



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : B64D 11/00	A1	(11) International Publication Number: WO 93/01088 (43) International Publication Date: 21 January 1993 (21.01.93)
(21) International Application Number: PCT/GB92/01228 (22) International Filing Date: 6 July 1992 (06.07.92) (30) Priority data: 9114626.6 6 July 1991 (06.07.91) GB (71) Applicant (for all designated States except US): MAGERIK LIMITED [GB/GB]; The Lodge, Station Road, Chinnor, Oxford OX9 4HA (GB). (72) Inventors; and (75) Inventors/Applicants (for US only) : SIMPSON, Leslie, James [GB/GB]; 3 Deep Acres, Chesham Bois, Amer-sham, Bucks HP6 5NX (GB). BAYLISS, Brian, Sydney [GB/GB]; Jobec, Shiplake Bottom, Peppard, Oxon RG9 5HP (GB).		(74) Agent: ALLSOP, John, Rowland; Rowland Allsop, 10 London End, Beaconsfield, Bucks HP9 2JH (GB). (81) Designated States: AU, GB, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, MC, NL, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: AIRCRAFT CABIN DIVIDER 		
(57) Abstract An aircraft cabin divider (9) formed of pivotally interconnected panel sections (10, 11, 12, 13) for erecting between two rows of passenger seats. The panel sections comprise an upper panel section (10) for mounting to the ceiling of an aircraft cabin and a lower panel section (12) for fixing to the floor of the cabin. The upper and lower panel sections are pivotally mounted to an intermediate panel section which in the installed position faces passengers sitting in the aft row of seats to one side of the divider. At least one of the pivotal interconnections is stress critical thereby to rigidise the structure in the installed position and so that under crash impact conditions, the intermediate panel section is able to follow the movement if the seat backs of the forward row of passenger seats such that the heads of the passengers in the aft row do not collide with the intermediate panel section of the divider so avoiding unnecessary injuries. To permit the intermediate panel section further freedom of forward movement, the stress critical interconnection, preferably between the intermediate panel section and the upper panel section, includes an expandable friction hinge (18) to enable the intermediate panel section to move away from the upper panel section to a maximum collapsed position determined by the expansion of the hinge.		

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AIRCRAFT CABIN DIVIDER

The present invention relates to aircraft cabin dividers primarily for dividing an aircraft cabin into sections catering for different classes of passenger seating.

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BACKGROUND OF THE INVENTION

Fixed dividers or bulkheads used to divide an aircraft cabin as between business and tourist class cabin areas respectively, are traditionally in the form of vertical partitions anchored to the floor tracks of the cabin or between the floor tracks and some form of mounting means on the ceiling of the cabin.

The position of the seat aft of the cabin divider is critical as regards the need to meet certain safety regulations relating to the minimum amount of head damage permissible under dynamic testing procedures, ie HIC (Head Injury Criteria).

To achieve this standard it will be appreciated that a lot of valuable space is consumed within an aircraft cabin by having to position the aft passenger seat well away from the divider. With current moves to introduce dynamic 16g testing, the consumption of space will of necessity increase.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an aircraft cabin divider which is collapsible above a predetermined stress level as would occur on crash impact so that the head of a passenger in the seat positioned aft of the divider does not collide with the divider as the head is propelled forward under the impact of the crash.

According to the invention there is provided a collapsible aircraft cabin divider comprising a series of pivotally interconnected divider panel sections, ceiling mounting means for mounting an upper one of the panel sections to the ceiling of an aircraft cabin, floor mounting means for mounting a lower one of the panel sections to the floor of the cabin, an intermediate one of the panel sections being arranged with respect to the others such that in the installed

- position of the divider it lies inclined to the vertical to allow the back of a passenger seat placed forward of the divider to move to a maximum recline position, and stress-critical means for forming the pivotal interconnection between at least two of the panel sections whereby under applied forces above a predetermined level the panel sections are allowed to pivot one with respect to the other and said one panel section to move to a collapsed position as it follows the movement of the back of said passenger seat placed forward of the divider.
- 10 By this means the critical part of the cabin divider is removed out of the path of travel of the descending head of a passenger strapped in the seat aft of the divider such that the position of that seat (and also the forward seat) can be arranged closer to the divider than would otherwise be possible if the divider were of the traditional fixed vertical variety.
- 15 Preferably the upper panel section is formed of two sub-panel sections pivotally connected to one another, with the stress-critical means in the form of a stress-critical expandable hinge between the lower one of the sub-panel sections and the inclined panel section to allow the latter to move away from the former during its movement to the collapsed position.
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BRIEF DESCRIPTION OF THE DRAWINGS.

