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Guering

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(54) **OVERHEAD PANEL FOR AN AIRCRAFT COCKPIT AND AIRCRAFT INCLUDING SUCH A PANEL**

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H05K 5/02	(2006.01)
H05K 13/00	(2006.01)

(52) **U.S. Cl.**

CPC ***H05K 5/0017*** (2013.01); ***B64D 43/00*** (2013.01); ***H05K 5/0026*** (2013.01); ***H05K 5/0247*** (2013.01); ***H05K 13/00*** (2013.01); *Y10T 29/49117* (2015.01)

(58) **Field of Classification Search**

CPC G06F 1/181
USPC 361/730
See application file for complete search history.

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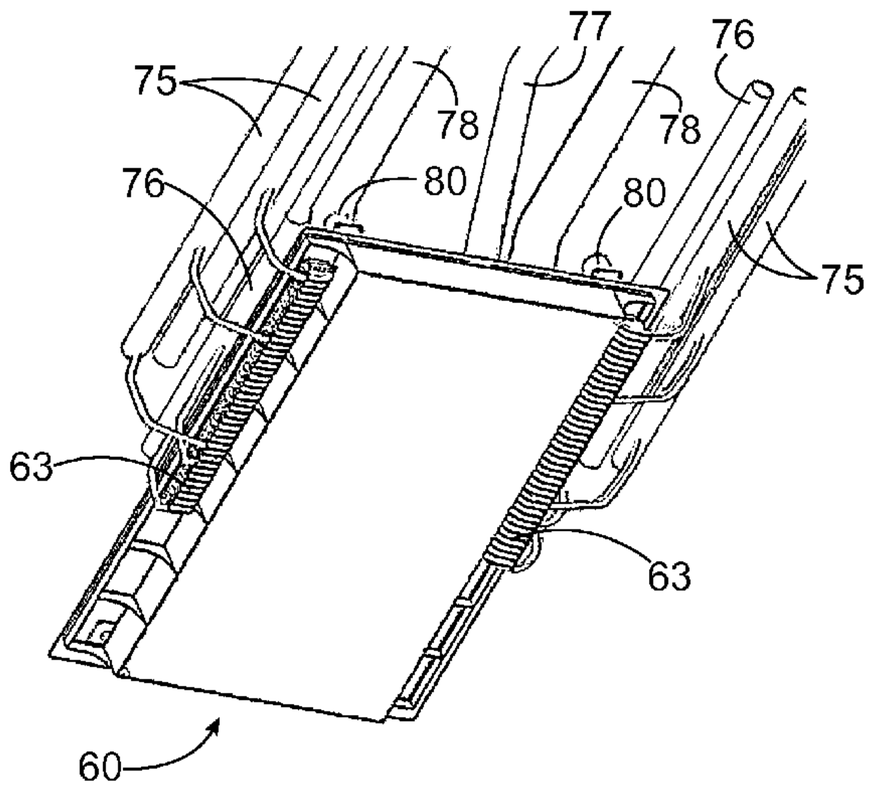
(57) **ABSTRACT**

The invention relates to an overhead panel able to be positioned in an aircraft cockpit, which includes an assembly of independent submodules (**67**), each of which is associated with a particular system or a particular function of the aeroplane, incorporated in a rigid self-supporting module (**60**), including a front face (**65**) to which the submodules (**67**) are attached, and two side faces fitted with peripheral electrical connectors (**63**) intended to be connected to different systems of the aeroplane.
The invention also relates to a method of manufacture of such a panel.

10 Claims, 6 Drawing Sheets



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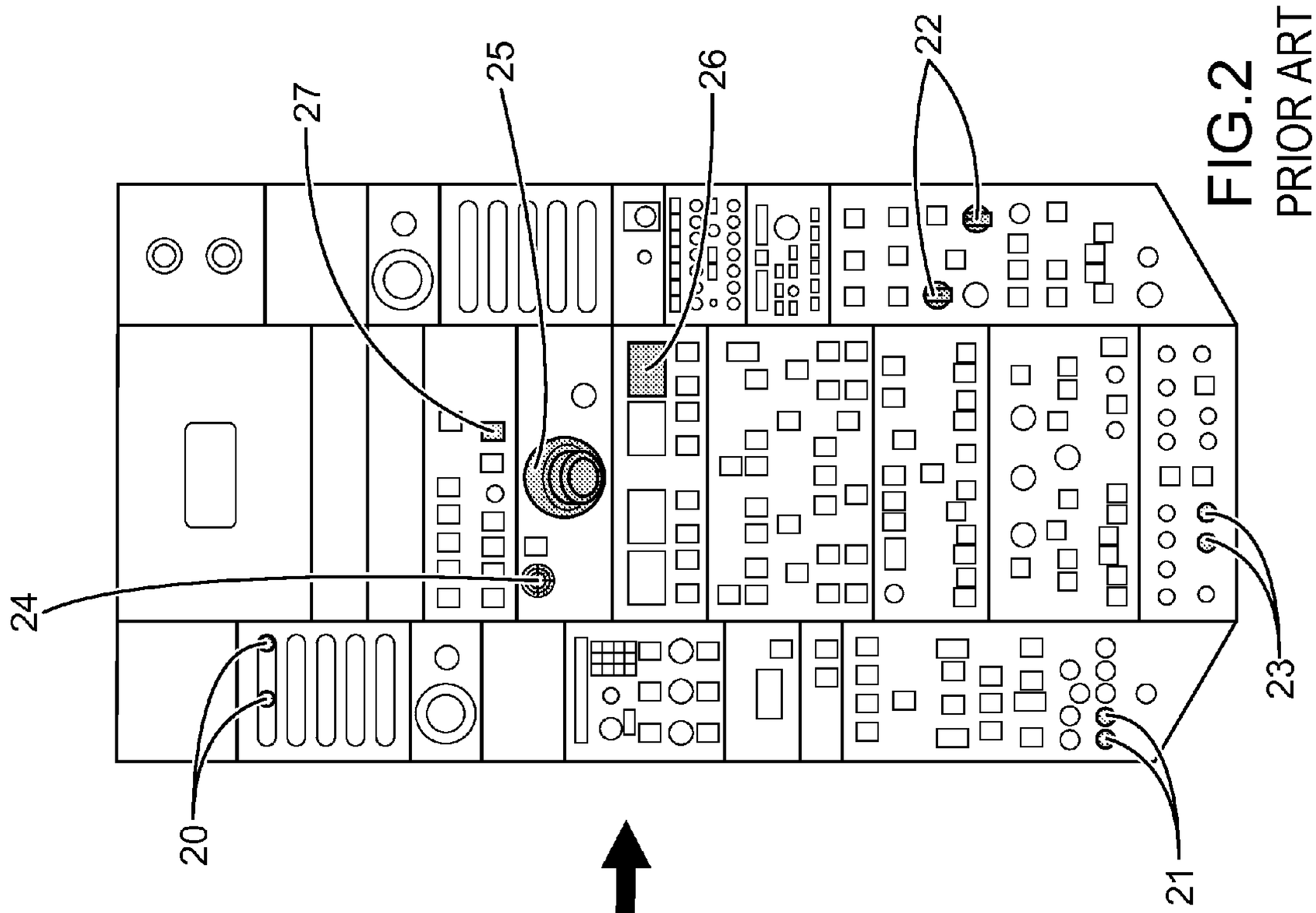


