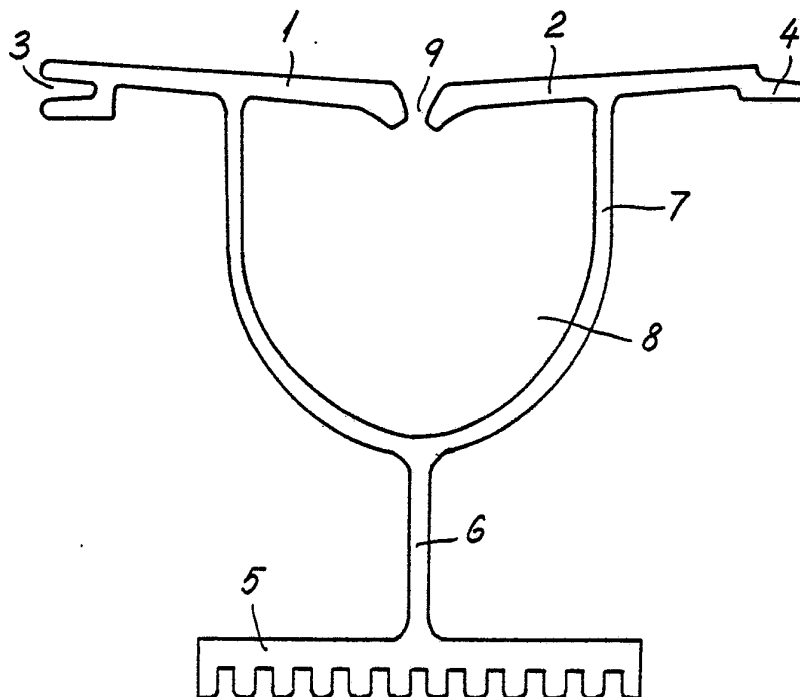




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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**(54) Title:** LANDING DECK FOR AIRCRAFTS**(57) Abstract**

Landing deck for aircrafts, in particular for helicopters, on seagoing vessels and offshore installations, such as platforms. When fuel is leaking from a helicopter after an accident, as for instance an unsuccessful landing, a fire often starts. In order to reduce the combustion intensity and the duration of such a fire continuous grooves or channels (8) are formed in beams of steel or metal, of which the deck is made, in the surface facing upwardly. Thereby fuel which has leaked out will be collected in the grooves or channels. The air supply to the grooves or channels is poorer than the air supply to fuel situated on decks without grooves or channels, and the combustion intensity, therefore, is reduced. Moreover, the combustion takes place on the surface of the liquid, and it is possible to drain a substantial part of the fuel without ignition thereof. Fuel may be collected from the grooves or channels by means of a collecting manifold or gutter.

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### Landing Deck for Aircrafts

The present invention relates to a landing deck for aircrafts, and in particular, but not exclusively, a helicopter deck of the type used on seagoing vessels and installations, such as offshore platforms.

It is desirable to protect such decks against fire. There is always a danger of accidents and damage, to a larger extent than on airfields, because of adverse weather conditions and because the deck follows the movements of the vessel or platform. In an accident fuel from a helicopter may leak out and be spread along the deck, and the fuel may be set on fire. The ignition may lead to a serious fire, and the combustion intensity may be very high when the fuel is spread out on a relatively smooth surface, causing that the fuel exposes a large surface to the air. It is of course desirable to limit and to stop such a fire as soon as possible, and it is known to provide systems adapted to coat the deck with foam in order to stop the fire. It is of course also known to place extinguishing equipment, such as foam extinguishers, on or near the decks, and, moreover, it is known to provide channels in the runways of airfields, for spraying of foam. In Norwegian Acceptance Print No. 139.526 is described means adapted to coat a helicopter deck with foam in order to stop a fire, whereby a framework is placed above a planar deck and a lattice work above the framework. In the cavities thereby formed below the lattice work are provided apertures for spraying of foam. The purpose of this is among else to prevent that the foam being sprayed is blown away without giving any fire extinguishing effect.

Thus, the known systems first of all concern means for extinguishing a fire in fuel which has been spread along a deck.

The object of the present invention is to provide means leading to a reduced intensity and duration of a possible fire on a deck, said means being "passive" means included in the deck, i.e. means which without any action are operative in case of a fire, without the need of starting the operation of an extinguishing system. The invention is, however, not restricted to the use of such means separately, and "active" means, such as a foam spraying system, may be used additionally.

Said object is achieved by means of a landing deck as defined in the succeeding patent claims.

The invention is among else based upon the fact that the combustion intensity by the combustion of a certain amount of combustible liquid usually increases with the size of the free surface of the liquid, and that said intensity is not influenced by the depth of the liquid below said free surface. Thus, it is in the principle possible to restrict the intensity of the combustion by restricting the free surface.

Moreover, the combustion intensity of a liquid in a container which is open at the top will depend on the ration between the size of the upper aperture of the container and the distance from said aperture to the liquid surface. When the container aperture is sufficiently small relatively to said distance, combustion on the liquid surface will extinguish by itself after a short time. In containers having equally large upper apertures the combustion intensity will decrease with increasing distance to the liquid surface.