- The invention will now be described by way of example with reference to the accompanying drawings wherein:
- 25

Fig 1 is a side view of an aircraft cabin illustrating a fixed vertical aircraft cabin divider according to the prior art:

- 30 Fig 2 is a side view of an aircraft cabin divider according to an embodiment of the invention in a pre-impact position between aft and forward located passenger seats:

- Fig 3 is a side view of the aircraft cabin divider of Fig 2 as in an impact position in relation to the aft and forward positioned passenger seats:
- 35

Fig 4 is a side and rear view of an aircraft cabin divider according to another embodiment of the invention: and

Fig 5 is a detail at location A in Fig 4 of the hinge connection between the upper and intermediate panel sections of the divider and illustrates the movement of the divider around that hinge connection in the event of crash impact.

PREFERRED EMBODIMENTS OF THE INVENTION

In Fig 1 a vertically mounted bulk head or cabin divider 1 according to the prior art is shown installed between the floor 2 and ceiling 3 of an aircraft cabin generally designated 4. As will be understood dividers of this type are introduced to separate business and tourist class areas of an aircraft cabin.

The position of a passenger seat 5 located aft of the cabin divider 1 as shown in Fig 1 is critical in relation to the injury which the head of a passenger P will sustain in a crash by collision of his or her head H with the divider 1.

For the purposes of illustration the passenger is shown belted to the seat in two positions, an upright position 6 corresponding to that adopted during take-off and landing and a maximum forward position 7 as would be sustained by the upper part of the body 8 being projected forward in the event of a sudden interruption in forward momentum of the aircraft occurring in a crash.

To ensure that head injuries to the passenger P are kept below certain specified levels the position of the aft seat 5 has to be such that the head H of the passenger P in the maximum forward bent position 6 of the body as shown in Fig 1, does not collide heavily with the vertical divider 1.

This necessarily results in valuable loss of aircraft cabin space and with the recent move to introduce dynamic 16g testing, this problem will increase.

To avoid the difficulty, the invention provides an energy absorbing bulk head divider 9 as shown installed in an aircraft cabin in Figs 2 and 3.

The divider 9 comprises four transversely interconnected panel sections, 10, 11, 12, 13, the upper one 10 of which is pivotally mounted at M to the cabin ceiling 3 as shown, and is formed of two relatively slidable parts 10' and 10".

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The bottom section 13 extends vertically between the seat base 14 and the floor 2 of the cabin to which it may be permanently affixed or movable on the cabin seat floor tracks (not shown).

10 The upper and lower panel sections 10 and 13 are offset with respect to one another, and are joined by two middle panel sections 11, 12 generally extending between the seat base 14 and the top of the back 15 of the passenger seat 16 positioned forward of the divider 9 as shown. As will be seen, the panel section 12 specifically extends over the end E of the arm rest 17 to the
15 seat back 15. It will be fully appreciated that the width and configuration of the panel sections 11, 12 may be chosen to match the dimensions of any particular aircraft seat and to ensure that they maintain contact with the back parts of the seat during its forwardly propelled movement.

20 The panel section 11 is itself configured to the shape of the seat back 15 in the example shown so that the seat back 15 is able to rest snugly against the panel section 11 in its maximum recline position as shown in dotted outline in Fig 2. It follows that the seat 16 may be positioned closer to the divider of the invention than to those dividers of the prior art.

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Further the panel section may be padded (not shown) in the head contact area.

Stress-critical hinges 18 are positioned between the panel sections 10, 11, 12, 13 and the panel section 10 mounting means M. The stress-critical hinges 18
30 are designed to fail above a predetermined impact load so that to all intents and purposes in normal conditions, the partition 9 presents a rigid structure between the aft and forward passenger seats 16 and 19.

