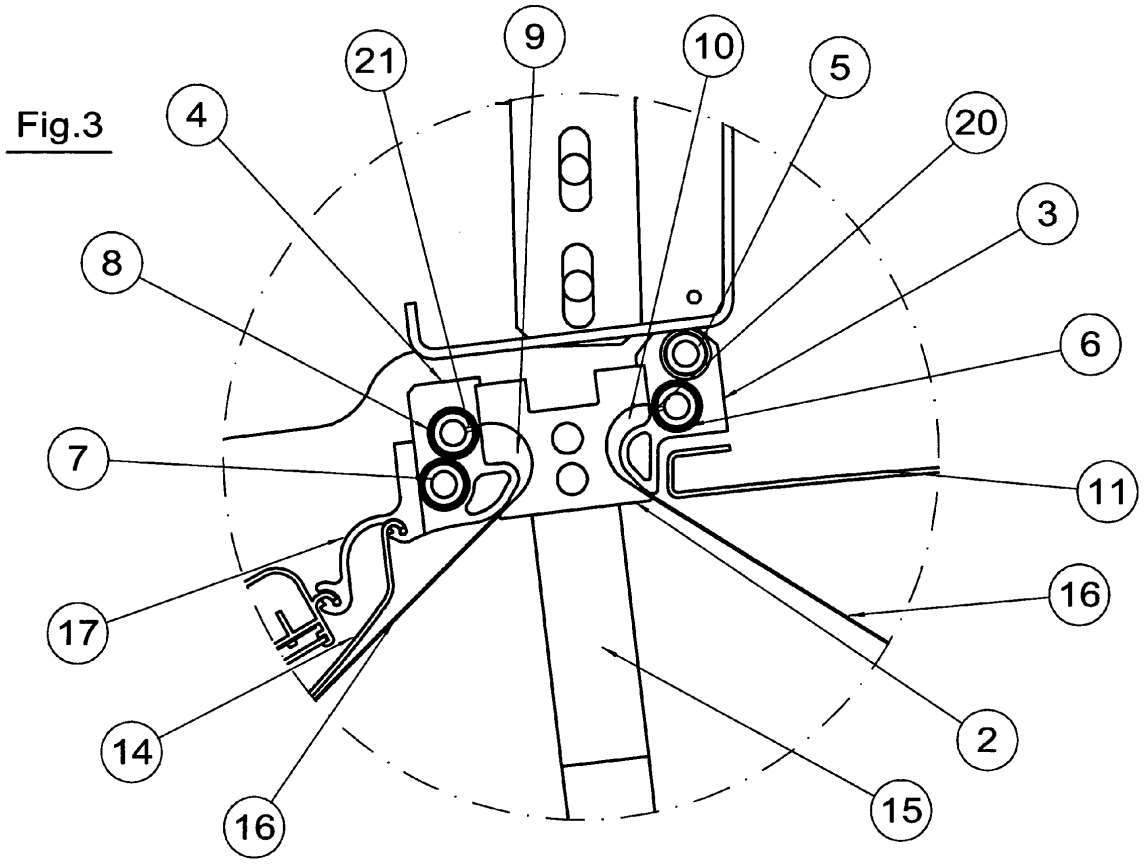
(54) **Fire-fighting system integrated with interior lining of environments assigned to people staying**

(57) A fire-fighting system for environments assigned to people staying (both "static" premises like entertainment rooms, waiting rooms, offices, etc., and "mobile" environments like collective means of transportations travelling on the land, the sea or the air) characterized in that the extinguishing fluid dispensing device (usually water) in the zones to be protected is realized with a series of modular elements, to be assembled one after the other; each of them is composed by aluminium extruded profiles (2-3-4) with shapes, dimensions, surface finishing of such a kind to best match and be perfectly integrated with the interior lining of the environment to be protected, and of such a kind to be functional elements for the assembly of components like, for example, lighting devices, air supply ducts, hand rails (15) etc., and of such a kind to present a narrow exit section (a fissure less than 2 mm wide) so that it is much more difficult to be damaged by users or unnecessarily activated; that is, it is much safer against vandalism respect to traditional systems.

Fig.3



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Description

FIELD OF THE INVENTION

[0001] This invention relates to fire-fighting systems for environments assigned to people staying, like civil environments (entertainment, waiting rooms, etc.), working environments (offices, workshops) and collective transportation vehicle which travel on the land, sea or in the air (trains, buses, ships, airplanes).

BACKGROUND OF THE INVENTION

[0002] Fire-fighting systems in environments assigned to people staying are, nowadays, quite widespread above all in premises (entertaining rooms, waiting rooms, offices etc.) as it is often required by laws and rules of most governments; on collective transportation vehicles, specially in railway and aeronautical applications, such system are much rarely implemented, also because of bigger plant difficulties. Fire-fighting systems are generally composed of: a tank, one or more pumping devices, a pipeline for the delivery of the fire extinguishing fluid (which has to be absolutely harmless for people, and so it's usually water) in all the areas to be protected, fire detection devices (which can be of several kinds), devices for dispensing fire extinguishing fluid in the areas to be protected. Fire detection device usually employed can be classified in two main categories: "active" systems which (by means of chemical or thermal or light emission analysis in the atmosphere) detect fire and send a signal for activate the fire-fighting system (which can be, here, "dry", that is the delivery pipeline is empty until the pumping system of the extinguishing fluid is activated by the signal); "passive systems" (which carry out the double function of fire detection and structural element of the plant) that are "suicide elements" like mercury filled bulbs or several kinds of plugs made with materials that melt at temperatures quickly reachable in case of fire (the system has here to be "wet", that is the delivery pipeline must be always filled with fire extinguishing fluid in pressure so that, when the fire detection element is "destroyed" by heat, the fire extinguishing fluid is spread on the fire zone). Dispensing devices normally implemented are various kinds of nozzles, most of which is the one known as "sprinkler": a common feature for all these nozzles is that when they are installed in the environment to be protected, the are totally, or partially, visible or anyhow accessible for people, with obvious problem of aesthetic aspect of the environment and risk of vandalism.

