PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :		(11) International Publication Number:
B64B 1/20, B64C 39/10	A1	**WO 00/48902**
		(43) International Publication Date: 24 August 2000 (24.08.00)

(21) International Application Number: PCT/IT99/00409

(22) International Filing Date: 14 December 1999 (14.12.99)

(30) Priority Data:
FI99A000031 16 February 1999 (16.02.99) IT

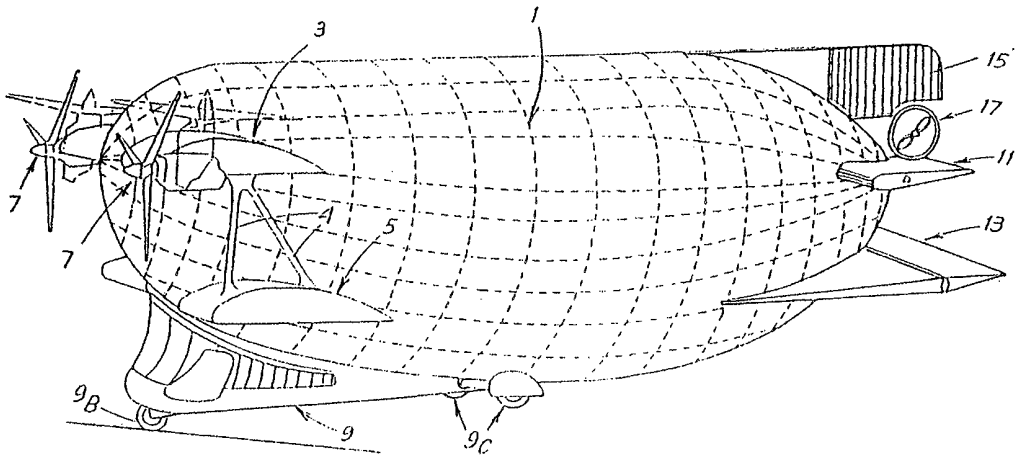
(71)(72) Applicant and Inventor: CECCHI, Siro, Vasco [IT/IT]; Via dell'Alberaccio, n. 50, I-59100 Prato-Fraz. S. Paolo (IT).

(74) Agent: TURINI, Laura; Via Castello, 50, I-56030 S. Pietro Belvedere (IT).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: AIRCRAFT EQUIPPED WITH A BULKY BODY CAUSING AN AEROSTATIC THRUST, AND CARRYING WINGS



(57) Abstract

The aircraft comprises a relatively bulky body (1) containing lighter gas than the air, and carrying surfaces (3, 5) set to cause, in the forward movement, the lift needed to raise the aircraft.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

DESCRIPTION

"AIRCRAFT EQUIPPED WITH A BULKY BODY CAUSING AN AEROSTATIC THRUST, AND CARRYING WINGS."

Technical Field

The present invention relates to the technical sector of the aeronautics and particularly of the construction of aircraft that move thanks to an aerostatic thrust caused by the volume of their own body.

Background Art

At present different types of aircraft are known, practically used for transport of people and goods. Excluding rocket vehicles - mostly used for space travel - and balloons, known aircraft are essentially classified like that: proper aeroplanes, helicopters, airships. Each type of aircraft presents its known advantages and disadvantages compared with the other. Particularly, aeroplanes lead in air speed, but need very long runways; helicopters permits vertical takeoff and landing, but involve high fuel consumption and limited capacity; airships permits vertical takeoff and landing and require installed horsepower and low consumption, but are very bulky and small manoeuvrable.

This invention principally aims at realising an aircraft capable of taking off and landing in limited spaces, involving fewer fuel consumption than a normal plane or helicopter, considerable minor volume or, in case of same volume, greater load-carrying capacity and better manoeuvrability than a normal airship.

Disclosure of invention

According to the invention, the aircraft comprises a relatively bulky body, containing lighter gas than the air and having such a volume as to cause an aerostatic thrust upwards, equal to a fraction of the total weight of the aircraft, the useful load and the stowed fuel, in order to activate the motorpropulsion system.

The aircraft is equipped with carrying surfaces set to cause, in the forward movement, the lift needed to float in the air, exceeding the complementary fraction of said total weight. Actually, these carrying surfaces are wings of any known suitable kind, either single or multiple overlapped. For example, the value of the aerostatic thrust may be equal to about half of the total weight, which involves half a volume compared with the one of a normal airship.

These carrying surfaces preferably comprise at least a couple of wings, placed at the opposite sides of said bulky body, and give the aircraft the ability to glide even in case of engine failure.

The motorpropulsion system may comprise a single central motorpropellant of any known suitable kind, with side transmission of motion to a couple of propellers (7), each of which is applied to a wing (3, 5; 103, 105) at the opposite sides of said bulky body.

The motorpropulsion system may comprise a couple of motorpropellants of any known suitable kind, even electric, possibly activated by solar panels placed over the surface of

the bulky body. Each motorpropellant is attached to a wing at the opposite sides of said bulky body, and can be possibly turned round a lateral axis of the aircraft in order to change the thrust direction from horizontal to vertical upwards, during the flight. In such a way, these motorpropellants allow the aircraft to take off vertically and stop in the air, overall producing, however, a thrust just equal to said fraction of the total weight of the aircraft itself.

In a preferable practical form of the invention, the motorpropellants and generally the centre of gravity of the aircraft are moved forwards, in flight direction, compared with the centre of the aerostatic thrust, so that the vehicle on the ground takes a trim inclined forwards and downwards. In the back of the bulky body mobile surfaces are attached, in order to give to the longitudinal axis of the aircraft a more aerodynamic trim, parallel with the forward direction, when flying.

In order to facilitate the manoeuvres when the aircraft is standing on the ground, it may comprise a lateral motorpropellant, generally placed in the back.