- Upon the occurrence of a crash, for example, the partition or divider 9 will deform or collapse as shown in Fig 3. In effect, the panel sections 11 and 12 will deform around and follow the movement of the seat back 15 of the passenger seat 16 forward of the divider 9 during which the upper panel section 10 will expand and tilt or pivot around its ceiling mounting M. By this means the panel section 11 which would otherwise obstruct forward movement of the head H of the passenger seat 19 as shown in Fig 3, will move forward out of the way of the path of travel of head H under the crash impact.
- 10 The aircraft cabin divider shown in Fig 4 has upper and lower normally vertically disposed panel sections 20 and 21 and a straight intermediate panel section 22 in contrast to the two-part intermediate panel sections 11 and 12 shown in Figs 2 and 3.
- 15 In the Fig 4 embodiment the cabin divider is shown in its normally installed position in a 747 Jumbo Jet and is designed to collapse in the direction of the arrow F under crash impact conditions.
- The upper panel section 20 is formed of two pivotally interconnected sub-panel sections 20' and 20'', the sub-panel section 20' being held to the ceiling of the aircraft by means of locating pins 23. The lower panel section 21 is held to the floor of the aircraft cabin by angled fixings 21'.
- 25 A specially designed friction hinge 23, see particularly Fig 5, connects the intermediate panel section 22 with the sub-panel section 20''. The hinge includes an expandable mechanism in the form of a rod 24 pivotally mounted to the panel section 22 and being slidably mounted in a housing 25 attached to the sub-panel section 20'' by bolts 26.
- 30 The rod 24 is retained within the housing 25 by means of a spring loaded pivotal locking lever or pawl 27 held, against the spring urging, by an inertia pin 28 in a recess 29 formed in the rod 24. With the rod 24 in the fully retracted position shown in Fig 5, the divider is held stable and effectively rigid in the normally installed position.

A similar friction hinge 23' to the hinge 23 is installed at the interconnection between the intermediate panel section 22 and the lower panel section 21, see particularly Fig 6. the hinge 23' is mounted within and along the lower edge of
5 the intermediate panel section 22 as shown.

The hinge 23' is comprised of similar component parts to the hinge 23 but in this case the rod 24 of hinge 23' is held by the pawl 27 in a partially retracted position with respect to its housing 25 so that a gap E is formed between the
10 panel sections 22 and 21 thereby to allow for downward movement of the panel section 22 as the inertia pins 28 are released in both the hinges 23 and 23' during crash impact.

Upon release of the pins 28 in both hinges, the pivot point of the friction hinge
15 23 moves from position V_1 shown in Figs 5 and 6 through a lower position V_2 with respect to an arc of a circle C described around the pivot point V_4 of the panel section 22 to the lower panel section 21, to position V_3 on that arc. with the rod 24 of the hinge 23 sliding out of the housing 25 to its fully retracted position and the rod 24 of the hinge 23' moving into its housing 25 so that the
20 intermediate panel section 22 is able to move freely to its fully forward collapsed position as shown.

The utilisation of cabin dividers according to the present invention as above described, means that the space occupied by the aft and forward passenger
25 seats to either side of the divider may be kept to a minimum in full compliance with relevant safety regulations.

CLAIMS

1. A collapsible aircraft cabin divider comprising a series of pivotally interconnected divider panel sections, ceiling mounting means for mounting an upper one of the panel sections to the ceiling of an aircraft cabin, floor mounting means for mounting a lower one of the panel sections to the floor of the cabin, an intermediate one of the panel sections being arranged with respect to the others such that in the installed position of the divider it lies inclined to the vertical to allow the back of a passenger seat placed forward of the divider to move to a maximum recline position, and stress-critical means for forming the pivotal interconnection between at least two of the panel sections whereby under applied forces above a predetermined level the panel sections are allowed to pivot one with respect to the other and said one panel section to move to a collapsed position as it follows the movement of the back of said passenger seat placed forward of the divider.
2. A cabin divider as claimed in claim 1 wherein there are three panel sections with said intermediate panel section being pivotally connected to the upper and lower panel sections by means of a said stress-critical means..
3. A cabin divider as claimed in claim 2 wherein the upper panel section is formed of two pivotally interconnected sub-panel sections.
4. A cabin divider as claimed in claim 3 wherein said stress-critical means is formed of an expandable hinge.
5. A cabin divider as claimed in claim 4 wherein one hinge part of the expandable hinge between the upper panel section and the intermediate panel section is attached to the latter, the other hinge part being in the form of an elongate rod, a housing attached to the lower one of said sub-panel sections in which the rod is under controlled slidable movement.
6. A cabin divider as claimed in claim 5 wherein the rod is secured in a fully retracted position in the housing by inertia responsive means such that under predetermined stress conditions the rod is released to allow the

intermediate panel section to move away from the upper panel section to a maximum forward collapsed position when the rod is at a maximum withdrawn position from the housing.

5 7. A cabin divider as claimed in claim 4 wherein one hinge part of the expandable hinge between the intermediate panel section and the lower panel section is attached to the latter, the other hinge part being in the form of an elongate rod, a housing mounted within the intermediate panel section in which the rod is under controlled slidable movement.