BRIEF DESCRIPTION OF THE INVENTION

[0003] The technical problem of fire extinguishing fluid dispensing devices which are visible and/or accessible by the people (and so anti-aesthetic and at risk of vandalism) is quite solved by this invention which discloses a dispensing system of the fire extinguishing fluid totally integrated with the interior lining of the environment where it is installed. The fire-fighting system is composed by the following basic elements:

1. A potable or demineralised water tank (or an alternative liquid and harmless fire-extinguishing media) and a pumping system able to pressurize water and make it reach, through a pipeline system, the dispensing devices with a desired value of pressure: this pumping system can be realized by an hydraulic compressor or by mixing water with a pressured inert gas (ex. Nitrogen) held in proper bombs. This devices can be chosen among the several kinds known in the prior art and available in the market.
2. A pipeline system installed above the ceiling of the environment to be protected (or inside the walls) to feed with the fire extinguishing fluid the dispensing devices.
3. A fire detection system able to detect fire and send an signal (electric, mechanical, pneumatic, etc.) for pressurizing the extinguishing fluid and deliver it in the zone to be protected. Such system can be chosen among the several kinds known in the prior art and available in the market.
4. A fire extinguishing dispensing device quite integrated with the interior lining of the environment to be protected: the system object of this invention is in fact, made with a series of modular elements, assembled one after the other, each composed by aluminium extruded profiles opportunely assembled one another. Inside one of this profiles there are the delivery ducts of the pressurized fire-fighting fluid: along this ducts, with a desired span, small diameter holes are made to let the extinguishing fluid come out of the ducts and be dispensed in the fire zone. One more profile is coupled to the first in such a way to form a converging section duct for the pressurized fluid coming from the holes characterized in having an outgoing section adequately narrow (about 2 mm). On the surfaces of the converging duct is drawn a series of small asperities able to "tear" the flow and to reduce it in small diameter drops so that at the exit of the duct (also because of the pressurization given by the converging duct and the following expansion outside of it) the fluid is nebulised (water mist), which, as well known from the prior art, has the best physical proprieties for fire extinction. To obtain a better localized water mist spray it is possible to insert inside the holes of the ducts some kinds of nebulising nozzles (known in the prior art and available on the market).

[0004] The utilization of modular elements composed with aluminium profiles assembled on the ceiling (or on the walls) of the environment to be protected, allows wide possibilities of integration with the environmental interior lining, both in terms of shapes (that can be quite customized) and superficial finish and colours, so that the prob-

lem of the anti-aesthetic traditional nozzles is avoided. Moreover, these profiles can be used, at the same time, for different aims: for example, they can be the basement for the arrangement of the lighting plant, or be a part of air ducts, or can also be used (on railway applications) as support structures for the assembly of hand rails for passengers.

[0005] It is therefore evident the high level of integration of such devices with the interior lining of the environment, above all in comparison to nozzles or sprinklers traditionally employed. Moreover, as the exit of the fire extinguishing fluid is carried out through a narrow opening between two coupled profiles (no more than 2 mm wide), the possibility of tampering and vandal actions is almost completely avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The drawings that are referred to in the following are relative to one of the possible embodiments of the invention, in particular to an application for a railway vehicle: what is disclosed in the drawing and in the following descriptions is not to be considered a limitation to different possible embodiments and applications of the same invention.

[0007] Drawing 1 Fig.1: it is shown a typical perspective view of the ceiling of the passengers' saloon of a railway vehicle, complete of central ceiling panels, lighting ducts, hand rails, and various panelling. The fire-fighting system integrated in the interior lining is composed by the profile on which hand rails are assembled, and by the two profile on which, respectively, are assembled the central ceiling panels and the lighting ducts.

[0008] Drawing 2 Fig.2: it shown a traverse view of the ceiling, in which is represented also the extinguishing fluid that has been sprayed by the dispensing system object of this invention.

[0009] Drawing 3 Fig.3: it is shown a detailed view of the fire-fighting system integrated with the interior lining, in which can be distinguished the three aluminium profiles that form the two converging ducts by means of which the fire extinguishing fluid is dispensed. It is also possible to see the holes through which the fire extinguishing fluid comes out from the delivery ducts and flows in the dispensing converging duct.

[0010] Drawing 4 Fig.4: is represented in perspective view the terminal part of the central profile; are visible the asperities drawn of machining work to "tear the flow" of the extinguishing fluid from the walls of the duct and to determine the nebulisation.

[0011] Drawing 4 Fig.5: are represented the fittings by means of which the profiles of two adjoining modules are connected.

[0012] Drawing 5 Fig.6: is represented a possible variation of the realization seen in the other sketches, in which the fireproof system is installed on a plain ceiling and is assembled in such a way to spray the extinguishing fluid in different directions for each side.

[0013] Drawing 5 Fig.7: is represented another possible variation in which the firefighting system is totally hidden inside the ceiling and is used as an assembling platform for the lighting plant.

[0014] Drawing 5 Fig.8: is represented an assembling inside of a wall, in which the spray of the extinguishing fluid is addressed towards the ceiling.