In another practical form of the invention, the motorpropulsion system consists of a thrusting motorpropellant placed in the back, regarding flight direction, behind said bulky body and near directional surfaces set to vary the flight trim. In this form, the aircraft cannot take off and land from a steady position, but needs a low thrust power of the engine and a relatively short runway.

Said bulky body preferably has a relatively rigid structure equipped with ribs and formers where spars of wings, cockpit, undercarriage and possibly said rear motorpropellant, are fixed.

With reference to Figs. 1, 2 and 3, the aircraft comprises a relatively bulky and long-shaped body 1, containing lighter gas than the air, and a couple of overlapped wings 3, 5 extended from both sides of the body 1, attached to the front part of the same body and connected one another at their ends by means of rafters 4. Two turboprop motorpropellants 7, are attached to the upper wing 3, symmetrically at the opposite sides of the body 1. These motorpropellants may be rotated during flight, from the trim depicted with continuos mark in Fig. 1 - where their thrust is almost parallel to the longitudinal axis of the body 1 - to the trim depicted with sketched mark - where such thrust is directed mostly upwards. Below the body 1 a cabin 9 is attached, to contain the useful load and the crew, equipped with a nose-wheel undercarriage 9B and a couple of rear-wheels 9C. Finally, an elevator 13, a tailplane 11, a rudder 15 and a little motorpropellant 17 with lateral axis propeller regarding the body 1, are attached to the back of the same body, for rotation and side approach manoeuvres.

The body 1 has such a volume as to cause an aerostatic thrust upwards, equal to a fraction, for example 50%, of the total weight of the aircraft, the useful load and the stowed fuel, in order to activate the motorpropellants 7, 17 and meet other power needs when flying. The distribution of weights and

volumes is established so that the resulting aerostatic thrust is slightly backward compared with the aircraft's centre of gravity; in this way, standing on the ground, it takes a slightly tail-raised trim, as shown in Fig. 1, just with the nose-wheel 9B resting on the ground. Obviously, like in case of airships, the vehicle would be moored by its bow to the ground by means of a mooring post, in order to take a trim lined with the wind direction.

For the takeoff, motorpropellants 7 are rotated in the trim depicted with sketched mark. They are balanced so as to cause an overall thrust upwards, greater than the difference between the total weight of the aircraft and the total aerostatic thrust, in order to allow the vehicle to take off. Successively, motorpropellants are gradually rotated forwards in the trim depicted with continuous mark, in order to gradually change the vertical thrust in forward thrust; then, as the forward speed rises, the lift of the wings 3, 5 becomes sufficient to support the aircraft. In fact, the tailplane 11 is a surface set to line up the longitudinal axis of the vehicle with the forward direction, lowering its back and raising its front.

In a second practical form of the invention, with reference to Figs. 4 and 5, the vehicle seems similar to the one above described, with a bulky body 101 containing lighter gas than the air, a couple of wings 103, 105 and a cabin 109, but with a single motorpropellant 107 attached to the back of the body 101 in a fixed position. The vehicle has also a single elevator 111

and a rudder 115 placed near the motorpropellant 107. In this case, volumes and weights are distributed in such a way that the aerostatic thrust and the centre of gravity of the aircraft fall into the resting triangle of the undercarriage 109B, 109C, so that the aircraft on the ground takes a trim with the longitudinal axis almost horizontal, as shown in Fig. 4. In this practical form, the aircraft according to the invention take off and work as a normal aeroplane.

As a substantial part of the aircraft weight is counterbalanced by the aerostatic thrust, in case of same useful load, the wings 3, 5; 103, 105 result much less extended compared with a normal plane, and it need a low power system of motorpropulsion, with low consumption.

Like for some airships, said lighter gas than the air may be contained in a tight casing placed over the surface of the bulky body defined by ribs and formers as follows, i.e. in one or more balloons (not shown in the drawing) placed in the bodies 1 and 101. These bodies may be obtained covering, with a fabric or plastic laminar layer 120, a relatively rigid structure equipped with ribs such as 119A, 119B (Figs. 6 to 13) and formers such as 121A, 121B. Ribs and formers are obtained by currents, also reticular, in light alloy plate, with V lateral section, possibly asymmetrical. In the point where they cross, they are fixed each other with gussets 123. The couple of wings 3, 5; 103, 105, connected one another by means of end rafters 4; 104, are attached to the rigid structure of the body 1; 101, by fastening their spars, such as 103A, 103B, 103C, to

ribs such as 119B, by means of screws, nails, or other suitable systems (Figs. 6, 8, 9 and 13).

Brief description of drawings.

This invention can be better understood by reading the description and looking at the enclosed drawings that are not to be considered restrictive examples of the invention.

- Figs. 1 and 2 show respectively side-front and top-side-front perspective views of a vehicle, according to a first practical form of the invention;
- Fig. 3 shows a front view of the vehicle of Figs. 1 and 2;
- Figs. 4 and 5 show respectively a side view and a front view of a second practical form of the invention;
- Figs. 6, 7, 8 and 9 show partial views of the aircraft of Fig. 4 divided into sections, respectively VI-VI, VII-VII of Fig. 8 and VIII-VIII, IX-IX of Fig. 6;
- Figs. 10 and 11 show an enlarged detail of the aircraft of Figs. 4 and 9, respectively X and XI of Fig. 6;
- Fig. 12 shows a view according to XII-XII of the detail of Fig. 11;
- Fig. 13 shows the enlarged detail XIII of Fig. 9.

Obviously, the drawings represent just practical examples of the invention, as shapes and elements may vary, but still remain within the range of the idea proposed as a solution. Reference numbers cited in the enclosed claims aims at facilitating their reading with reference to the description, and don't limit the range of the protection represented by these claims.

