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WO 2004/024558 A2 US 6170779 B1
US 5454530 A

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(54) Abstract Title: **Compound aircraft having fairings to reduce drag on rotor hub during fixed-wing mode**

(57) A stopped-rotor aircraft 10 comprises a fuselage 14, a rotor hub 12 comprising a plurality of blades attached thereto, said hub 12 being rotatable by an engine 22, there being at least one retractable fairing 60, 64, covering a portion of said hub, said fairing being deployable / retractable by an actuator operated by a controller. The rotor may be locked into placed to provide lift surfaces when it transforms from rotary-wing (helicopter) to fixed-wing (aeroplane) flight. The retractable fairings 60, 64, when deployed form a flush aerodynamic surface with a rotating fairing 62, thereby reducing parasitic drag otherwise caused by the exposed rotor hub on the convertible aircraft. Ideally two retractable fairings 60, 64, are employed. The compound rotorcraft may comprise more than one hub and/or engine. Figure 5 shows the fairings in the retracted position, with the deployed positions shown by dashed-line 76.

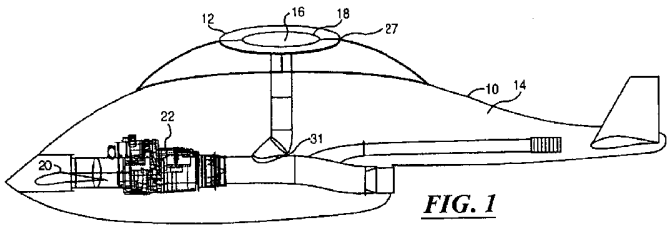

FIG. 1

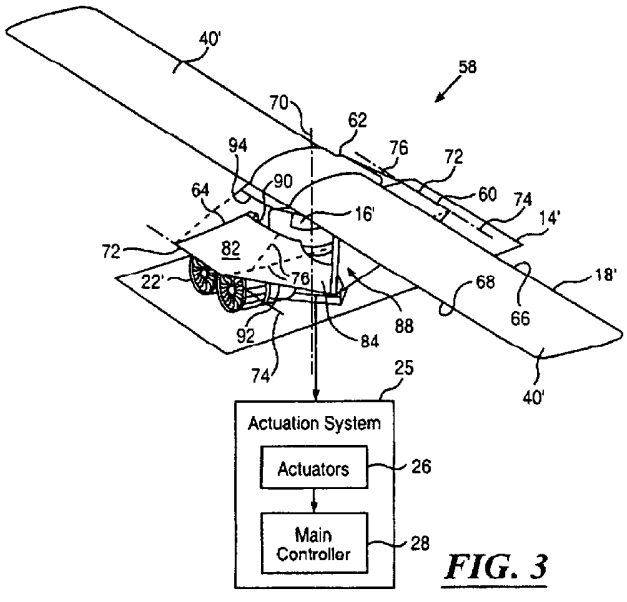

FIG. 3

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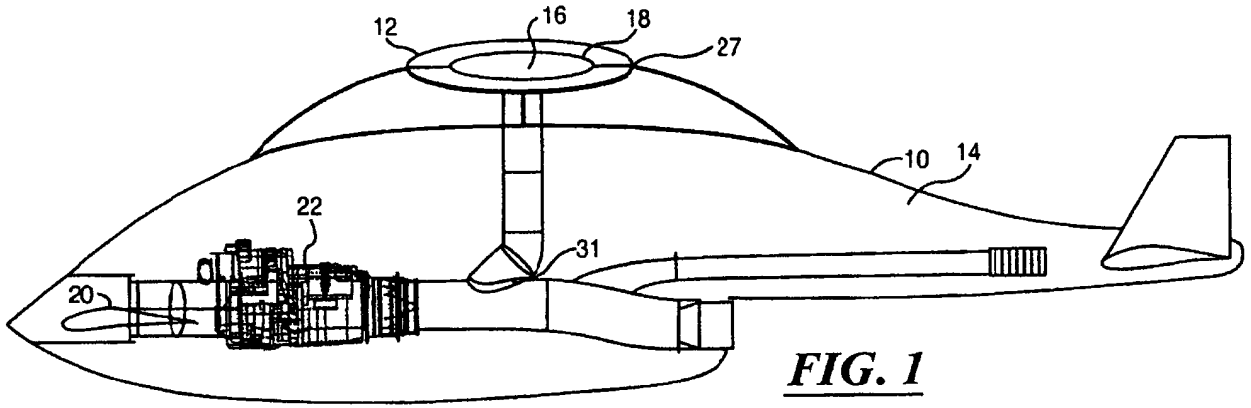
12
16
18
27
10
14
22
31
20