[0015] Drawing 6 Fig.9: is represented an embodiment in which, to obtain a better localization of the nebulised water spray, a nebulising nozzle is used.

DETAILED DESCRIPTION OF THE INVENTION

[0016] In the following disclosure numerical references are used to the figures described above. The ones described in the following (one in details, the others only introduced as possible variations) are only some of the possible embodiments of the fire-fighting system object of this invention, and are, so, not intended to be exhaustive or to limit the realization of the invention to the embodiments described: their purpose is simply that of disclosing at best the principle of the invention and its possible practical applications, and to make a person skilled in the technique be able to carry it out.

[0017] The invention disclosed in the following relates to the technical field of fire-fighting systems for environments assigned to people staying (both "static" premises like offices, entertainment rooms, waiting rooms, etc., and "mobile" environments like collective means of transportation travelling on the land, sea and air). The plant part of the fire-fighting system (that is, the means through which the pressurized extinguishing fluid, following an alarm generated by the fire detection system, is supplied to the dispensing devices in the fire area) is not the object of this invention: fluids transportation systems and fire detection devices already known in the prior art can be used. Preferably, the kind of plant to be used is the "dry" one, that is the extinguishing fluid supply piping system will be empty in no alarm conditions; preferably, the fluid pumping system will consist in water pressurized by nitrogen bombs: this apparatus will be activated by the fire detection system (which can be chosen among one of the kinds known in the prior art and available on the market) and will make the extinguishing fluid be delivered (through a proper system of pipes, fittings and valves) to the fire affected zone where the detection system has been activated. The object of this invention is an innovative extinguishing fluid dispensing device which is totally integrated with the lining of the environment to be protected: this device is realized with modular elements to be assembled one after the other, each composed by aluminium extruded profiles wherein are drawn the ducts for the extinguishing fluid; along the ducts, with desired span, small holes are made to get the fluid out and make it enter a converging section duct formed by the assembly of the aluminium profiles; the walls of the converging duct are not smooth, but have tooling-machine made small asperities which are able to "tear" the flow going out of

the converging duct; the terminal section of the duct, through which the pressured extinguishing fluid is spayed in the environment, is very small, so that to create a longitudinal fissure no more than 2 mm wide; the fluid so reduced to small diameter drops (less than 1 mm and down to a few μm) will extinguish fire employing the well known fire-fighting proprieties of nebulised water. To obtain a better localization of the nebulised water spray, it's possible to insert, in the pressurized fluid drawing holes of the ducts, some nebulising nozzles (known in the prior art and available on the market).

[0018] Using aluminium extruded profiles allows to realize dispensing devices with shapes, dimensions, superficial finishing and colours that match and fit the environment lining where they are installed, so avoiding all the typical aesthetic drawbacks of traditional nozzles (ex. sprinklers); moreover, such profiles can be, at the same time, used as functional elements for assembling of lighting devices, air ducts, hand rails, etc.; properly shaping the spraying duct it is possible to get any direction for the sprays; the small dimensions of the exit section of the spray (a fissure less than 2 mm wide) make the system be not easily damageable or unnecessarily activated by the users, and so it is safer, respect to traditional systems, against vandalism.

[0019] In the Fig. 1-2-3-4-5 is shown a possible embodiment of the invention for an application on a railway vehicle. The system is integrated with the lining of the ceiling of the passengers' lounge: two series of fire-fighting modular elements (1) are installed near the central ceiling panelling (11) and are the support for the assembly of that panelling on both sides; on external sides of the modules' profiles are fitted the fastening elements on which the passengers' saloon lighting plant (14) is assembled; the hand rails (15) are directly assembled on the central profiles (2) of the modules (1). The fire-fighting module is composed by the assembly of a central profile (2) and two lateral profile (3-4): inside the lateral profiles (3) and (4), the ducts (5-6-7-8) are drawn for the delivery of the pressurized extinguishing fluid; along the ducts, with preferred and different spans for each duct, there are the small holes (20-21) that let the fluid enter the converging section ducts (9-10); the walls of the ducts are not smooth but are characterized by tool-machine made asperities (22) able to "tear" the flow and reduce it in small diameter drops, that is able to nebulise it; out of the converging ducts, sprays of nebulised water (16) are emitted to extinguish the fire (the areas that have to be hit by the nebulised spray are selected on the basis of the information sent from the fire detection system: only the involved modules are supplied with the extinguishing fluid); the connection between adjoining modules' profiles is made by means of proper fittings (23) of the pressure fast-engage kind (or % of a round).

[0020] In Drawing 5 are represented sketches of some alternative embodiments of the system. In Fig.6 the system is composed of two only profiles (41-42) shaped in such a way to direct the extinguishing spray downwards (44) on one side and upwards on the other (43), so that also the ceiling is protected. In Fig.7 the system is again composed of two profiles (30-31) installed inside the ceiling and fit for the assembly of the lighting device (32) from whose sides are emitted the extinguishing sprays (33). In Fig.8 is shown an embodiment in which the profiles (50-51) are inside the wall (53) and the spray (52) is towards the ceiling.

[0021] In Drawing 6 (Fig.9) is shown the possible solution in which, inside the pressurized fluid drawing hole is assembled a nebulising nozzle (62), by means of which it is possible to obtain a better localization of the nebulised spray.