CLAIMS

1) Heavier aircraft than the volume of air moved, equipped with a motorpropulsion system, characterized by the fact that it comprises:

- a relatively bulky body (1; 101), containing lighter gas than the air and having such a volume as to cause an aerostatic thrust upwards, equal to a fraction of the total weight of the aircraft, the useful load and the stowed fuel, in order to activate the motorpropulsion system;
- carrying surfaces, of any kind or shape (3, 5; 103, 105), set to cause, in the forward movement, the lift needed to float in the air, exceeding the complementary fraction of said total weight.

2) Aircraft according to claim 1, characterized by the fact that the value of the aerostatic thrust is equal to about half of the total weight.

3) Aircraft according to claim 1 or 2, characterized by the fact that said carrying surfaces comprise at least a couple of wings, of any kind or shape (3, 5; 103, 105), placed at the opposite sides of said bulky body.

4) Aircraft according to anyone of the above claims, characterized by the fact that said motorpropulsion system comprises a single central motorpropellant with side transmission of motion to a couple of propellers, each of which is applied to a wing (3, 5; 103, 105) at the opposite sides of said bulky body.

5) Aircraft according to anyone of the above claims, characterised by the fact that said motorpropulsion system comprises a couple of motorpropellants (7), each of which is applied to a wing (3, 5; 103, 105) at the opposite sides of said bulky body.

6) Aircraft according to claim 5, characterized by the fact that said motorpropellants (7) can be turned in order to change the thrust direction from horizontal to vertical upwards, during the flight. In such a way, these motorpropellants allow the aircraft to take off vertically and stop in the air.

7) Aircraft according to claims 4, 5 or 6, characterized by the fact that the wings, the motorpropellants (7) and generally the centre of gravity of the aircraft are moved forwards, in flight direction, compared with the centre of the aerostatic thrust, and that in the back of said bulky body (1), planes (11) equipped with mobile surfaces, are attached, in order to give the aircraft an horizontal trim, when flying.

8) Aircraft according to claims 4 to 7, characterized by the fact that it comprises a lateral motorpropellant (17) for rotation and/or side approach manoeuvres.

9) Aircraft according to claims 1 to 3, characterized by the fact that the motorpropulsion system comprises a motorpropellant (107) placed behind said bulky body, regarding flight direction, and near directional surfaces (111, 115) set to vary the flight trim.

10) Aircraft according to anyone of the above claims,

characterized by the fact that said bulky body (1; 101) has a relatively rigid structure equipped with ribs (119A, 119B, ...) and formers (121A, 121B, ...) where spars (103A, 103B, 103C) of at least one couple of wings, cockpit (9; 109), undercarriage (9B, 9C; 109B, 109C) and possibly said rear motorpropellant (107), are fixed.

11) Heavier aircraft than the volume of air moved, equipped with a motorpropulsion system, characterised by all the features claimed as described and shown as example on the enclosed drawings.