FIG.2
PRIOR ART

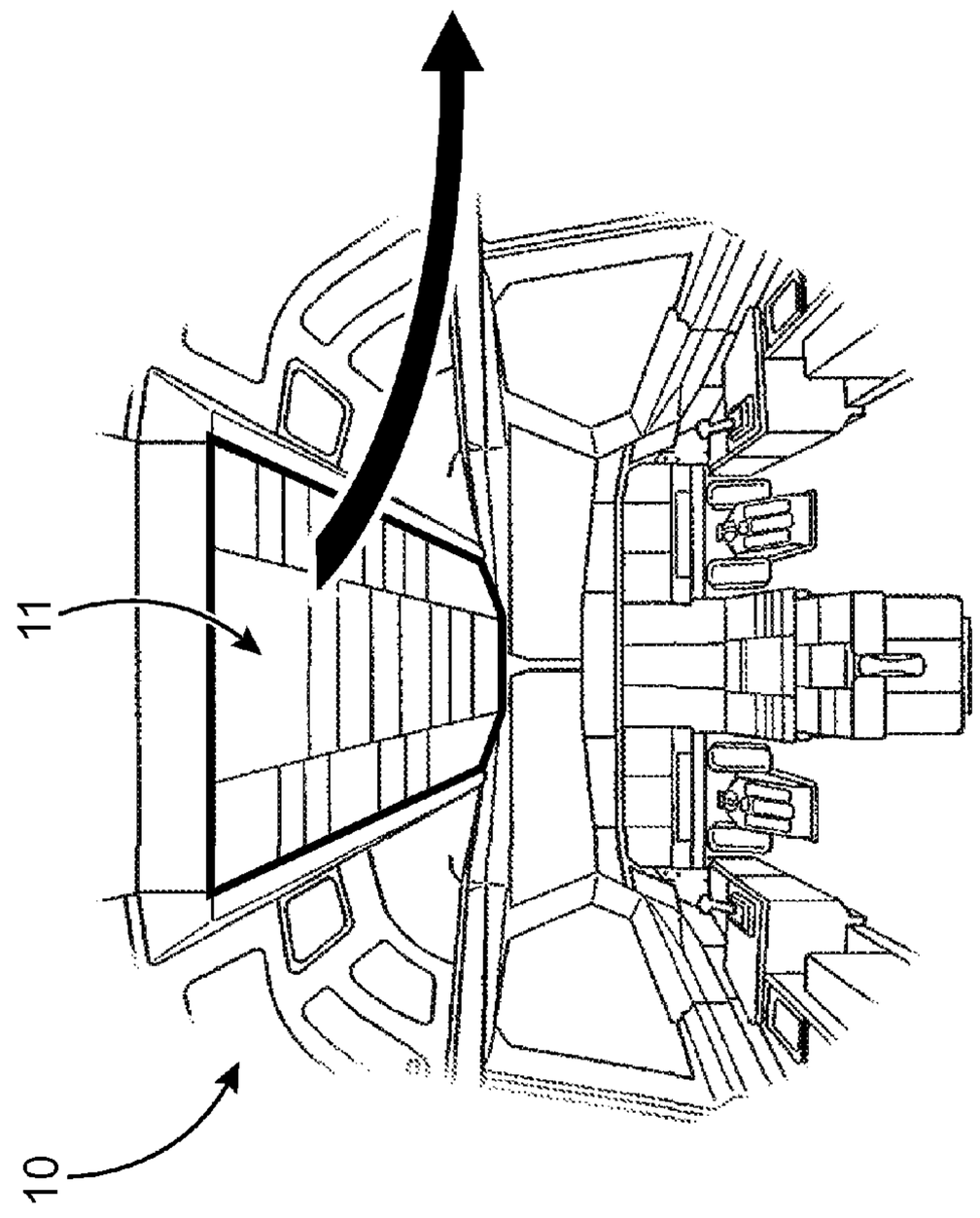
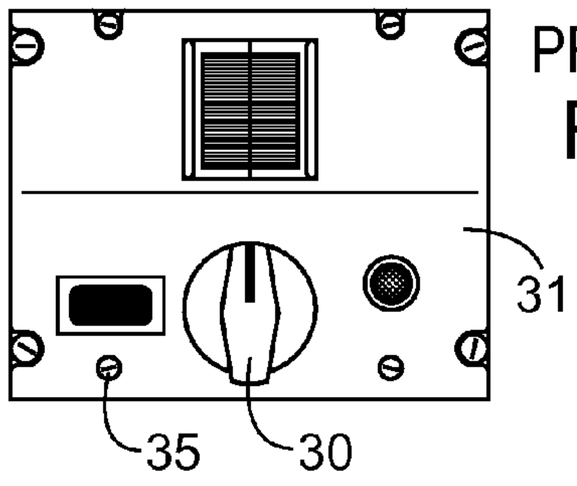
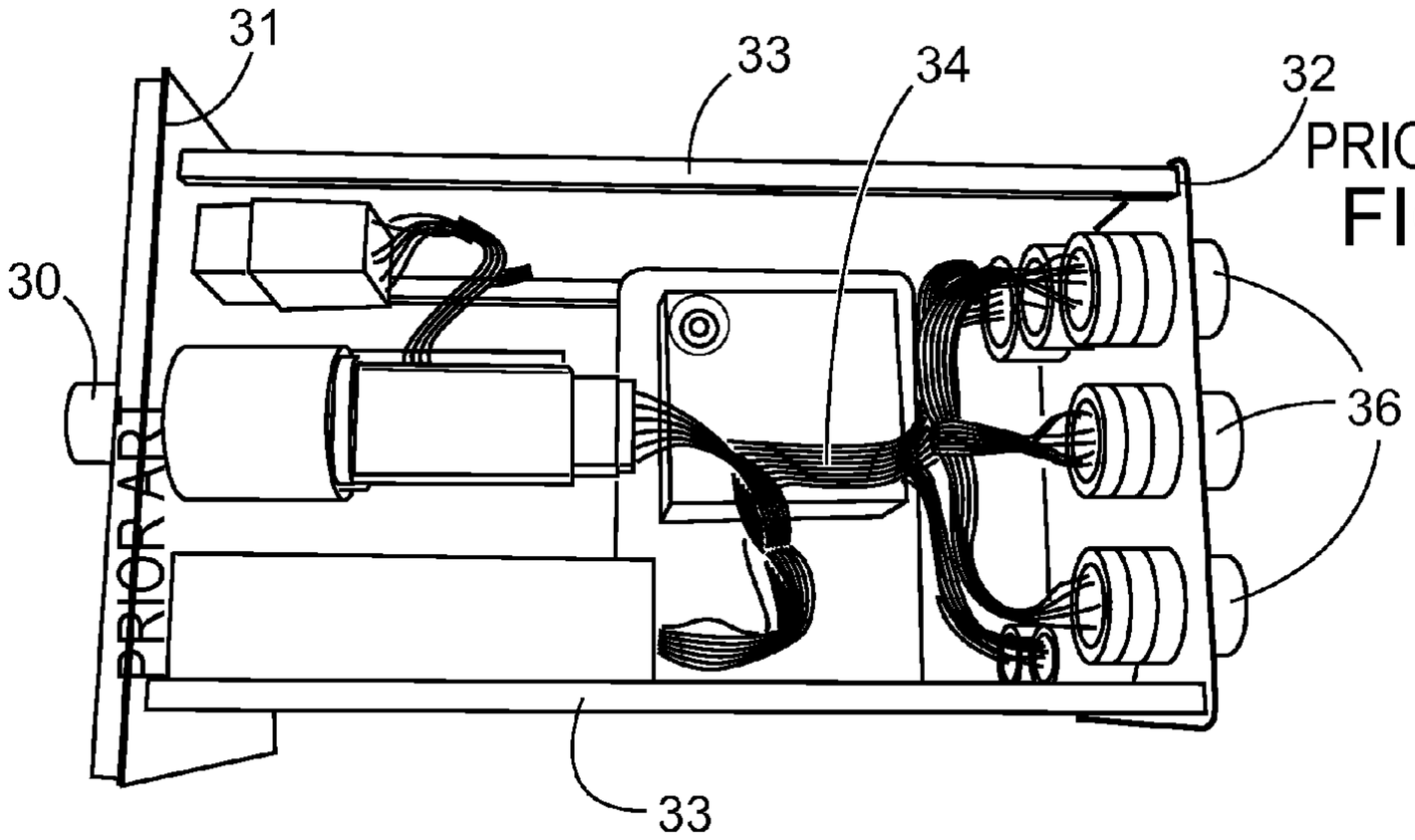