Claims

1. A fire-fighting system for environments assigned to people staying (both "static" premises like entertainment rooms, waiting rooms, offices, etc., and "mobile" environments like collective means of transportation travelling on the land, the sea or the air) composed by a people-harmless extinguishing fluid (ex. water) tank, by a device able to pressurize the fluid and deliver it (through a proper supply piping, fittings and valves system) in the area to be protected against fire on the basis of the activation signals emitted by one or more fire detection devices; this system being **characterized in that** the extinguishing fluid dispensing device is composed of a series of modular elements (1), to be assembled one after the other, each of them being composed by the assembling of aluminium extruded profiles (2-3-4) with shapes, dimensions and surface finishing of such a kind to best match and fit the interior lining of the environment to be protected (11-13-14-15), and of such a kind to be functional elements for the assembly of components like, for example, lighting devices, air supply ducts, hand rails etc.

2. A fire-fighting system according to claim 1, **characterized in that** inside one or more of the aluminium profiles which form the modular elements, ducts are drawn by means of which the pressurized extinguishing fluid is delivered (5-6-7-8).

3. A fire-fighting system according to claim 2, **characterized in that** the extruded profiles are assembled in such a way to realize one or more converging section ducts (9-10).

4. A fire-fighting system according to claim 3, **characterized in that** a series of small holes (21-22), drawn with preferred spans on the profiles containing the ducts (5-6-7-8), let the pressurized extinguishing fluid enter the converging section ducts (9-10).

5. A fire-fighting system according to claim 4, **charac-**

terized in that the wall of the profiles that form the converging section ducts are not smooth but present tool-machine made small asperities (22) able to "tear" the pressurized flow and reduce it in small diameter drops; that is, able to nebulise it.

6. A fire-fighting system according to claim 5, **characterized in that** the terminal section of the converging duct through which the nebulised extinguishing fluid (16) is sprayed on the area to be protected, consists of a longitudinal fissure less than 2 mm wide.

7. A fire-fighting system according to claim 6, **characterized in that** the small dimensions of the exit section of the extinguishing spray are able to minimize the visual impact of the system on the users, and moreover it makes much more difficult, for the same users, to damage it or unnecessarily activate it; in other words, the system object of this invention is safer against vandalism respect to traditional ones.

8. A fire-fighting system according to claim 7, **characterized in that** it is possible to obtain extinguishing fluid sprays oriented in any direction (33-43-44-52) by means of properly shaping the terminal part of the converging duct.

9. A fire-fighting system according to claim 8, **characterized in that** it is possible to obtain a better localization of the nebulised spray by inserting, in the pressurized fluid drawing hole, a nebulising nozzle (62) of one of the kinds known in the prior art.

10. A fire-fighting system according to claim 8 or 9, **characterized in that** the profiles of adjoining modules are assembled by means of proper fittings (23) of the pressure fast-engage kind (or ¼ of a round).