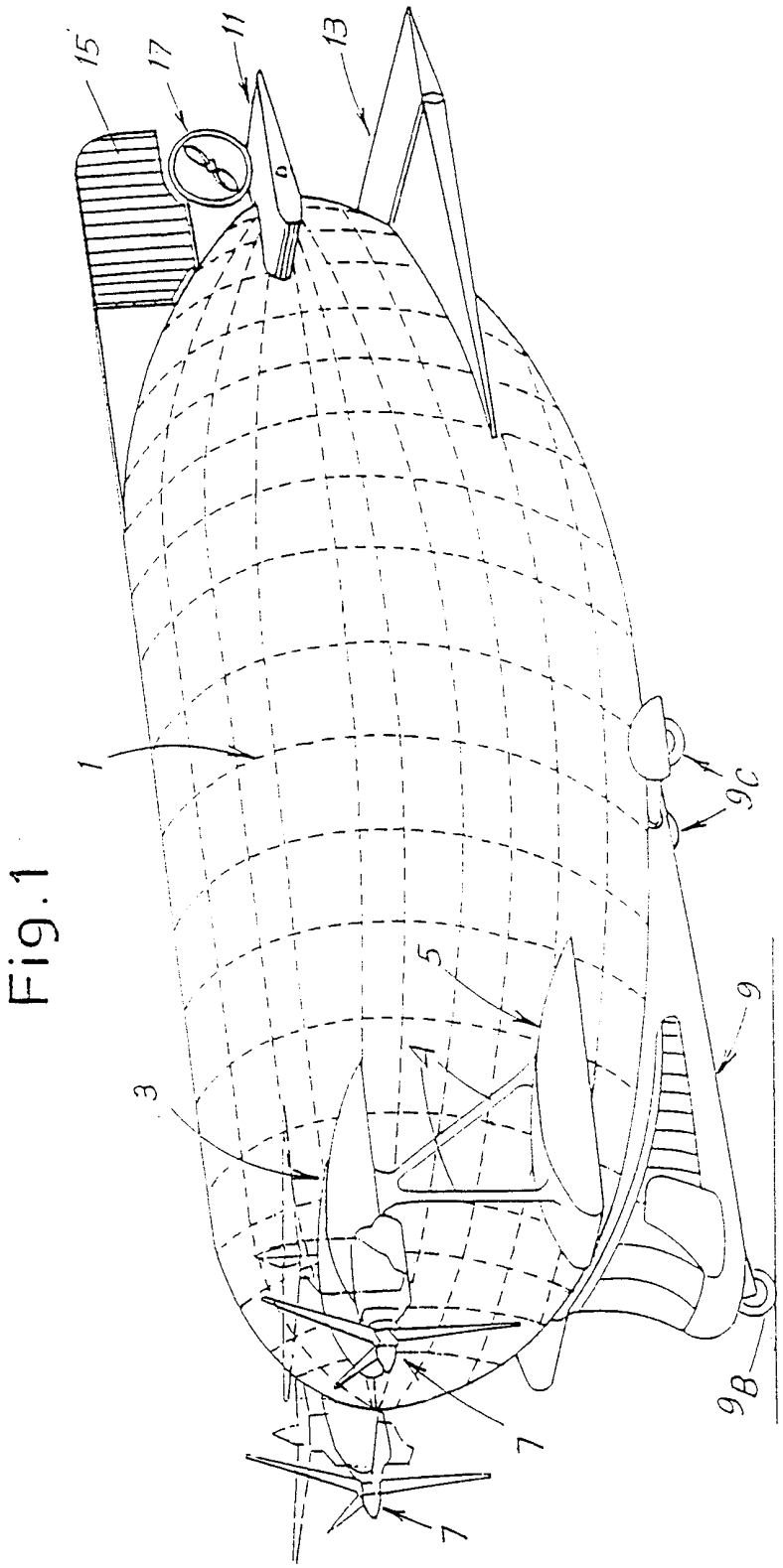


Fig.1

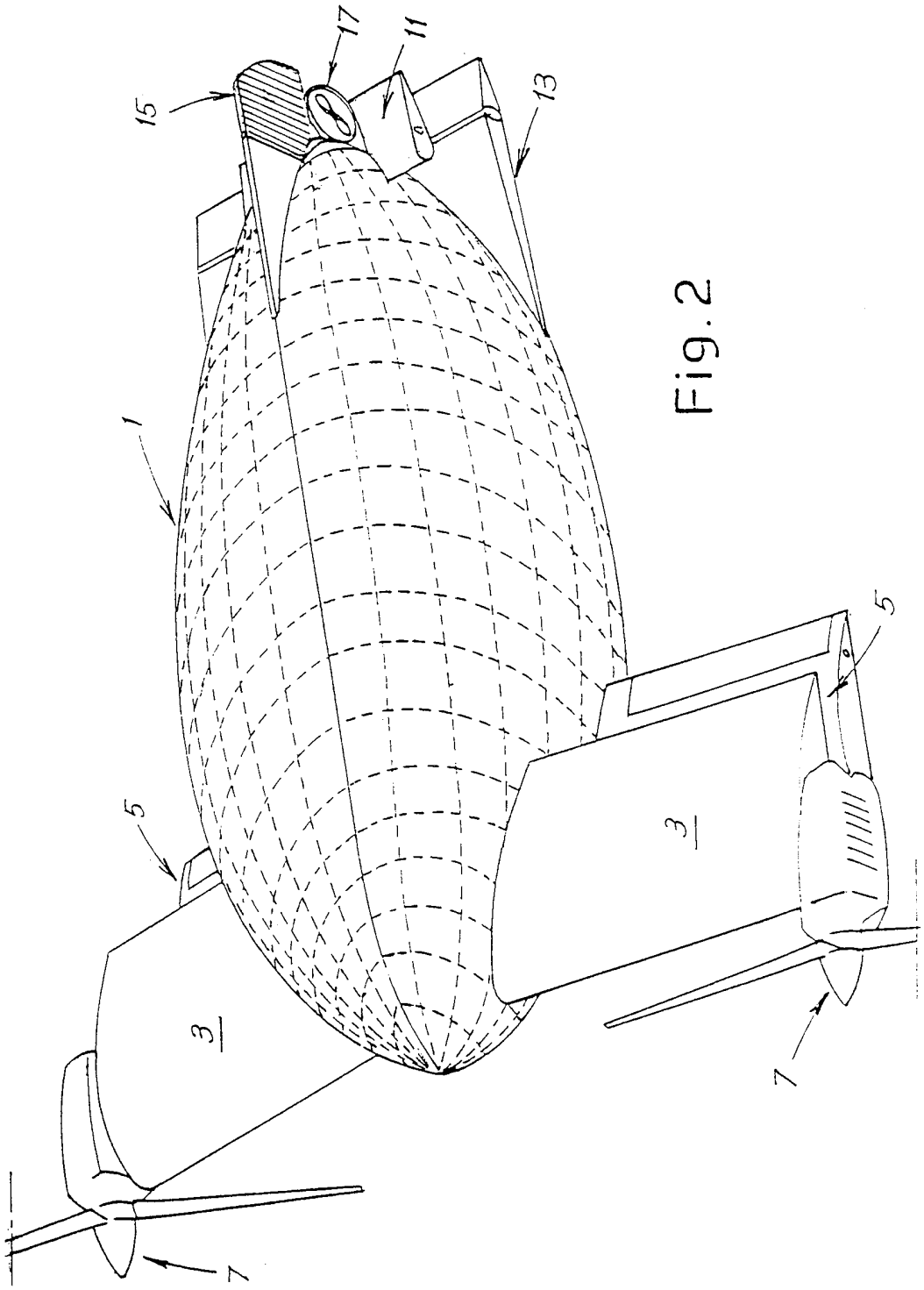