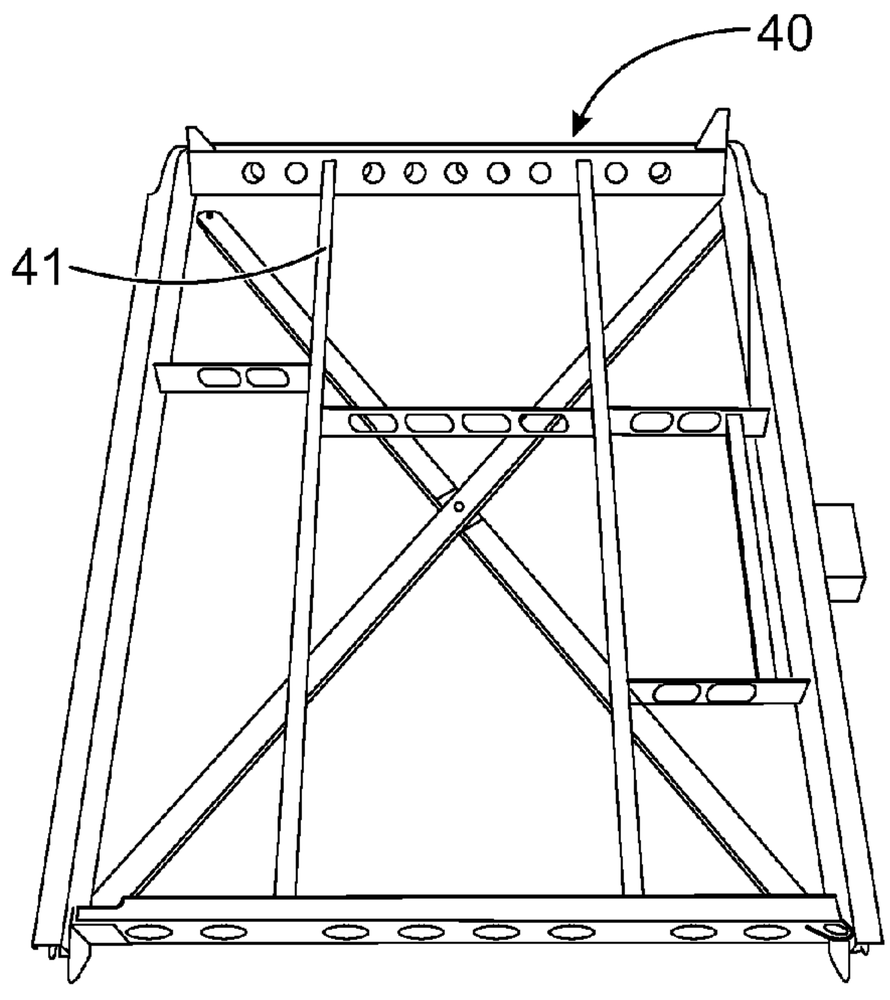
FIG.1
PRIOR ART



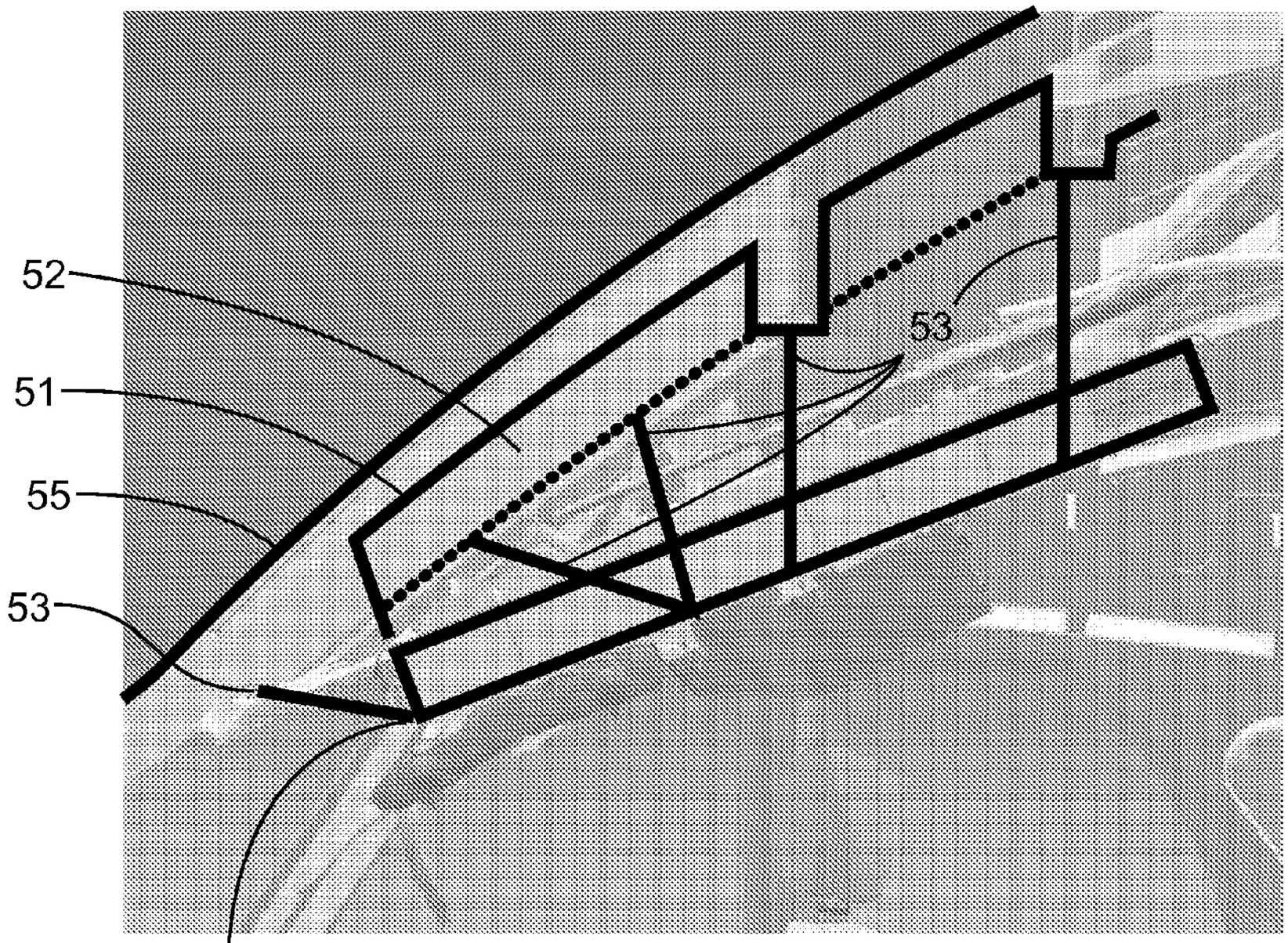
PRIOR ART
FIG.3



PRIOR ART
FIG.4



PRIOR ART
FIG.5



PRIOR ART
FIG.6

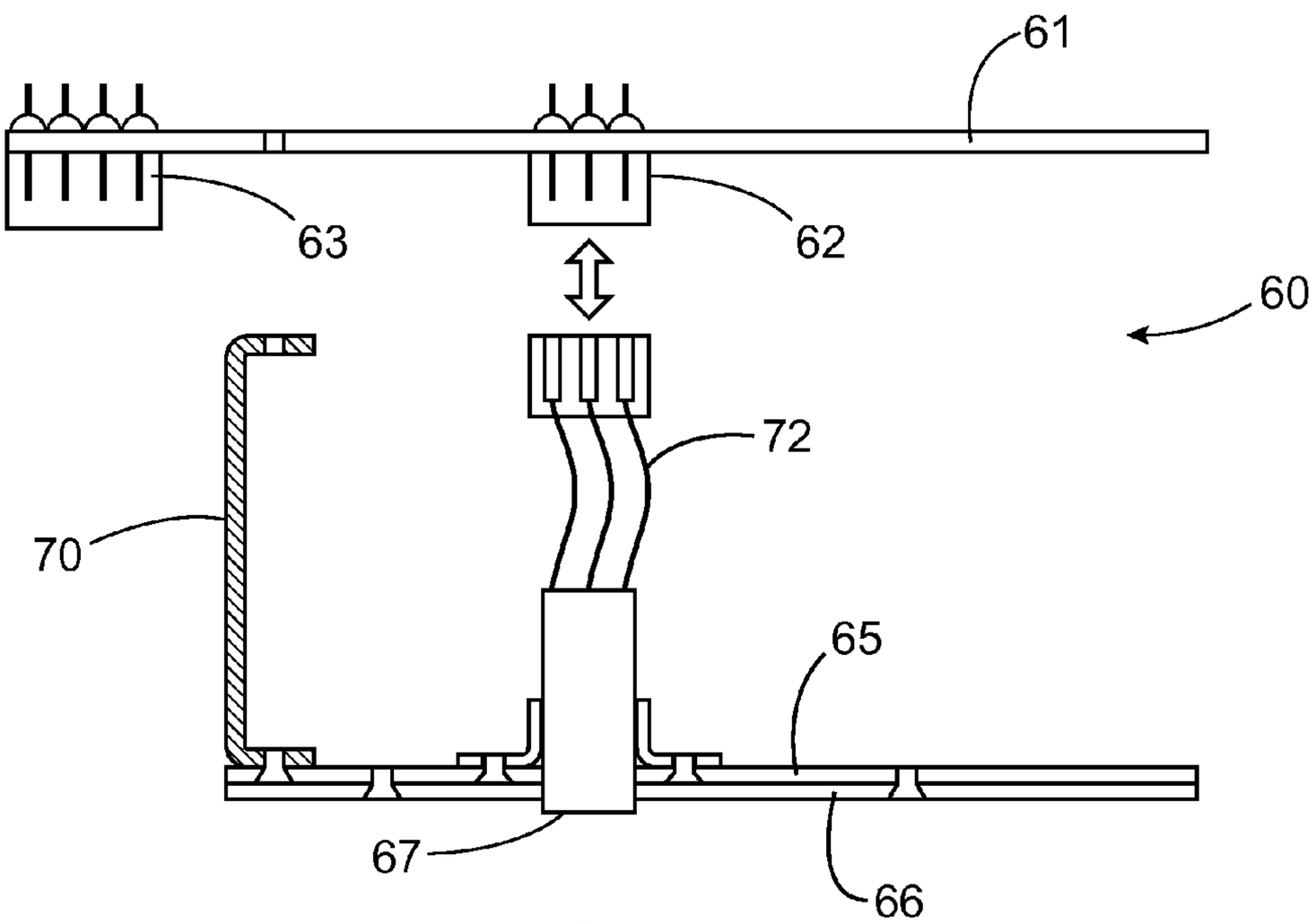


FIG.7

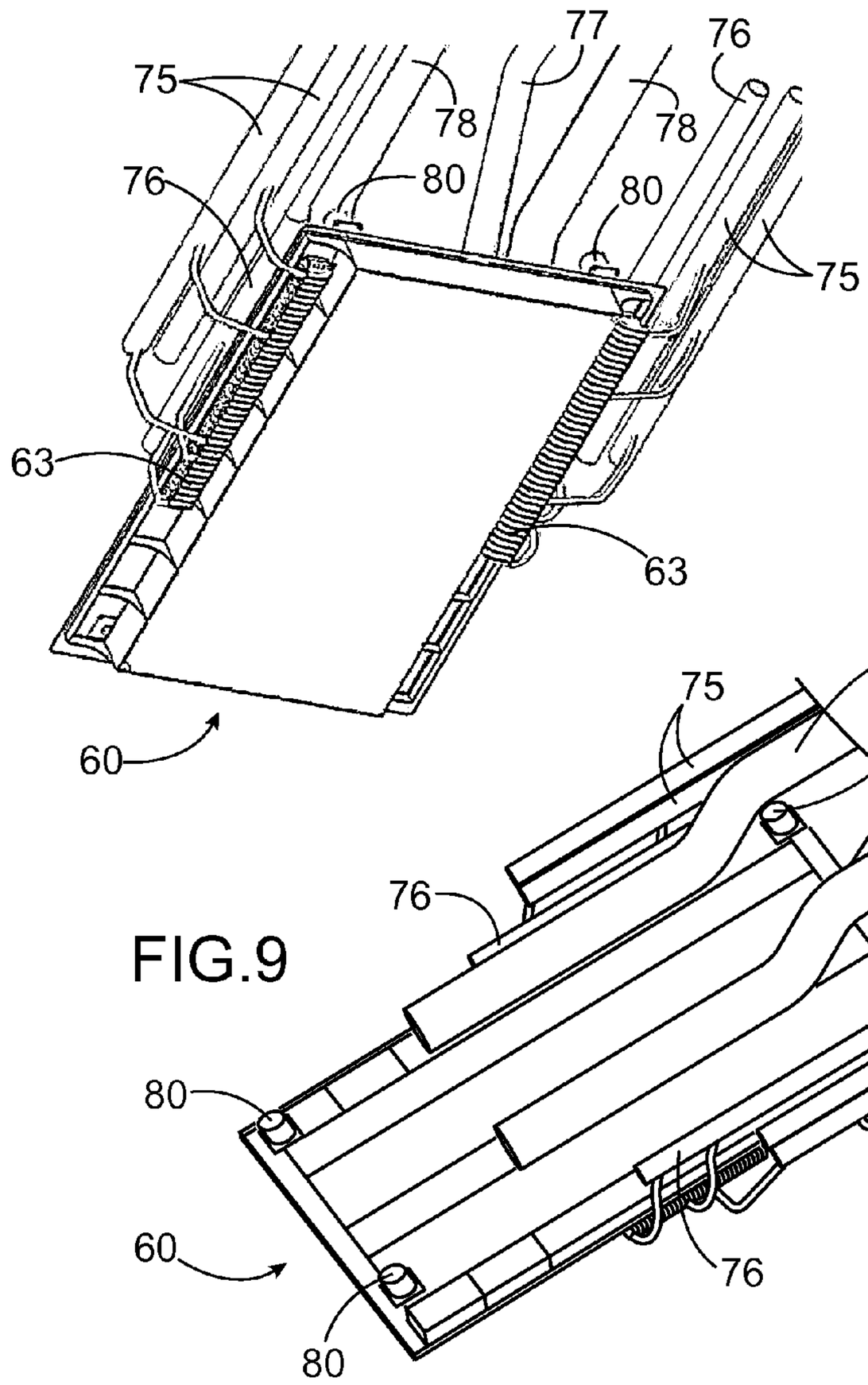


FIG.8

FIG.9

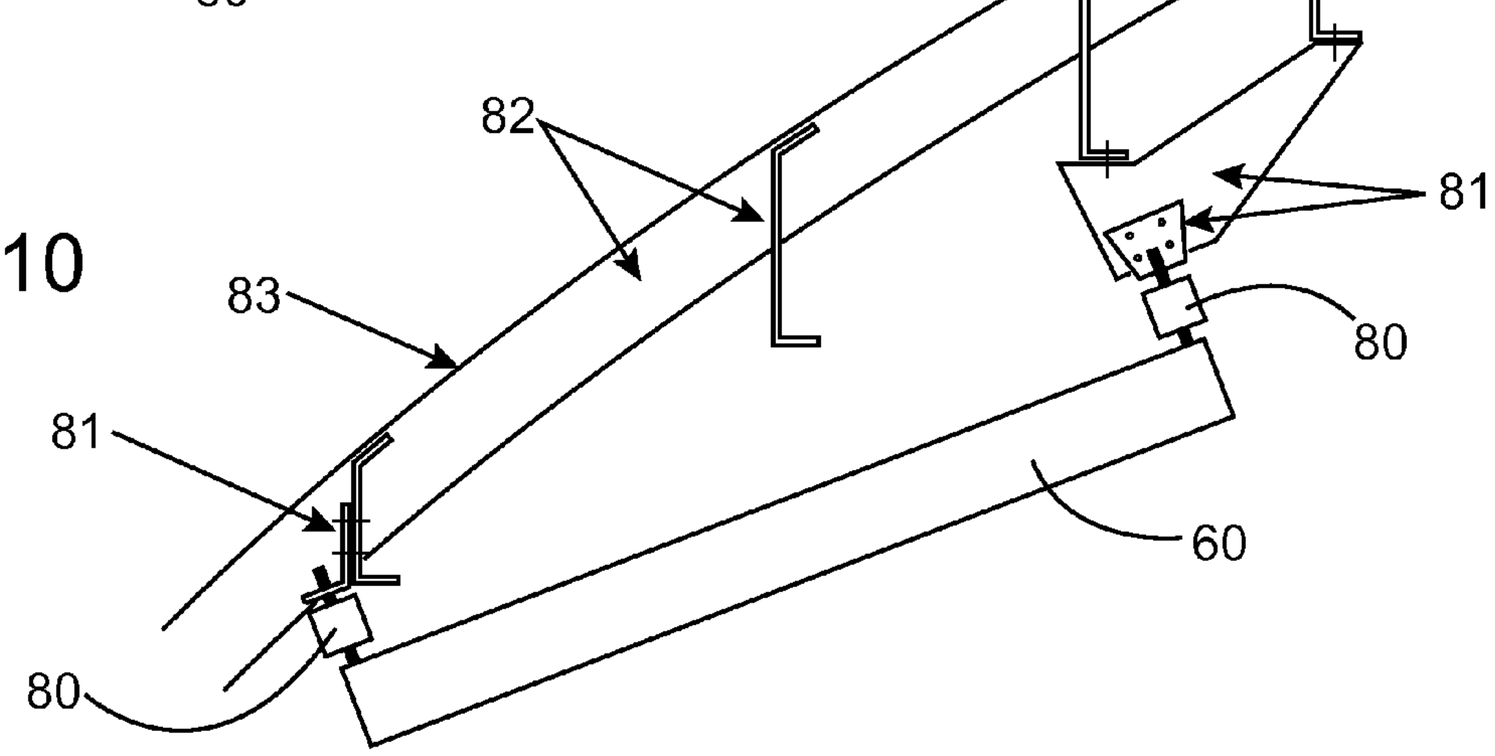


FIG.10

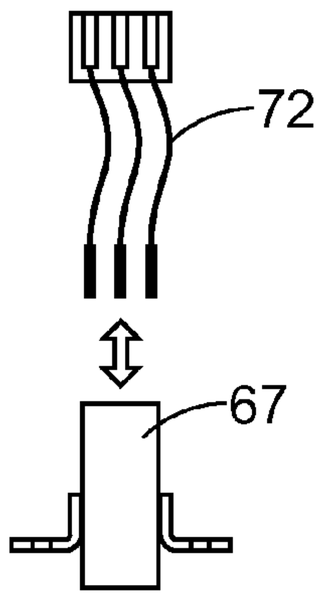


FIG.11A

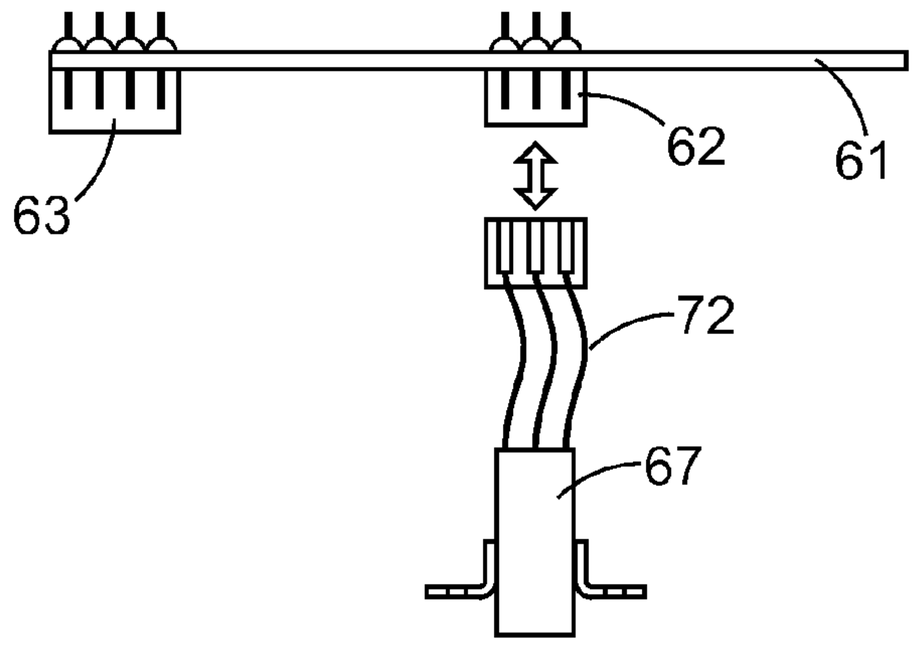


FIG.11B

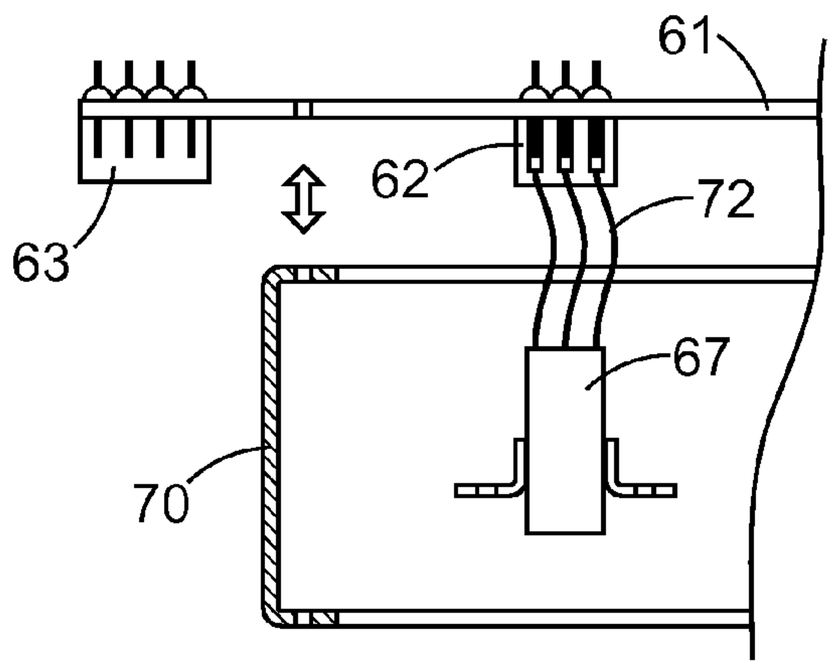


FIG.11C

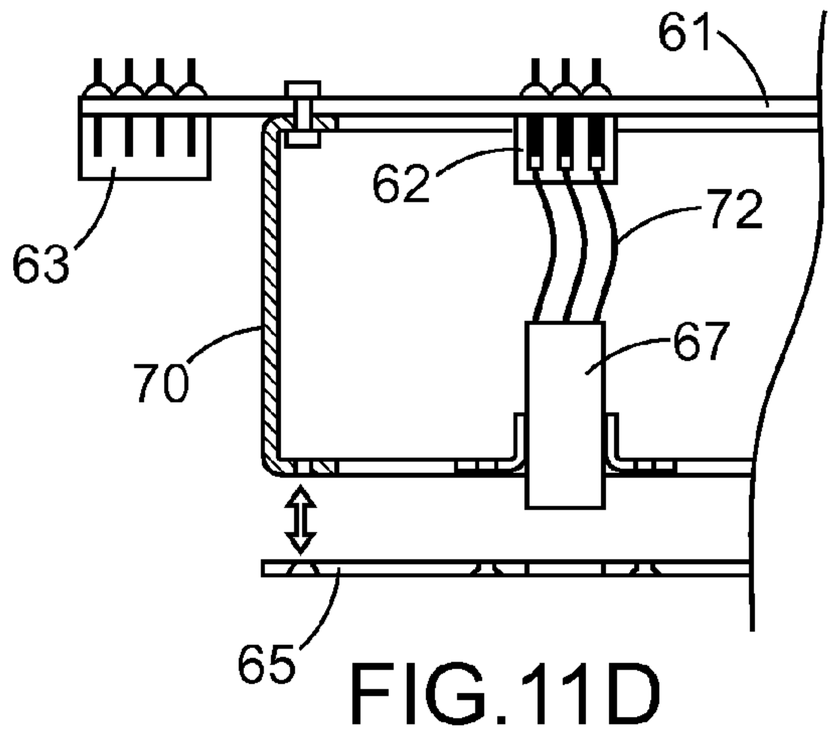


FIG.11D

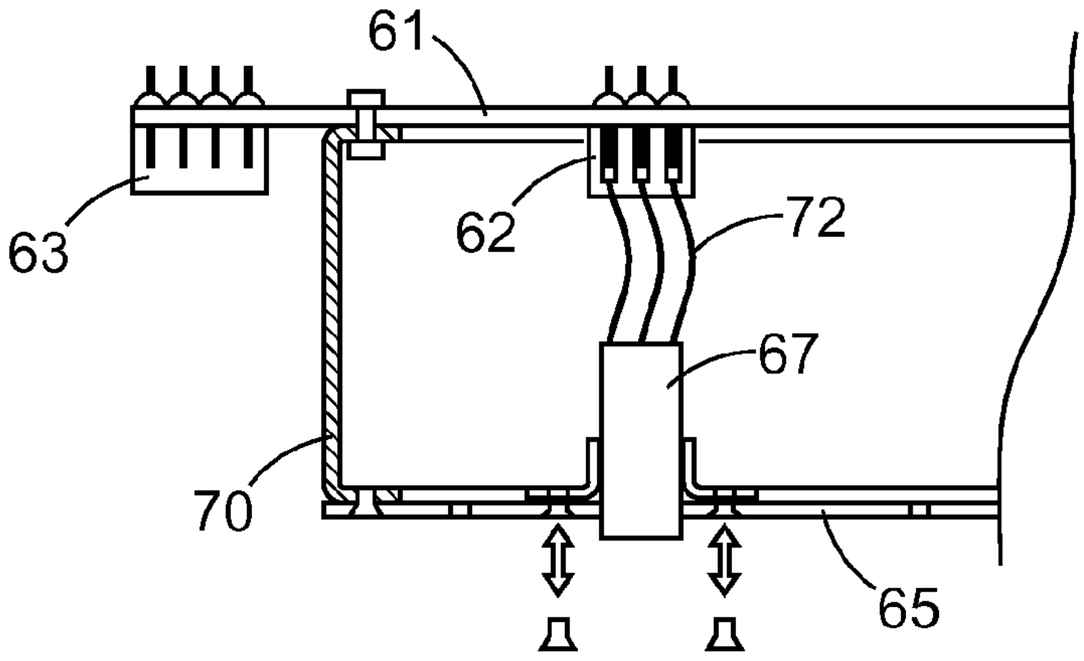


FIG.11E

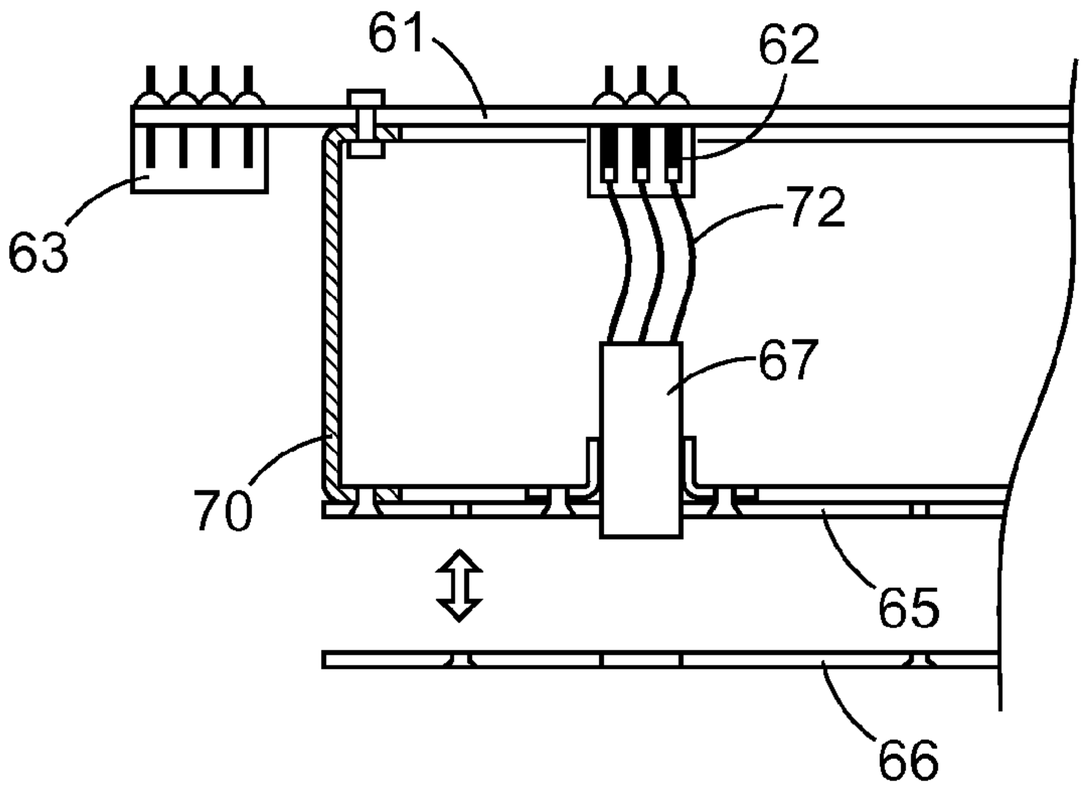


FIG.11F

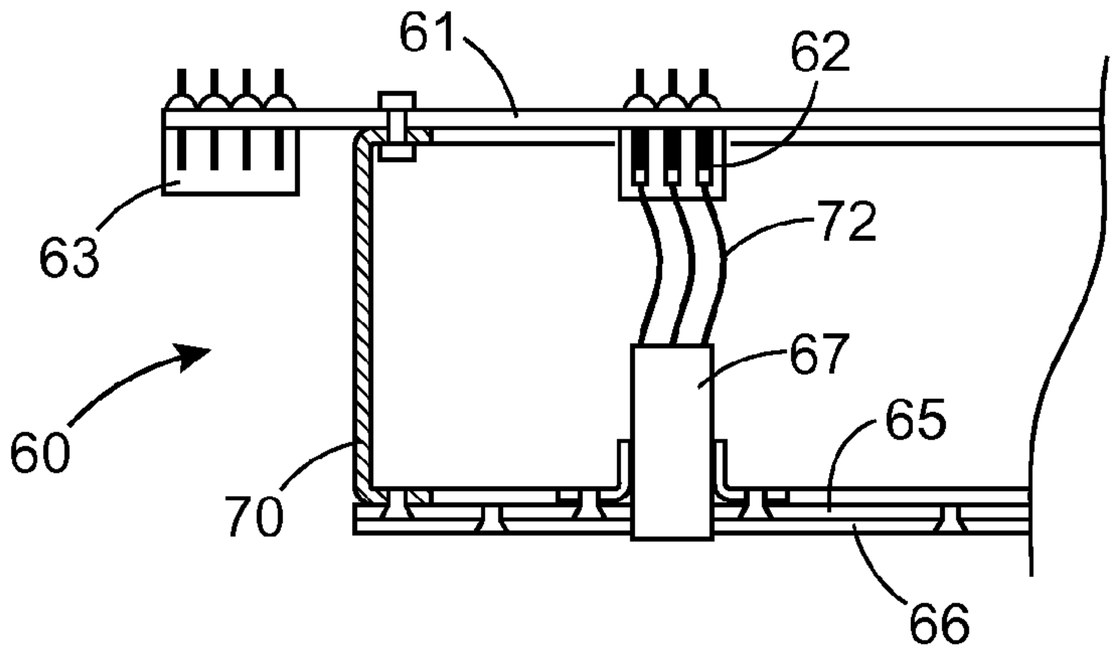


FIG.11G

OVERHEAD PANEL FOR AN AIRCRAFT COCKPIT AND AIRCRAFT INCLUDING SUCH A PANEL

TECHNICAL FIELD

The invention relates to an overhead panel for an aircraft cockpit and an aircraft including such a panel.

In the remainder of the document, for the sake of simplification of the description, an aircraft of the aeroplane type is considered.

STATE OF THE PRIOR ART