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8. A cabin divider as claimed in claim 7 wherein the rod is secured in a partially retracted position in the housing by inertia responsive means such that under predetermined stress conditions the rod is released to allow the intermediate panel section to move towards the lower panel section as the rod
15 of the hinge between the intermediate section and the upper panel section is withdrawn from its respective housing.

9. A cabin divider as claimed in claim 8 wherein the inertia responsive means is in the form of a spring loaded pivotal lever, an inertia pin releasably
20 mounted in the housing to urge the pivotal lever to engage a recess in said rod to secure the rod in the partially retracted position in said housing.

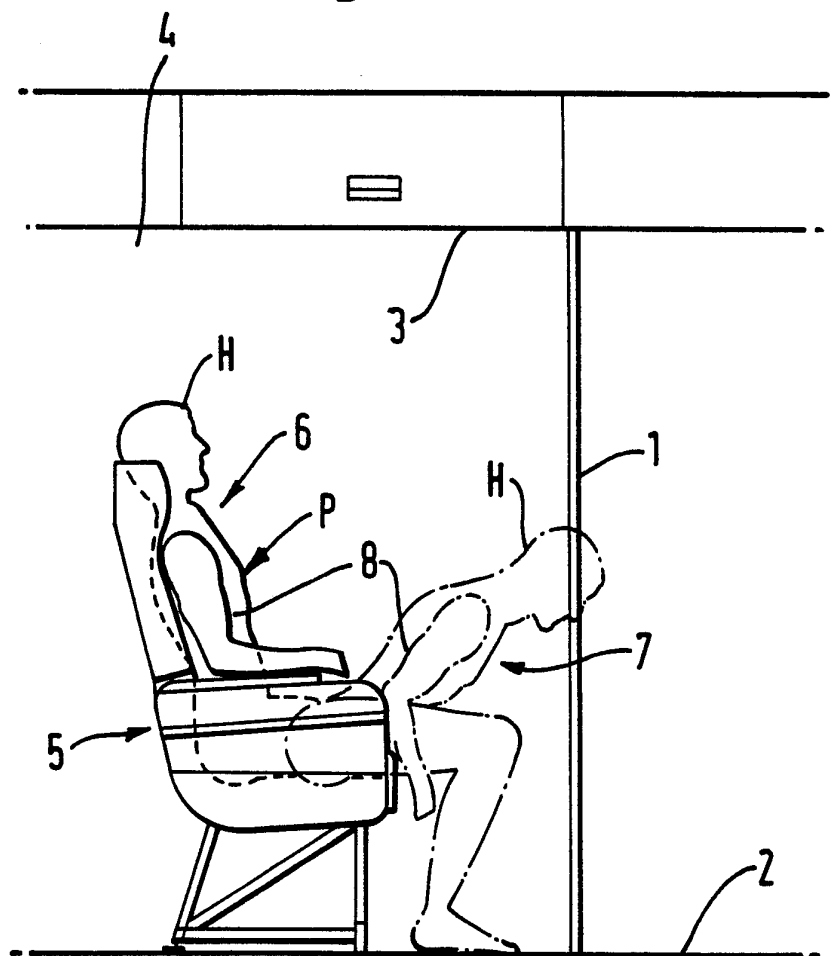
10. A cabin divider as claimed in claim 1 wherein said intermediate panel section is pivotally connected to the upper and lower panel sections, said
25 intermediate panel section being formed of a lower and upper sub-panel section, said lower sub-panel section having a depth to correspond to the depth of the arm rest of said passenger seat such that the upper sub-panel section is able to follow said movement of the back of said passenger seat to the collapsed position.

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11. A cabin divider as claimed in claim 8 wherein said upper one of the panel sections is formed of two relatively slidable parts such that the point of pivotal interconnection between the intermediate panel section and the upper panel section is able to move relative to the ceiling mounting means as the
35 intermediate panel section moves to the collapsed position.