Fig. 2

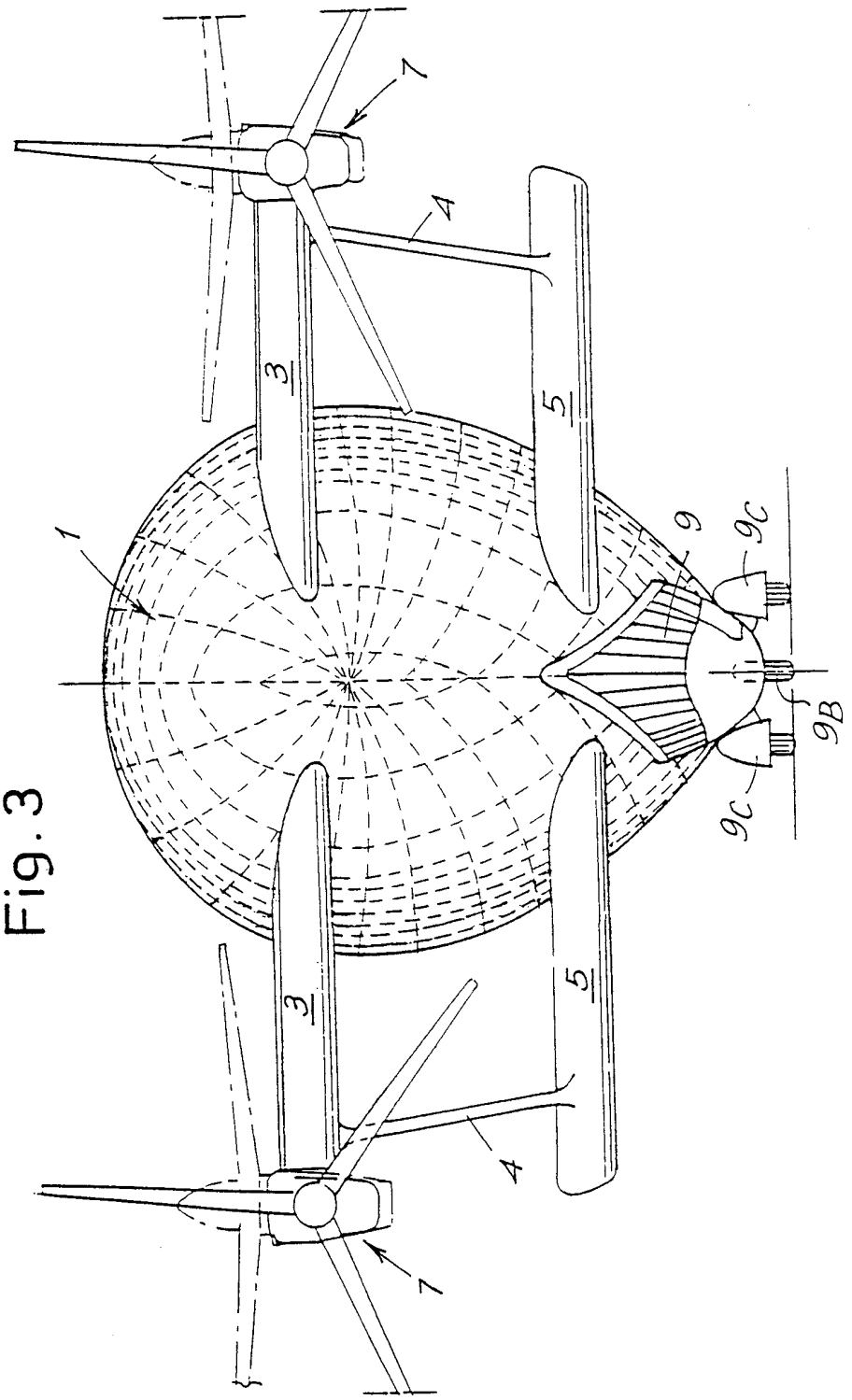


Fig. 3