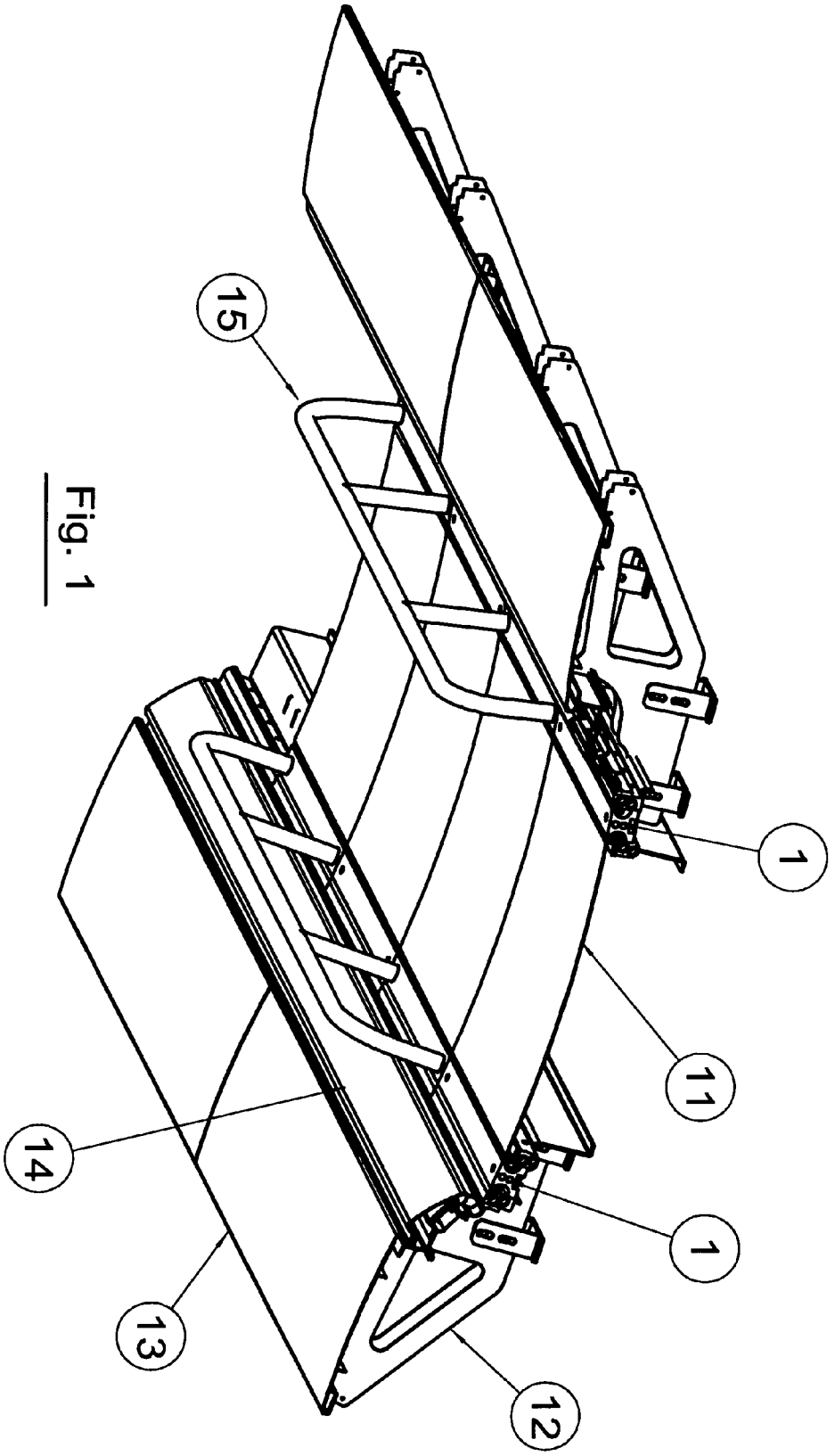


Fig. 1

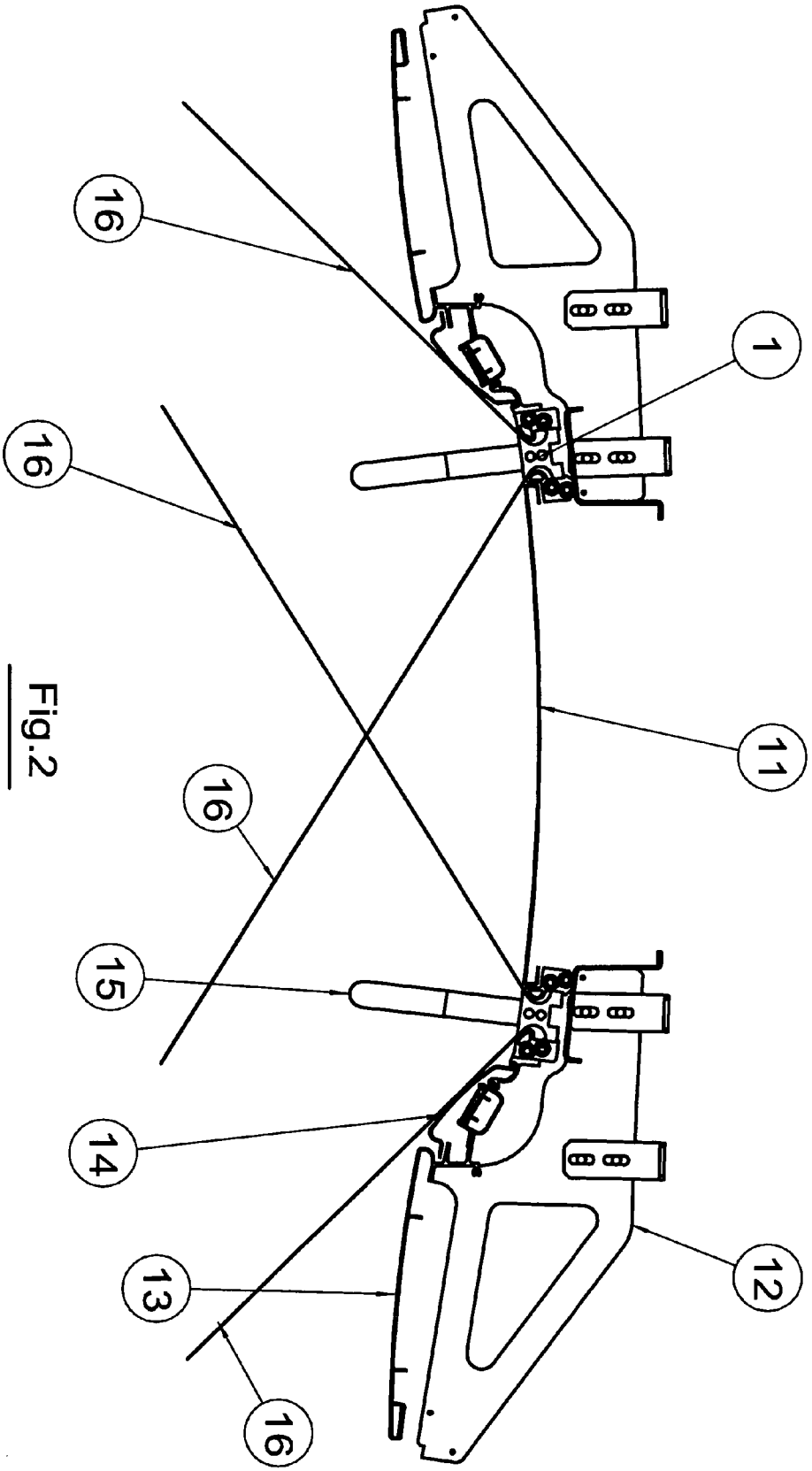