The invention is involved in a context of a search for overall improvement of aeroplanes' nose sections. In this context, all the major components of the cockpits, as described for example in the document entitled [1] "Cockpit-ATA100 Chapter 25-10-20" ("Airbus A340/A330 System description note", Sep. 15, 1993), are concerned, notably the overhead panel located above the pilots, the role of which is to give a simplified instantaneous status of the aeroplane's main systems.

Such an overhead panel **11**, which is illustrated in FIGS. **1** and **2** respectively in an aeroplane cockpit **10**, as seen from the front, consists of independent submodules. Each submodule is associated with a particular system or with a particular function. This may, for example, be:

a circuit breaker **20**,
a pushbutton **21**,
a multi-position selector dial **22**,
an inverter **23**,
a beeper **24**,
a reading light **25**,
a fire pull handle **26**,
a multi-stage pushbutton light **27**.

It covers an area of approximately 100 mm×600 mm.

As illustrated in FIGS. **3** and **4**, each submodule, in this case a multi-position selector dial **30**, includes a front plate **31** and a rear plate **32**, connected together by small columns **33**. On front plate **31** quick-release fasteners **34** of the said submodule and fasteners **35** of an illuminated label, for example a plexiglass plate which is etched and illuminated from within, or a luminescent plate, are represented. Each submodule **30** is connected to one or more rear connectors **36**, attached to rear plate **32**, by a connection harness **34**. Such a harness **34** is wired, with the rear plate swivelled through 180°.

The submodules assembly is attached to a support frame **40**, fitted with attachment strips **41**, as illustrated in FIG. **5**. This support frame is itself attached rigidly to a drip shield, closely following the shape of the fuselage, which forms a protective shell positioned as close as possible to the structure of the aeroplane to resolve the technical problems posed by bird strikes on the cabin, by vibrations, by dripping water (condensation on the ceiling structure), and through fretting of the contacts.