A main idea on which the invention is based is to take advantage of these facts, by providing grooves in at least some of the beams of the deck, in order to reduce the combustion intensity. Another main idea is to drain the liquid rapidly from the deck during a fire, in order to reduce the amount of liquid set on fire.

Thus, when combustible liquid, such as helicopter fuel, is spread on a deck constructed in accordance with the present invention and set on fire, the liquid will very rapidly flow down into the grooves. Only portions of the beams remaining between the grooves will be wetted by liquid, and said liquid will either burn or vaporize. Most of the liquid will flow down into the grooves. There, the liquid may burn, but with a much lower intensity than when burning on a planar deck surface without grooves. Moreover, the liquid in the grooves is protected against the radiation heat from liquid burning on the deck surface, and it is possible to achieve that most of the liquid is drained from the deck without being set to fire. For the purpose of the drainage the deck may have an inclination, and collecting gutters or manifolds may be provided in order to collect liquid from all the grooves and to direct it away from the deck.

When a deck in accordance with the invention is constructed of extruded beams of aluminium or an aluminium alloy the grooves may of course be formed during the extrusion. The same applies to steel beams. For beams formed in another manner, for instance by rolling, the grooves may also be formed by the manufacture of the beams. To the extent it is warrantable with respect to strength and stability grooves may also be formed in existing decks, e.g. by milling, or by sawing through the beams and subsequently mounting of gutters on the underside of the beams, below the sawn slits.

The grooves may be undercut, i.e. have an upper opening which is narrow relatively to the space below the opening. Thereby the supply of air to the grooves will be choked, and simultaneously the volumetric capacity of the grooves will be large.

When the invention is used on floating installations which may move in such a manner that the inclination of the deck is changed, the deck should be inclined in the direction of the

grooves, from the middle towards each end, or from each end towards the middle, in order to secure that drainage of the liquid is achieved. Inclination merely in one direction towards a manifold brings about the risk that the inclination may be "negative" because the installation takes an opposite inclination.

In order to further increase the effect of the invention the surface of the beams may be inclined in the transverse direction, towards the grooves, so that the liquid flows rapidly down into the grooves.

The invention will hereinafter be explained by means of the accompanying drawing, showing the cross section of a deck beam for the construction of a deck in accordance with the invention, and it will be appreciated that several such beams are placed side by side in order to constitute the deck.

The beam shown, which may appropriately be made by extrusion of metal, comprises two upper flanges 1, 2, a lower flange 5 and a web 6, and two channel walls 7 connect the web and each of the upper flanges 1, 2. Thus, the channel walls 7 define a groove 8, which at the top is open through a slit 9. Along the edges of the upper flanges 1, 2 are shown a slot 3 and a tongue 4, respectively, for joining to corresponding beams, possibly by placing of sealing means between the beams.

As shown, the two upper flanges 1, 2 are inclined in the transverse direction, inwardly towards the slit 9. This brings about that liquid on the upper side of the upper flanges will flow rapidly towards the slit 9 and therethrough.

The beam shown has a cross section in which the walls 7 defining the groove 8 constitute supporting parts of the cross section. Within the scope of the invention the grooves 8 may of course be formed in more massive beams, and the grooves may have substantially smaller cross sections than the one shown,