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Fig. 1



2/5 Fig. 2

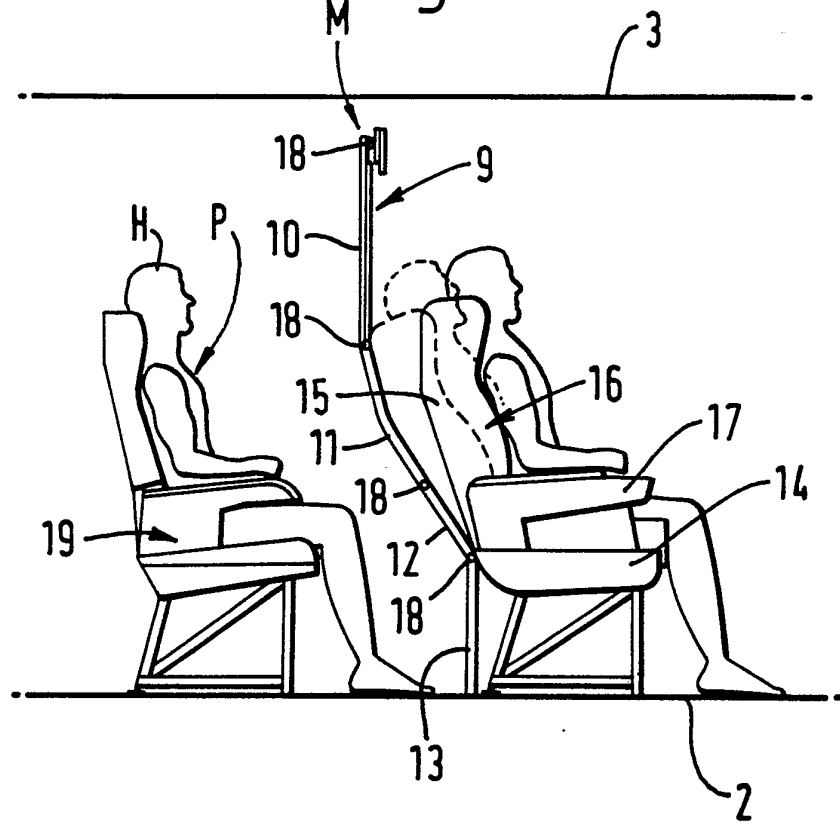
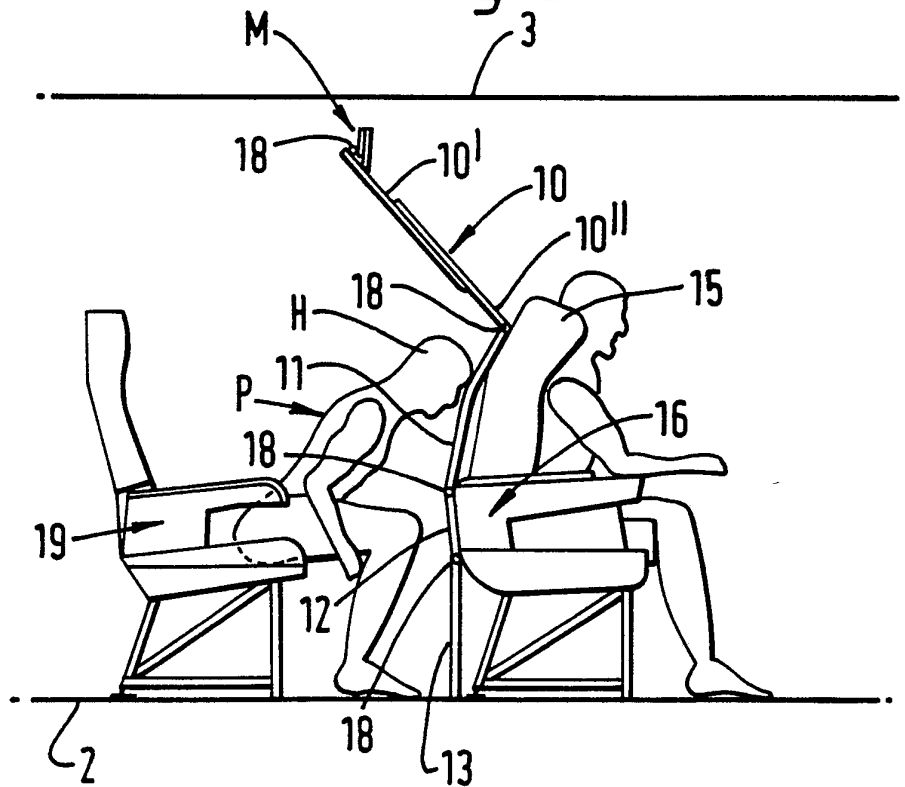
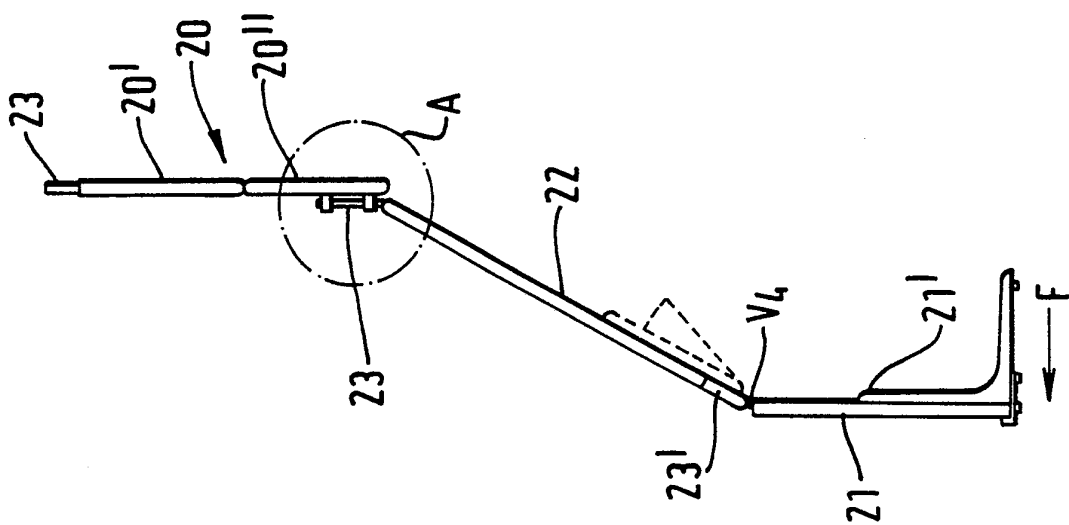