FIG. 1

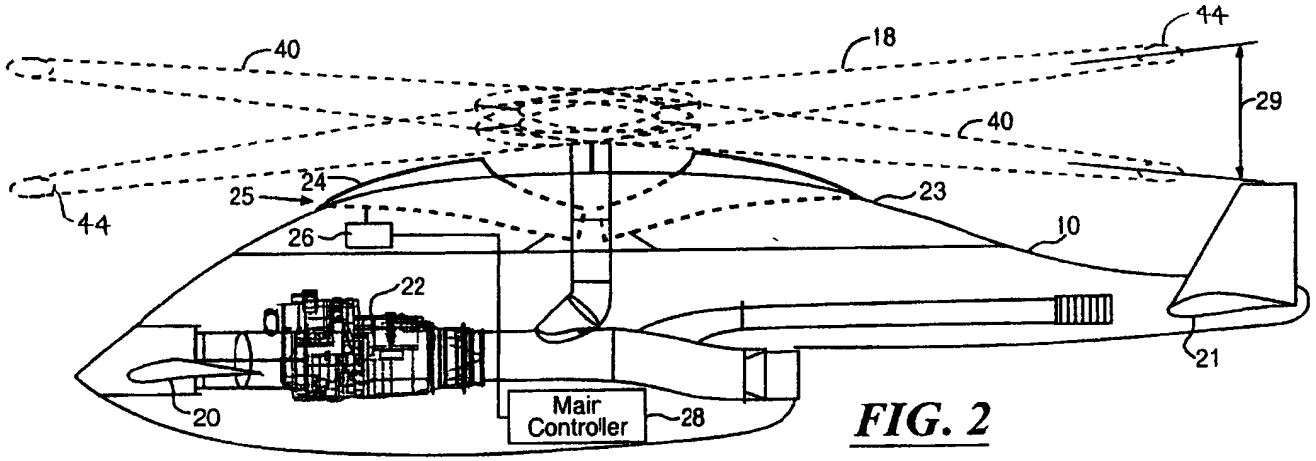
40
18
44
29
40
24
25
23
44
26
10
22
21
20
Mair Controller
28

FIG. 2

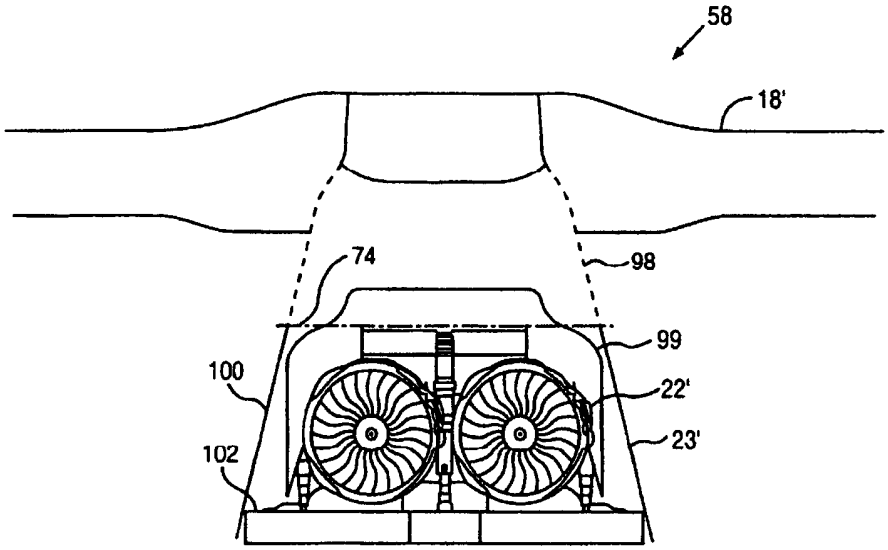
58
18'
74
98
99
100
22'
102
23'