Fig.2

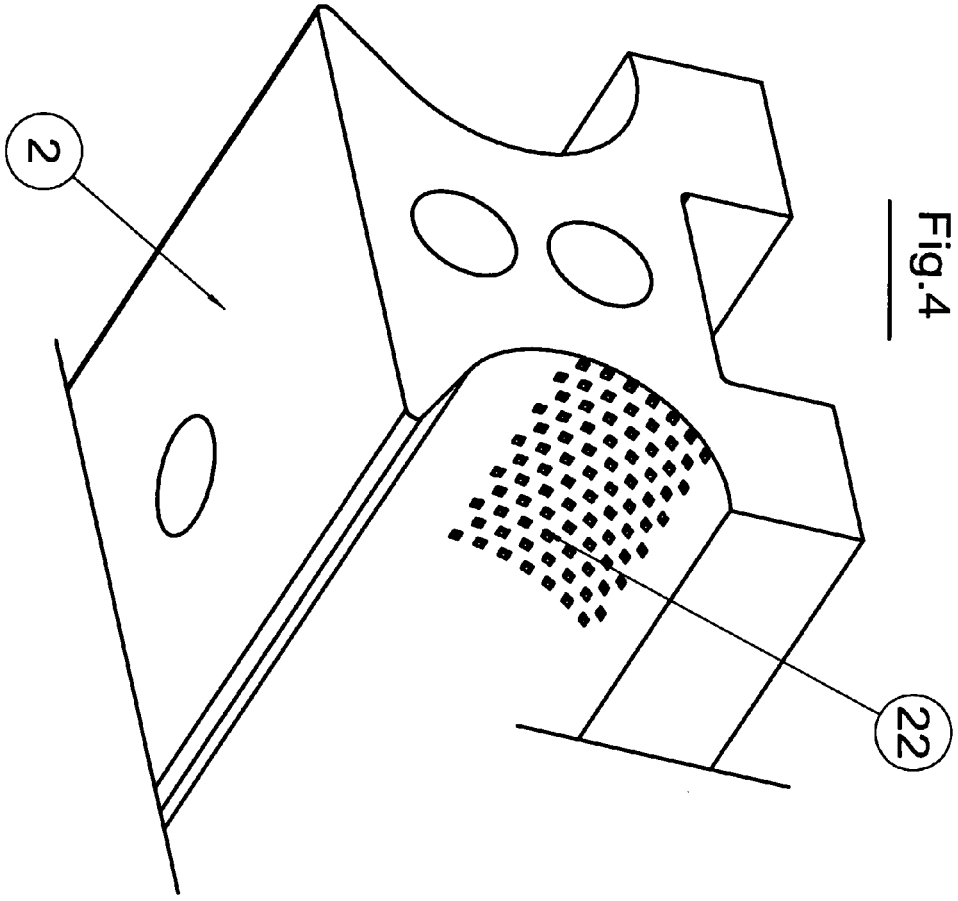


Fig.4