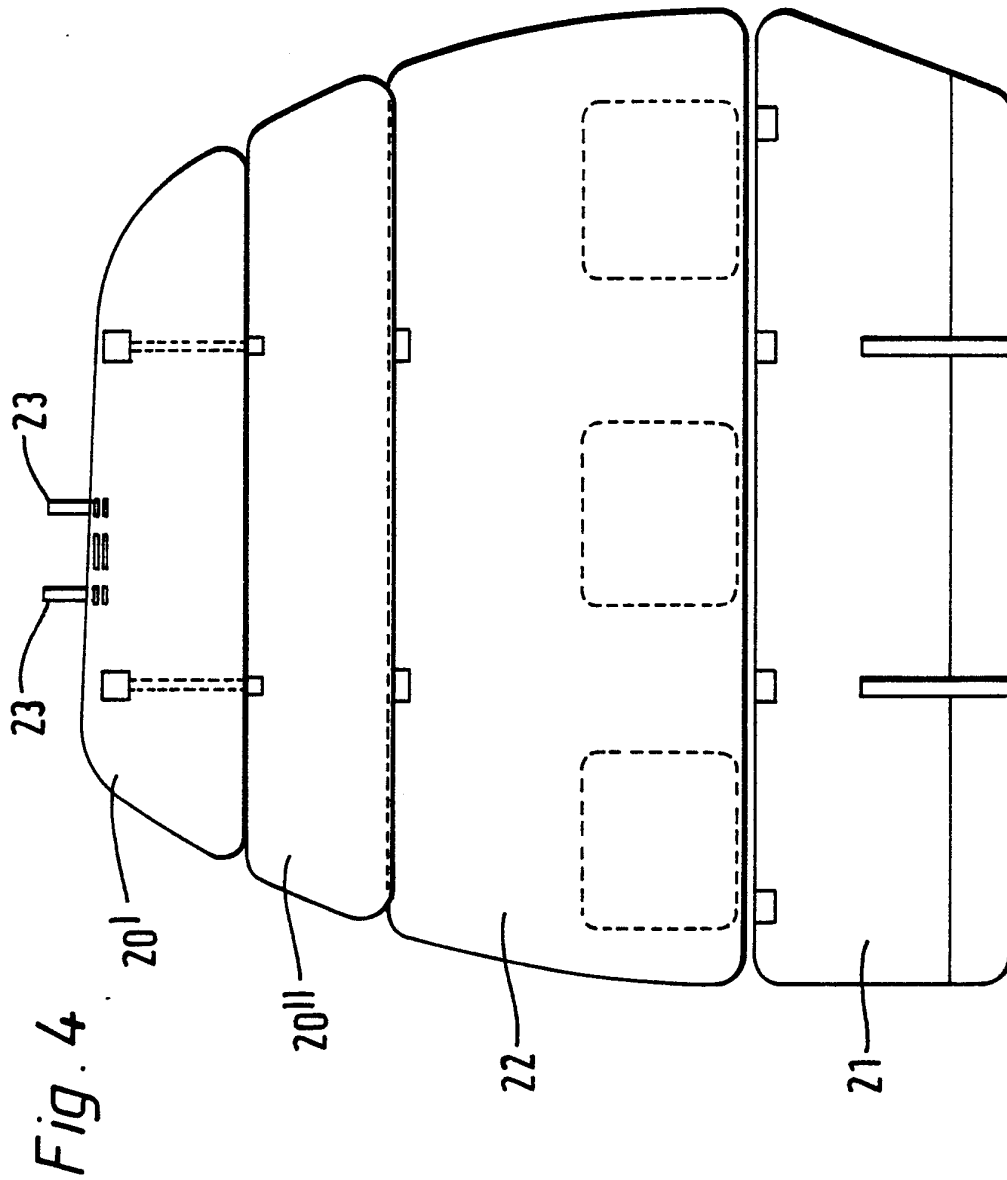
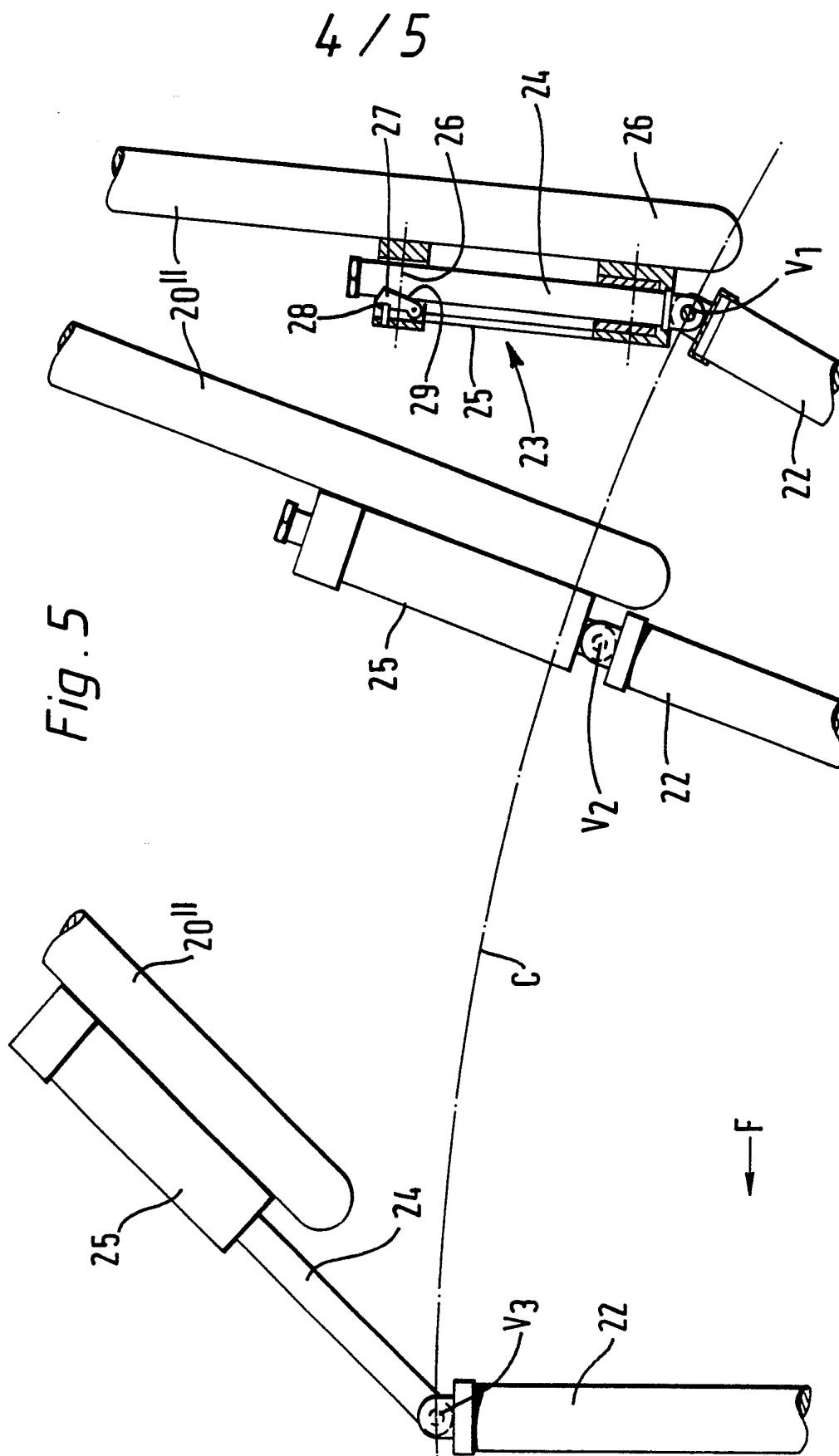