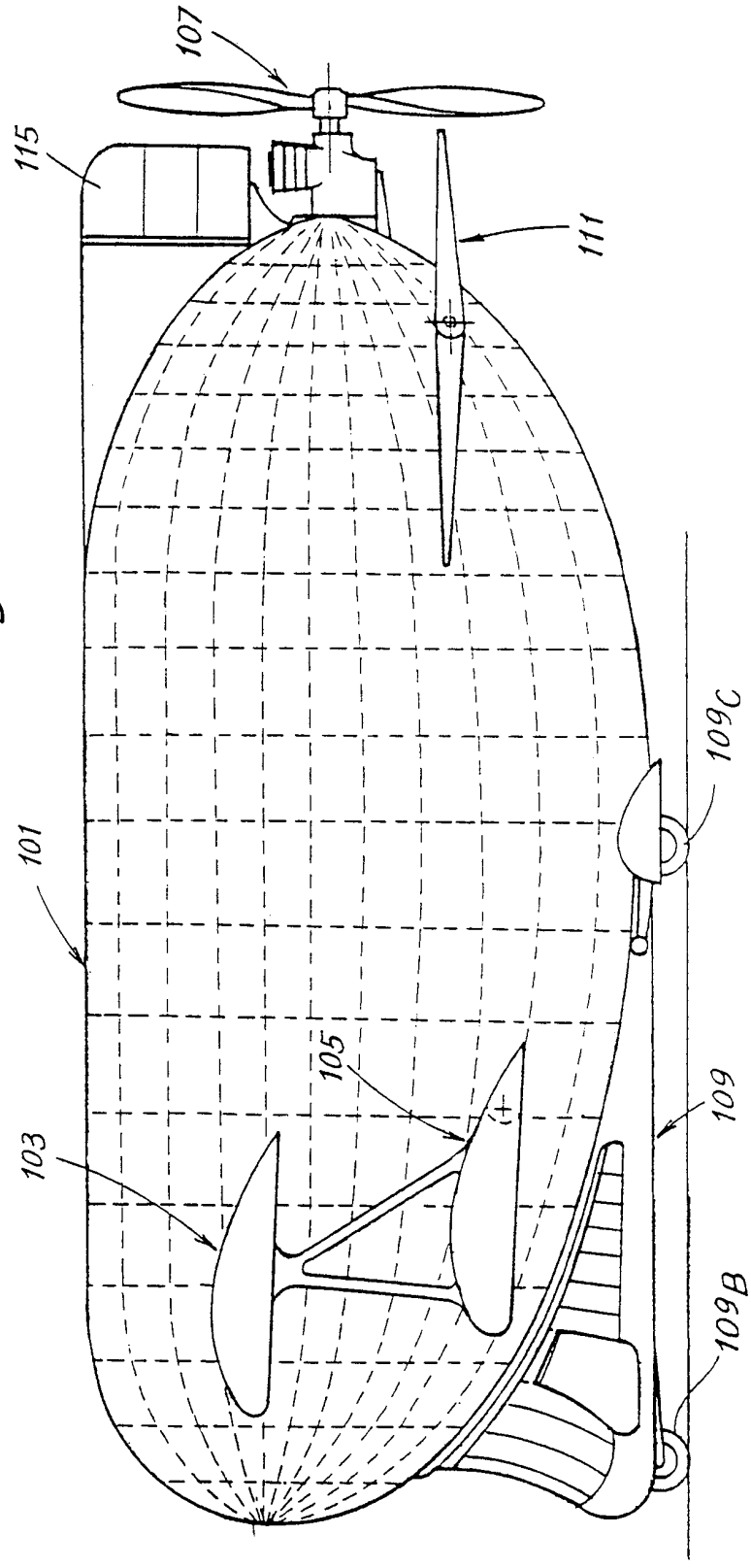


Fig. 4

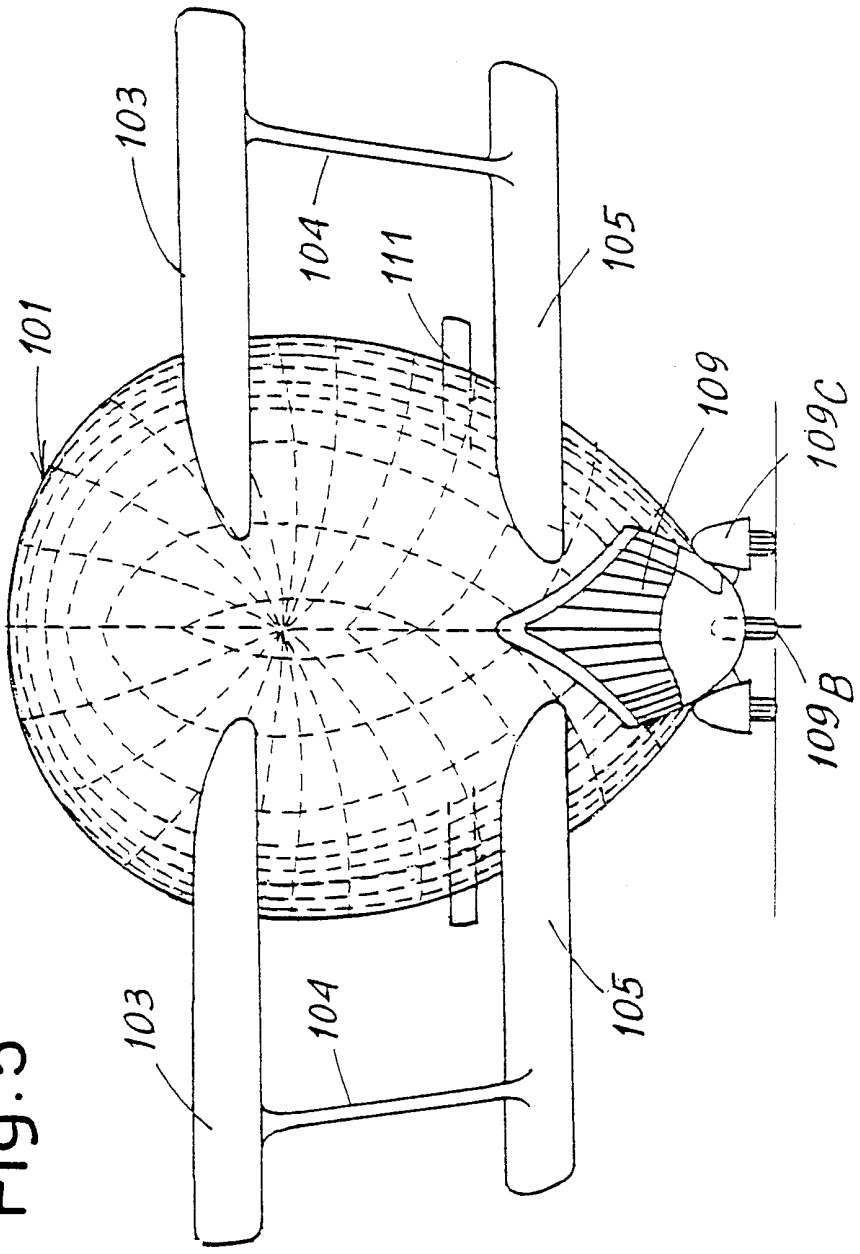


Fig.5

Fig.6