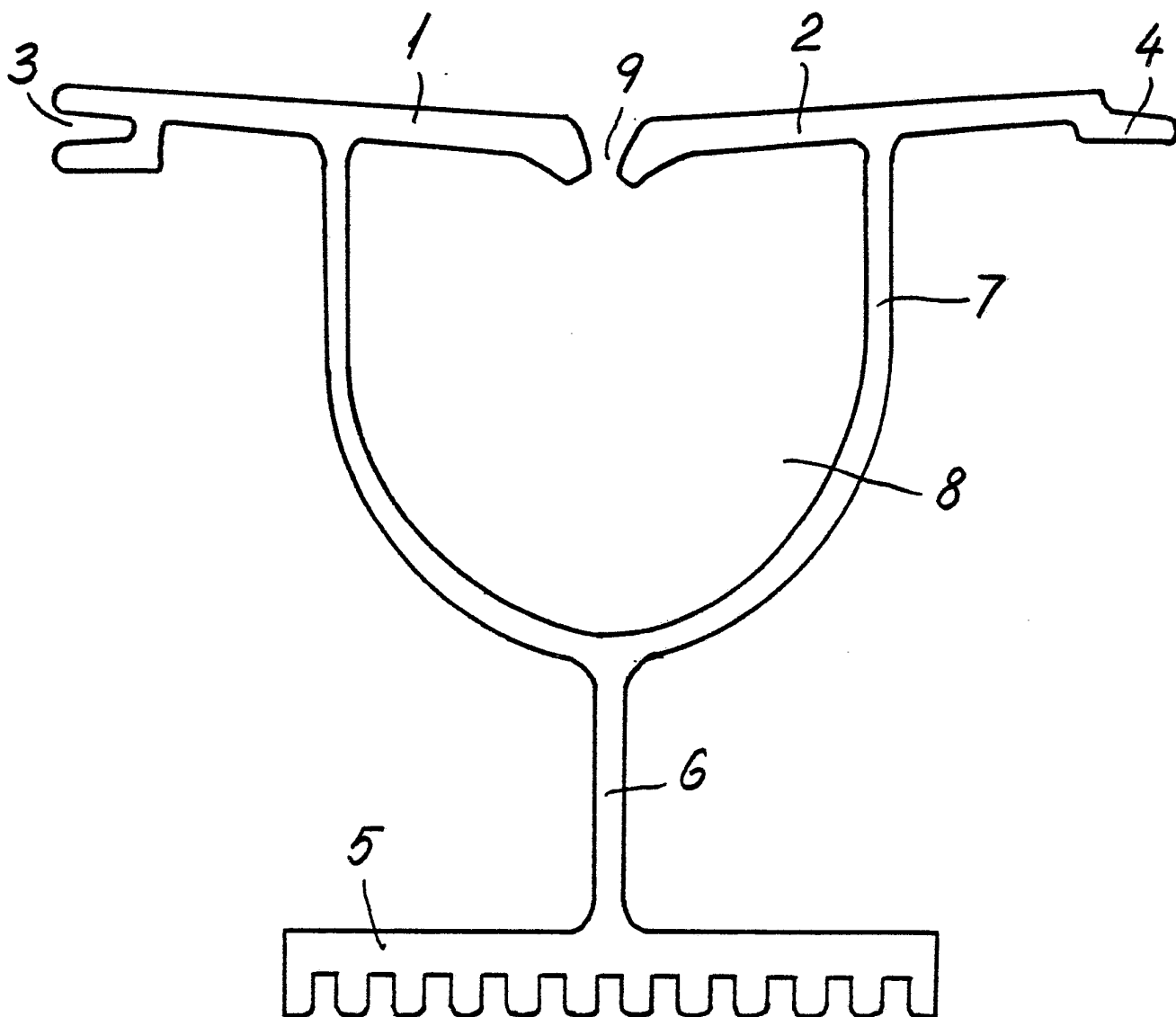
relatively to the main dimensions of the beam.

Additionally to grooves for the drainage channels may also be provided for supply of foam for fire extinguishing.

CLAIMS.

1. Landing deck for aircrafts, comprising of beams, characterized in that at least some of the beams have longitudinal, continuous channels (8) which are open at the top, through slits (9) in the upper side of the beams, said beams being inclined in their longitudinal direction.
2. Landing deck as defined in claim 1, characterized in that said slits (9) have a width which is substantially less than the maximum width of said channels (8).
3. Landing deck as defined in claim 1 or 2, characterized in that said channels (8) are defined by walls (7) which support upper flanges (1, 2) making the upper sides of the beams.
4. Landing deck as defined in claim 1 to 3, characterized in that at least one collecting manifold or gutter is provided in the transverse direction of said channels and communicate therewith and are connected to at least one drainage conduit.

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## INTERNATIONAL SEARCH REPORT

PCT/NO85/00041

International Application No

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| <b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                          |                                                                   |
| According to International Patent Classification (IPC) or to both National Classification and IPC 4<br>B 64 F 1/00, E 01 F 3/00, E 04 D 11/00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                          |                                                                   |
| <b>II. FIELDS SEARCHED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                          |                                                                   |
| Minimum Documentation Searched 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                          |                                                                   |
| Classification System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Classification Symbols                                                                   |                                                                   |
| IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | B 64 F 1/00; E 01 F 3/00; E 04 D 11/00                                                   |                                                                   |
| US C1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 52:578, 579, 581, 588; 114:261; 244:114                                                  |                                                                   |
| Documentation Searched other than Minimum Documentation<br>to the extent that such Documents are Included in the Fields Searched *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                          |                                                                   |
| SE, NO, DK, FI classes as above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                          |                                                                   |
| <b>III. DOCUMENTS CONSIDERED TO BE RELEVANT *</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                          |                                                                   |
| Category *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Citation of Document, 11 with indication, where appropriate, of the relevant passages 12 | Relevant to Claim No. 13                                          |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | NO, B, 148 328 (MAGNUS BIRKELAND)<br>13 June 1983                                        |                                                                   |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | US, A, 3 555 762 (N J COSTANZO Jr)<br>19 January 1971                                    |                                                                   |
| <p>* Special categories of cited documents: 10</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&amp;" document member of the same patent family</p> |                                                                                          |                                                                   |
| <b>IV. CERTIFICATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                          |                                                                   |
| Date of the Actual Completion of the International Search<br>1985-09-09                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                          | Date of Mailing of this International Search Report<br>1985-09-11 |
| International Searching Authority<br>Swedish Patent Office                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                          | Signature of Authorized Officer<br>Björn Salén <i>Björn Salén</i> |