Fig. 3



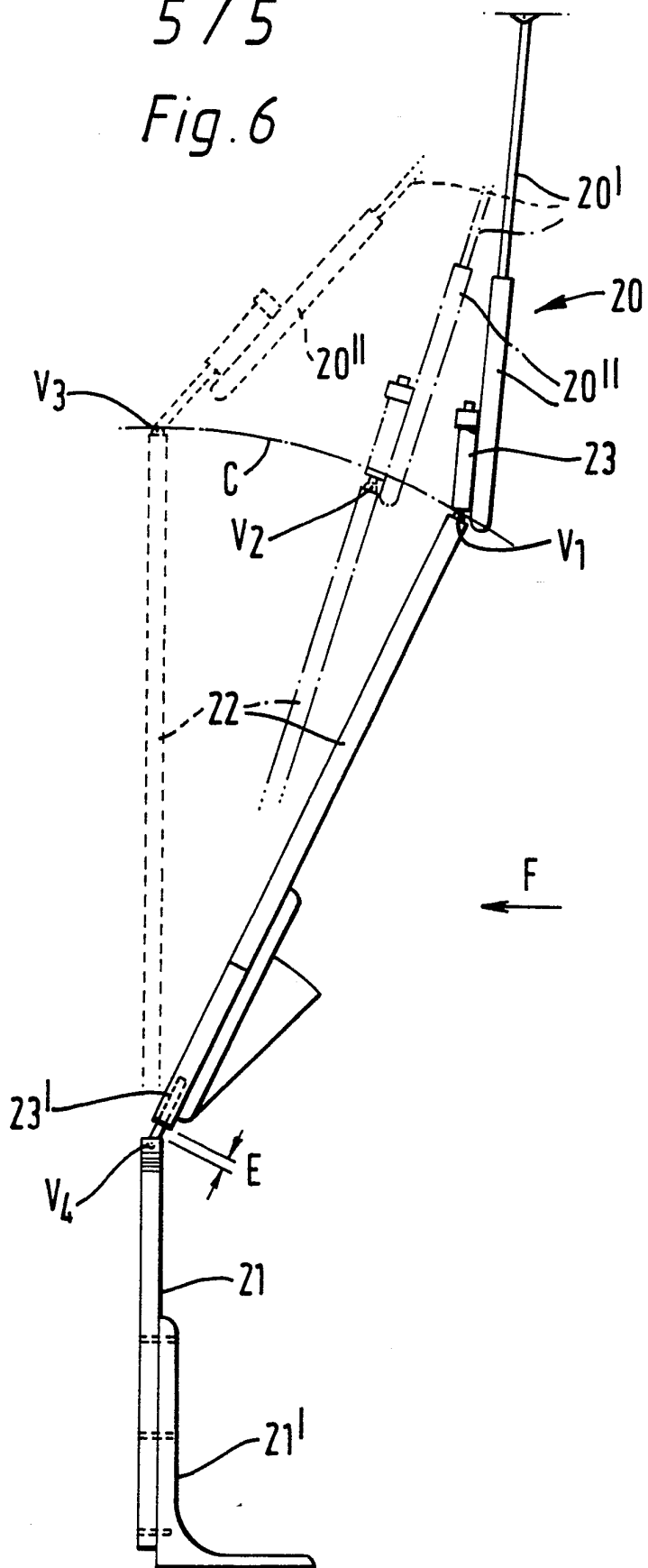
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Fig. 6



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 92/01228

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 B64D11/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	B64D	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	EP,A,0 361 717 (MAGERIK LTD) 4 April 1990 see column 3, line 36 - column 4, line 40 ---	1-4, 10
A	FR,A,2 458 461 (DE CARNIERES) 2 January 1981 see the whole document ---	1
A	US,A,4 597 549 (RYAN) 1 July 1986 see the whole document ---	1
A	DE,C,3 917 206 (MESSERSCHMITT-BOLKOW-BLOHM GMBH) 17 May 1990 see the whole document -----	1
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
04 NOVEMBER 1992	11. 12. 92	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	HAUGLUSTAINE H.	

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. GB 9201228
SA 62904

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0361717	04-04-90	None	
FR-A-2458461	02-01-81	None	
US-A-4597549	01-07-86	None	
DE-C-3917206	17-05-90	None	