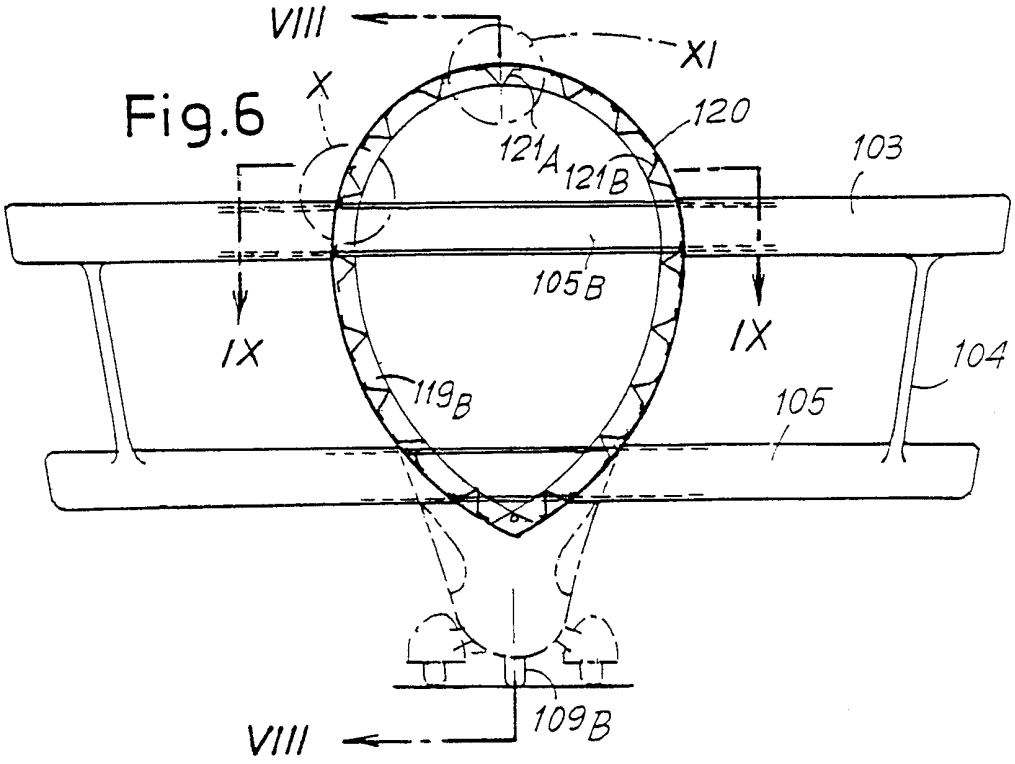
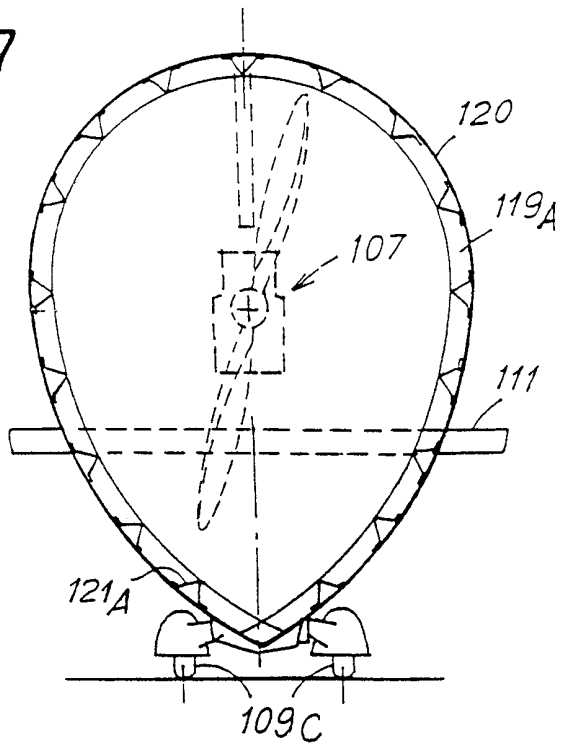