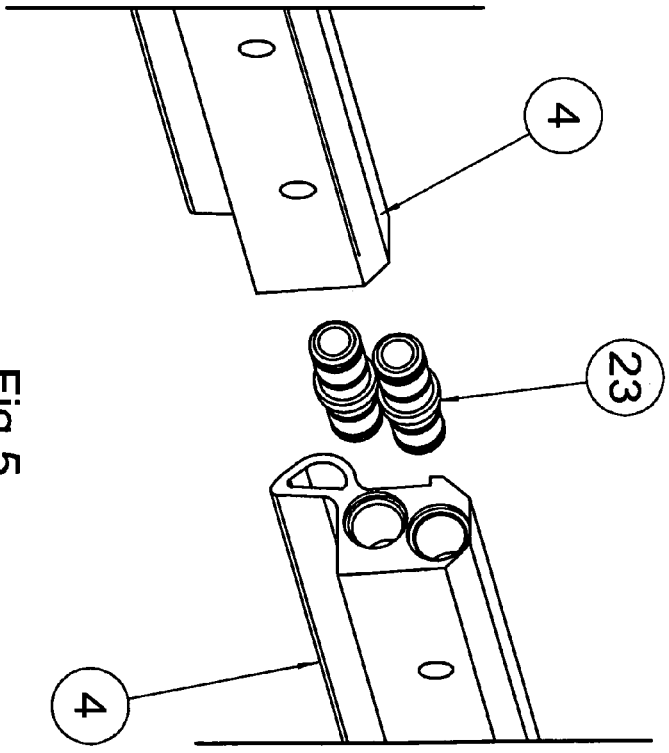
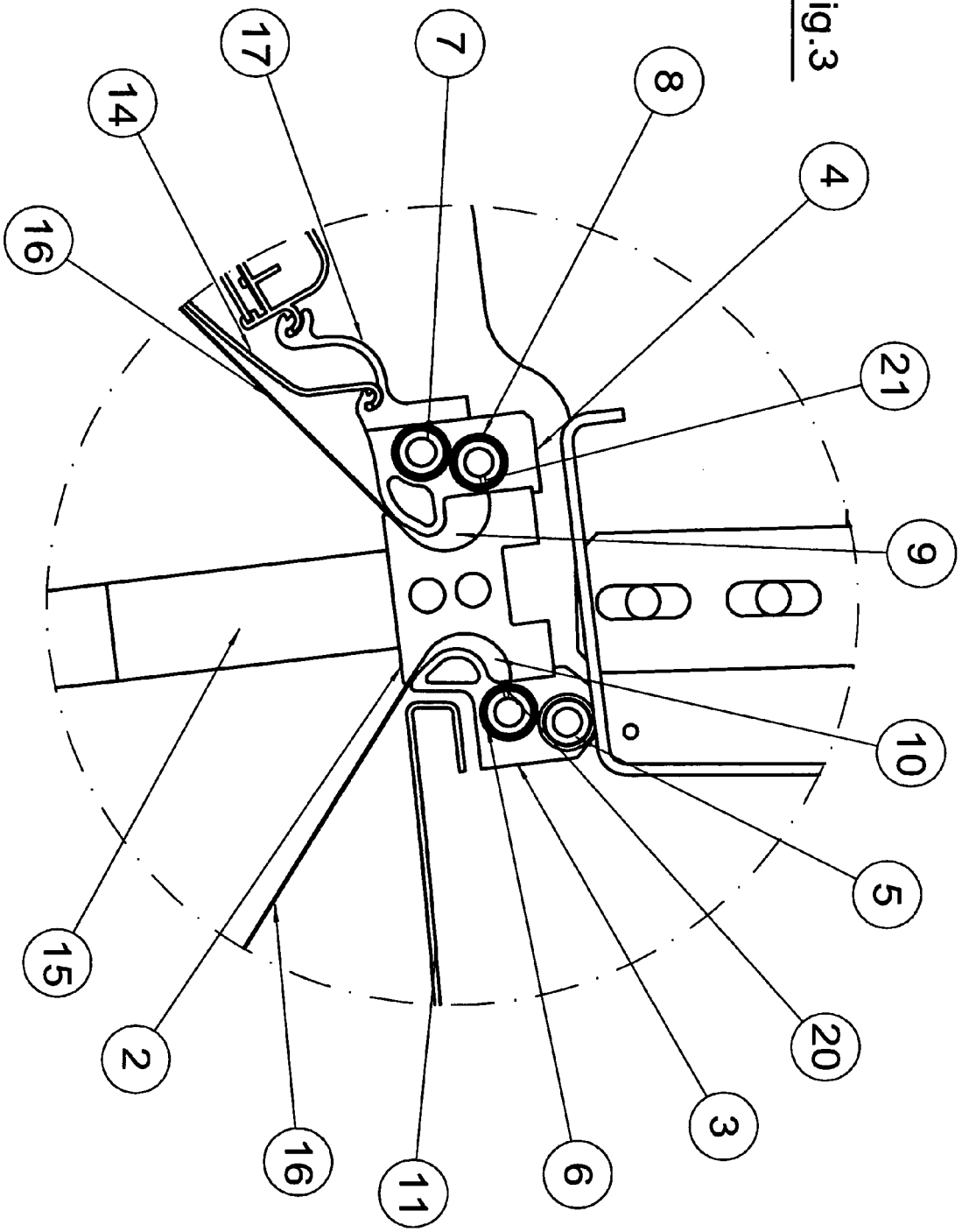