FIG. **6** illustrates, in the structure of the aeroplane, this drip shield **51**, volume **52** dedicated to storage of wiring, where the face of the structural attachment connecting rods **53** allows a rigid connection between this drip shield **51** and support frame **54** of the overhead panel. Reference **55** illustrates the area sensitive to bird strikes.

The overhead panel of the prior art has many disadvantages:

being complex to produce (too many modules and too many parts required for its assembly) and is therefore costly,
demanding volume (need for a drip shield for attachment to the structure of the aeroplane) and high weight,
delicate installation (accessibility of wiring) which is difficult to inspect,
aerodynamic constraint (essential requirement in designing a shape of an aeroplane nose section),
electrical segregation (1/2),
substantial additional wiring length (problem of storage in rear area) and storage of wiring in blind fashion.

The object of the invention is to overcome all these disadvantages in a radical fashion by incorporating into a single module an assembly which has hitherto consisted of multiple elements positioned on an independent frame.

DESCRIPTION OF THE INVENTION

The invention relates to an overhead panel able to be positioned in an aircraft cockpit, characterised in that it includes an assembly of independent submodules, each of which is associated with a particular system or a particular function of the aeroplane, incorporated in a rigid self-supporting module, for example of parallelepipedic shape and less than 100 mm thick, including a front face to which the submodules are attached, and two side faces fitted with connectors intended to be connected to different systems of the aeroplane.

The self-supporting module advantageously includes:

a rear plate including an integrated circuit plate to which central electrical connectors and peripheral connectors are welded,
a front plate, to which the submodules are attached,
a perimeter frame providing the junction between these two rear and front plates, over the entire periphery of the module;
standard micro-harnesses, each enabling a connection to be made between a submodule and a central connector positioned on the rear plate.

Advantageously, an illuminated label is positioned on the front plate.

Advantageously, the front plate includes a metal sheet in which weight reduction and accessibility holes are made.