VIII
XI
X
120
121A
121B
103
105B
IX
IX
104
119B
105
VIII
109B

Fig.7


120
119A
107
111
121A
109C

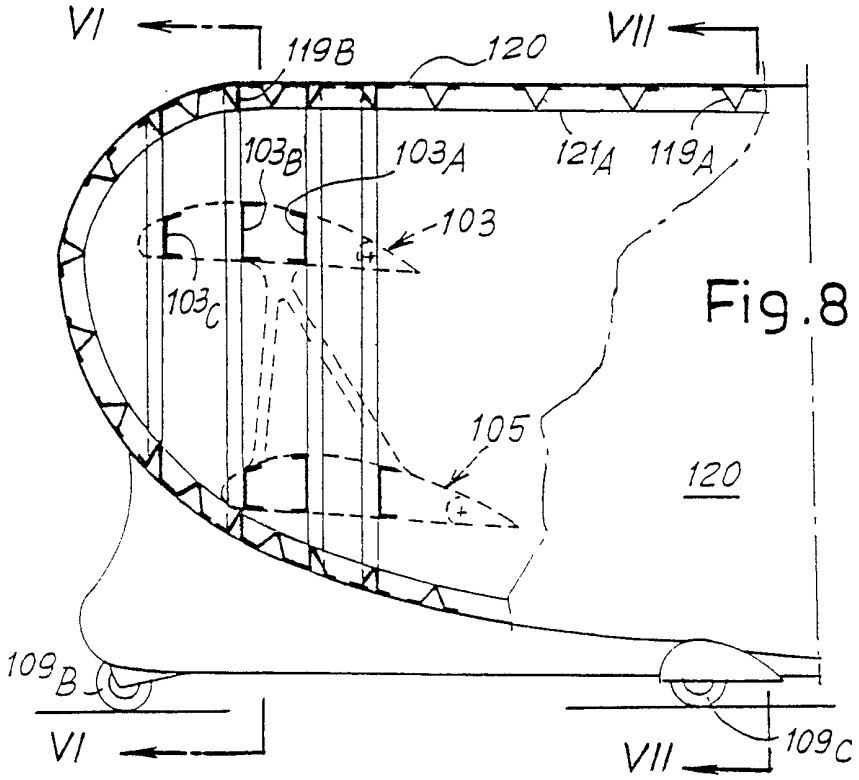

VI
VII
119B
120
103B
103A
121A
119A
103
103C
105
120
109B
109C
VI
VII

Fig.8

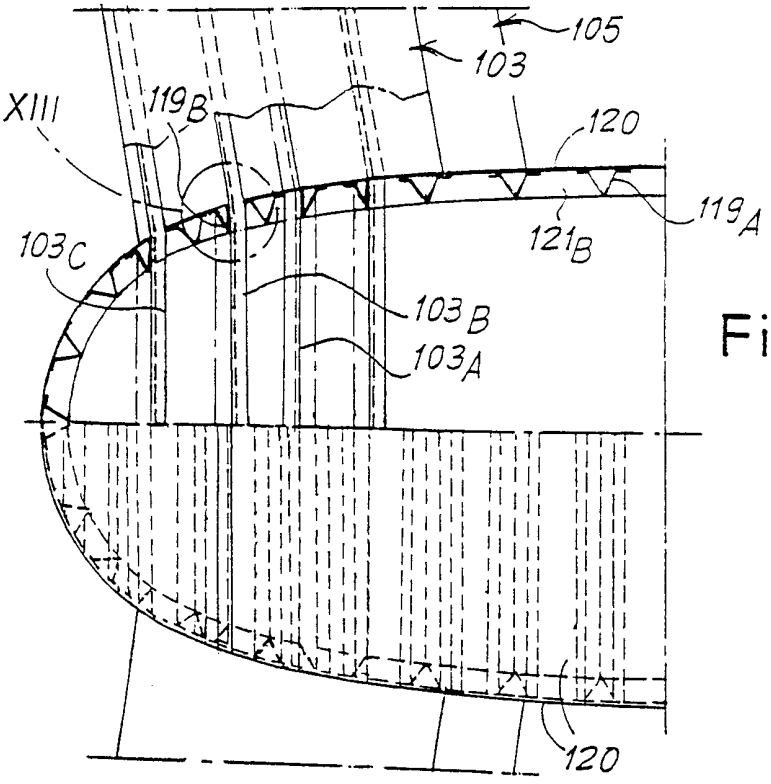

105
103
XIII
119B
120
119A
121B
103C
103B
103A
120

Fig.9

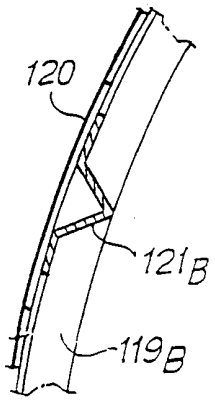


Fig.10

Fig.11

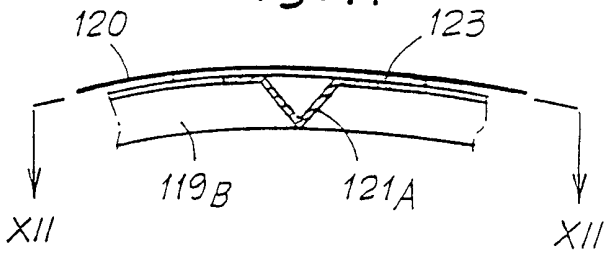


Fig.13

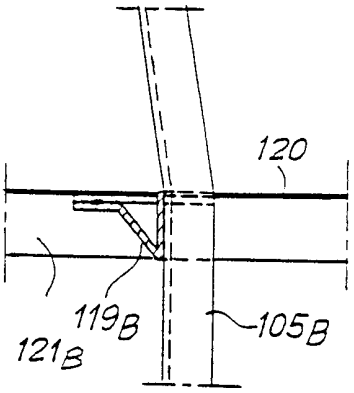
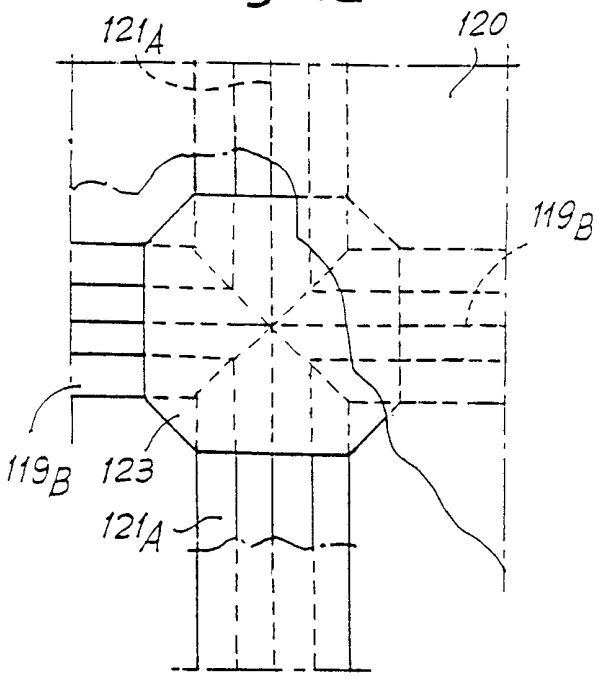


Fig.12



INTERNATIONAL SEARCH REPORT

Ir ational Application No
PCT/IT 99/00409

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B64B1/20 B64C39/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B64B B64C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 005 783 A (TAYLOR JAMES D) 9 April 1991 (1991-04-09) column 8, line 23 - line 28	1-3,5, 10,11
X	US 4 052 025 A (CLARK FRANK M ET AL) 4 October 1977 (1977-10-04) column 2, line 43 - line 56 column 5, line 21 - line 38	1-3
X	EP 0 583 666 A (BUNDO MUTSURO) 23 February 1994 (1994-02-23) column 4, line 45 - line 55	1,5,6
A	GB 2 250 007 A (OMIYA SOUSUKE) 27 May 1992 (1992-05-27) page 7, line 22 -page 8, line 9	8

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 March 2000	11/04/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Hauglustaine, H

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

In ational Application No
PCT/IT 99/00409

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 907 218 A (MILLER RALPH H) 23 September 1975 (1975-09-23) the whole document ---	1
X	EP 0 768 238 A (HIROSE TOKUZO) 16 April 1997 (1997-04-16) the whole document -----	1

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

In tional Application No
PCT/IT 99/00409

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5005783	A	09-04-1991	NONE		
US 4052025	A	04-10-1977	NONE		
EP 0583666	A	23-02-1994	JP	6064592 A	08-03-1994
			US	5383627 A	24-01-1995
GB 2250007	A	27-05-1992	JP	4169397 A	17-06-1992
			US	5240206 A	31-08-1993
US 3907218	A	23-09-1975	NONE		
EP 0768238	A	16-04-1997	NONE		