Fig.5

Fig.3



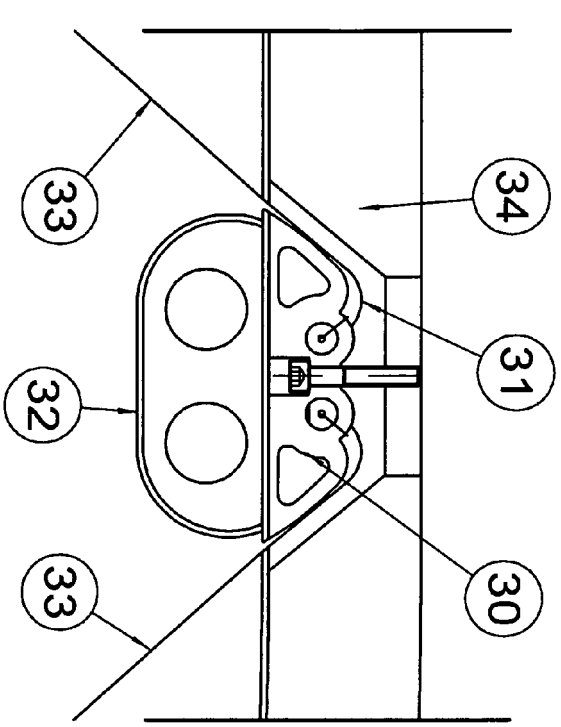


Fig.7

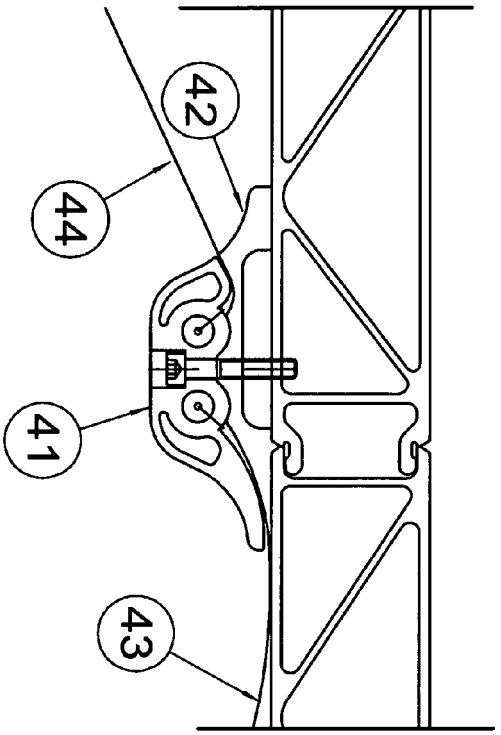


Fig.6

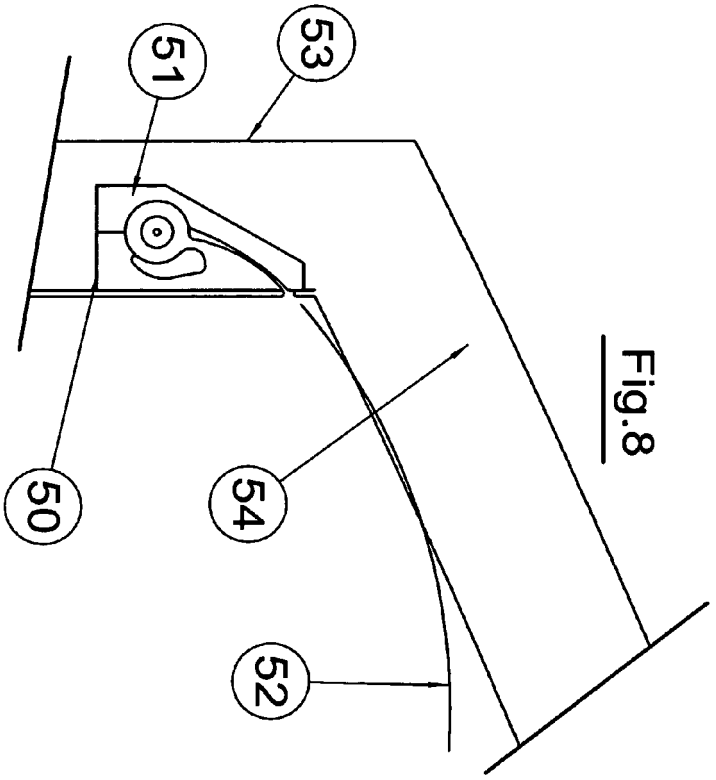


Fig.8

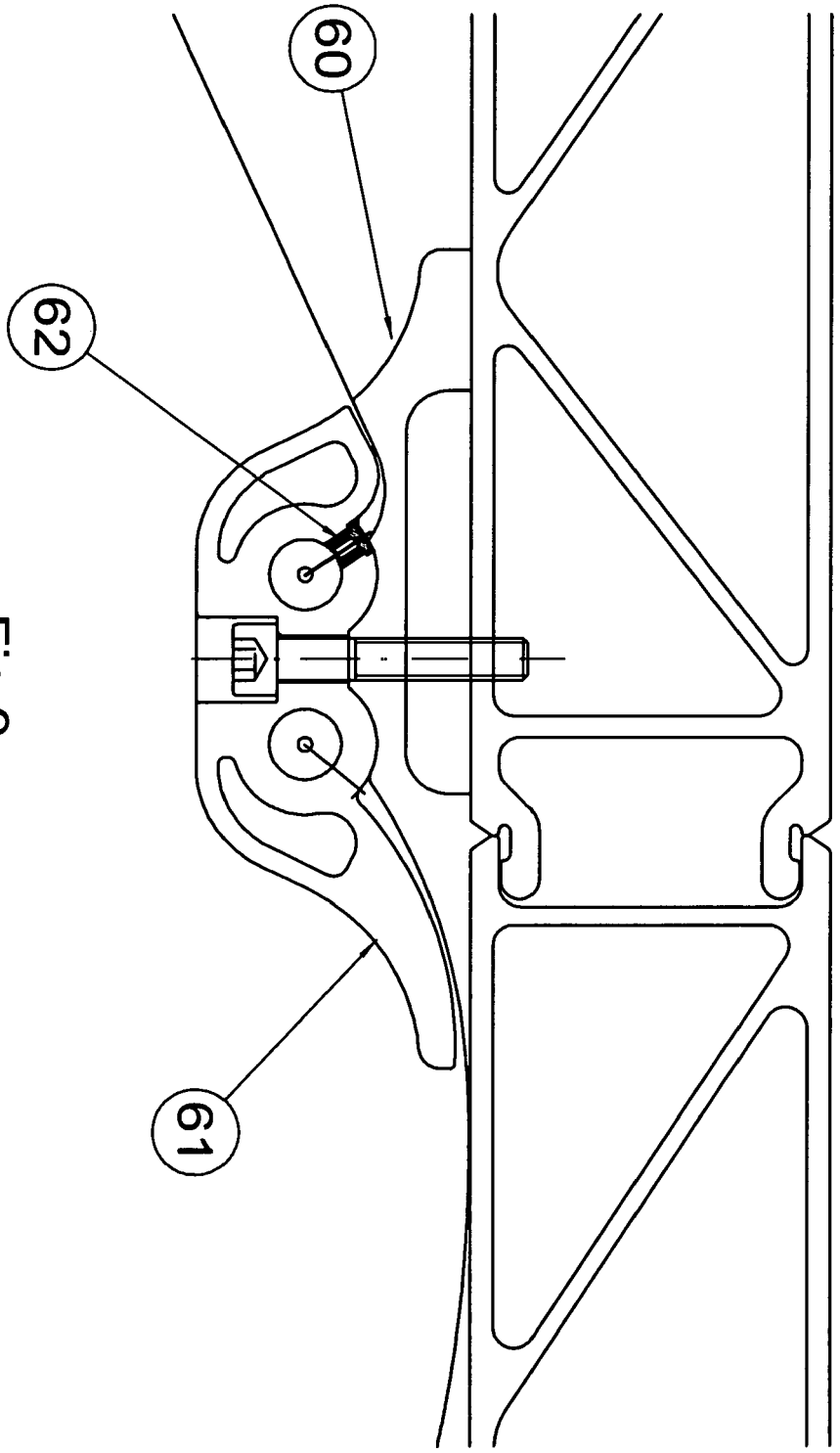


Fig.9

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EUROPEAN SEARCH REPORT

Application Number
EP 10 42 5106

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* abstract; figures 1,2,5 *	3,9	ADD.
X	DE 10 2007 004051 A1 (FOGTEC BRANDSCHUTZ GMBH & CO [DE]) 31 July 2008 (2008-07-31)	1,2	A62C3/07
A	* figures * * paragraphs [0035], [0043] *	3,5	
A	US 4 079 786 A (MOLING LEROY I) 21 March 1978 (1978-03-21) * figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

A62C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 August 2011	Nehrdich, Martin

CATEGORY OF CITED DOCUMENTS

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