Advantageously, the overhead panel includes dampening pins positioned on the rear surface of the rear plate, for example in each of the corners of this rear surface.

Advantageously, the rear plate may include an integrated circuit plate the final layer of which is an anti-condensation layer, or a small panel made of thermoplastic material.

The invention also relates to a method for manufacturing the overhead panel which includes the following steps:

integration of the mini-harnesses on the submodules,
clipping of each of these mini-harnesses on the corresponding central connectors previously welded on the integrated circuit plate,
attachment of the assembly formed in this manner to the perimeter frame,
docking of the front plate, ensuring that each of the submodules is centred in a corresponding recess of the front plate,
attachment of the submodules, on the front plate through the rear face.

The overhead panel of the invention has the following advantages:

Production as a rigid self-supporting module (6 working faces) including a rear plate consisting of an integrated circuit, a front plate, where these plates are connected to

one another by a perimeter frame, an illuminated label attached to the front plate, where all the submodules are attached to the front plate, where all the connection components are welded (one operation) on the rear plate, and standardised, prefabricated interface mini-harnesses connect the submodules and the connection components,

elimination of the frame of the prior art,

elimination of the drip shield,

secure wiring, with direct access, and no excess lengths,

flexible installation with four dampeners (anti-impact and anti-vibration protection),

high-density circuit-breaker connectors positioned laterally (direct access to the attachments, segregation of the system),

integrated drip protection,

reduction of the overall volume (elimination of the frame/constant thickness less than 100 mm).

BRIEF DESCRIPTION OF THE ILLUSTRATIONS

FIGS. **1** and **2** illustrate an overhead panel of the prior art positioned respectively in the cockpit of an aeroplane and as seen from the front,

FIGS. **3** and **4** illustrate a submodule of the overhead panel of the prior art,

FIG. **5** illustrates the frame mount of the overhead panel of the prior art,

FIG. **6** illustrates the attachment of the overhead panel of the prior art to the structure of the aeroplane,

FIG. **7** illustrates a partial schematic view of the overhead panel of the invention,

FIGS. **8** and **9** illustrate the overhead panel of the invention, respectively as a top view and bottom view,

FIG. **10** illustrates the attachment of the overhead panel of the invention to the structure of an aeroplane,

FIGS. **11**A to **11**G illustrate the different steps of assembly of the overhead panel of the invention.

DETAILED DESCRIPTION OF PARTICULAR EMBODIMENTS

As illustrated in FIG. **7**, the overhead panel of the invention **60** includes a rigid self-supporting module formed of:

a rear plate **61** including an integrated circuit plate on which are welded central electrical connectors **62** intended to be connected to submodules **67**, and peripheral electrical connectors **63** intended to be connected to the different systems of the aeroplane,

a front plate **65**, which is formed from a metal sheet to which are attached submodules **67** (in this case, a push-button), previously described in the device of the known art, where an illuminated label, which can be illuminated, is positioned on the front face of this front plate,

a perimeter frame **70** forming the junction between these two rear and front plates, over entire periphery of the module;

standard micro-harnesses **72**, each enabling a connection to be made between a submodule **67** and a central connector **62** positioned on the rear plate, where this connection may be made easily and rapidly.

This assembly forms a rigid self-supporting module, with 6 working faces.

As illustrated in FIGS. **8** and **9**, the overhead panel of the invention is, through its peripheral electrical connectors **63**, connected to:

connections **75** entitled "Route M" (where M stands for "average"), which are low-power cables requiring no substantial protection (conventional functions),

connections **76** entitled "Route S" (where S stands for "sensitive"), which are coaxial cables, which are segregated separately.

In these figures a pipe **77** for extracting heat energy produced by the overhead panel, and two air conditioning pipes **78**, each of which is terminated by an air outlet to convey fresh air to the cockpit, which are not connected to the overhead panel of the invention, but which pass close by it, are also represented.

As illustrated in these figures, four dampening pins **80** are positioned at all four corners of the rear surface of the rear plate of the overhead panel of the invention.

The metal sheet forming the front plate may be pierced with weight reduction and accessibility holes. The front face of the front plate, which corresponds to the different represented systems and functions of the aeroplane, is fixed for an aeroplane programme, in order that it may be easily understood by the pilots.

Advantageously, the rear plate includes an integrated circuit which resists condensation. To this end it may include a final specific layer, or be positioned on a small panel made of a thermoplastic material.

As illustrated in FIG. **10**, the overhead panel of the invention **60** is positioned on small intermediate brackets **81** attached to the structure of the aeroplane **82** (reference **83** represents the aeroplane's aerodynamic profile), where four dampening pins **80** are positioned between the rear surface of the rear plate and these intermediate brackets **81**.

The assembly of the overhead panel of the invention includes the following steps illustrated in FIGS. **11**A to **11**G:

1. integration of mini-harnesses **72** on submodules **67**, for example action buttons or lights (FIG. **11**A),

2. clipping of these mini-harnesses **72** on the corresponding central connectors **62** previously welded on the integrated circuit plate of rear plate **61** (FIG. **11**B),

3. attachment of the assembly formed in this manner to perimeter frame **70** (FIG. **11**C),

4. docking of front plate **65**, ensuring that each of submodules **67** is centred in a corresponding recess of the front plate. Advantageously, the perimeter frame and the front plate are locally perforated, enabling the objects to be recentred more easily in their recesses using tools if required (FIG. **11**D),

5. attachment of submodules **67**, for example action buttons, on front plate **65** (FIG. **11**E),

6. installation and attachment of illuminated label **66** (FIG. **11**F).

FIG. **11**G illustrates the assembly of overhead panel **60** ready to be installed in the cockpit of an aeroplane.

The invention claimed is:

1. An overhead panel for provision in an aircraft cockpit, the overhead panel comprising:

an assembly of independent submodules, each of which is associated with a particular system or a particular function of the aircraft; and

a rigid self-supporting module comprising a front plate to which the assembly of independent submodules is attached, and two side faces fitted with peripheral electrical connectors for connection to different systems of the aircraft.

2. The overhead panel according to claim **1**, in which the rigid self-supporting module is parallelepipedic in shape and less than 100 mm thick.

3. The overhead panel according to claim **1**, in which the module includes:

a rear plate including an integrated circuit plate to which central electrical connectors and the peripheral electrical connectors are welded;

a perimeter frame forming a junction between the rear plate and the front plate, over an entire periphery of the module; and

micro-harnesses, each making a connection between a submodule and a central connector positioned on the rear plate.

4. The overhead panel according to claim **1**, wherein an illuminated label is positioned on the front plate.

5. The overhead panel according to claim **1**, wherein the front plate includes a metal sheet in which weight reduction and accessibility holes are made.

6. the overhead panel according to claim **3**, further comprising dampening pins positioned on the rear surface of the rear plate.

7. The overhead panel according to claim **3**, wherein the rear plate comprises an integrated circuit plate the final layer of which is an anti-condensation layer.

8. The overhead panel according to claim **3**, wherein the rear plate includes a small panel made of a thermoplastic anti-condensation material.

9. An aircraft including a cockpit in which an overhead panel according to claim **1** is installed.

10. A method for manufacturing the overhead panel according to claim **3**, which includes:

integration of mini-harnesses on the submodules,

clipping the mini-harnesses on the corresponding central connectors previously welded on the integrated circuit plate of rear plate,

attachment of the assembly formed in this manner to the perimeter frame,

docking the front plate, ensuring that each of the submodules is centered in a corresponding recess of the front plate,

attachment of the submodules on the front plate.

* * * * *