FIG. 4

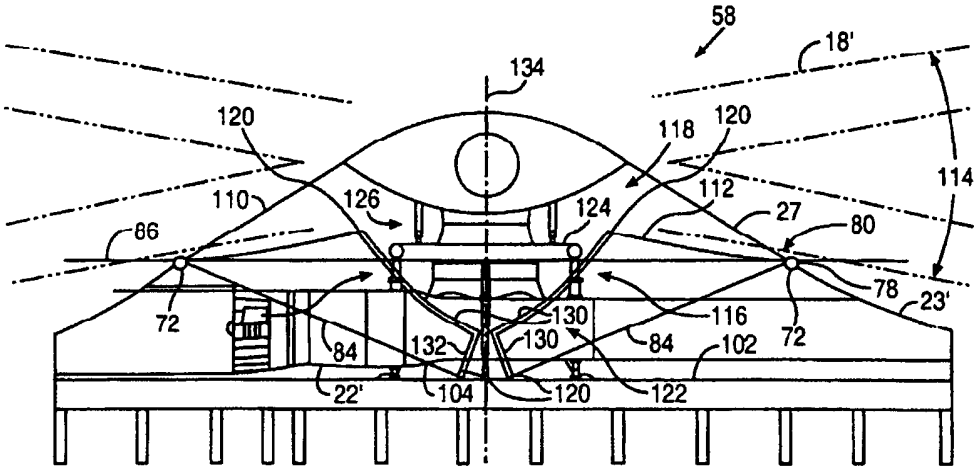
58
18'
134
120
118
120
114
110
126
124
112
27
80
86
78
23'
72
130
116
72
84
132
130
84
102
22'
104
120
122

FIG. 5

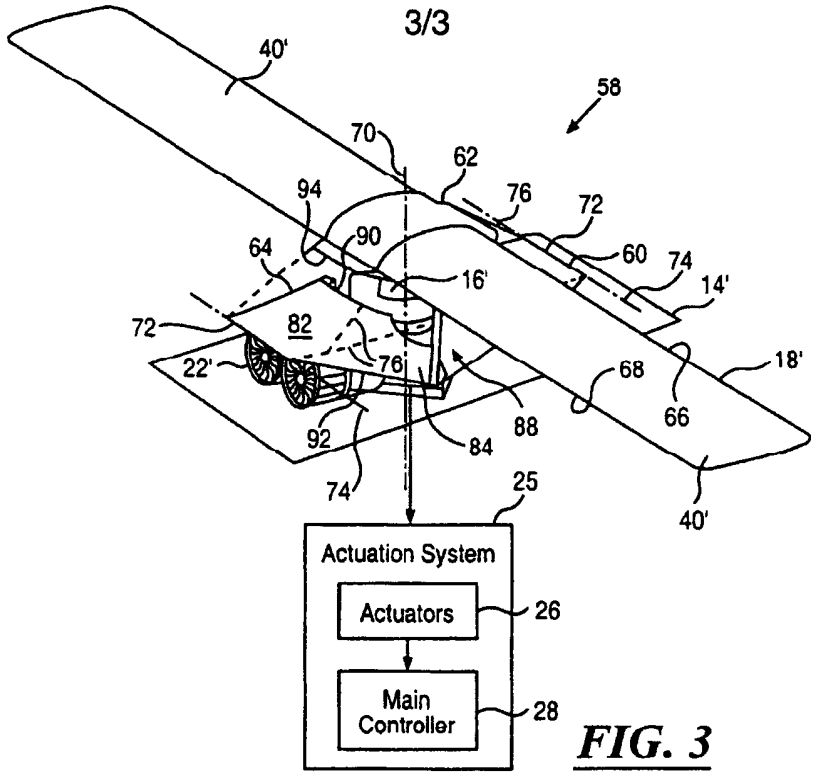
40'
58
70
62
94
76
72
90
64
60
74
14'
16'
72
82
22'
76
68
18'
66
92
88
84
74
25
40'
Actuation System
Actuators
26
Main Controller
28

FIG. 3

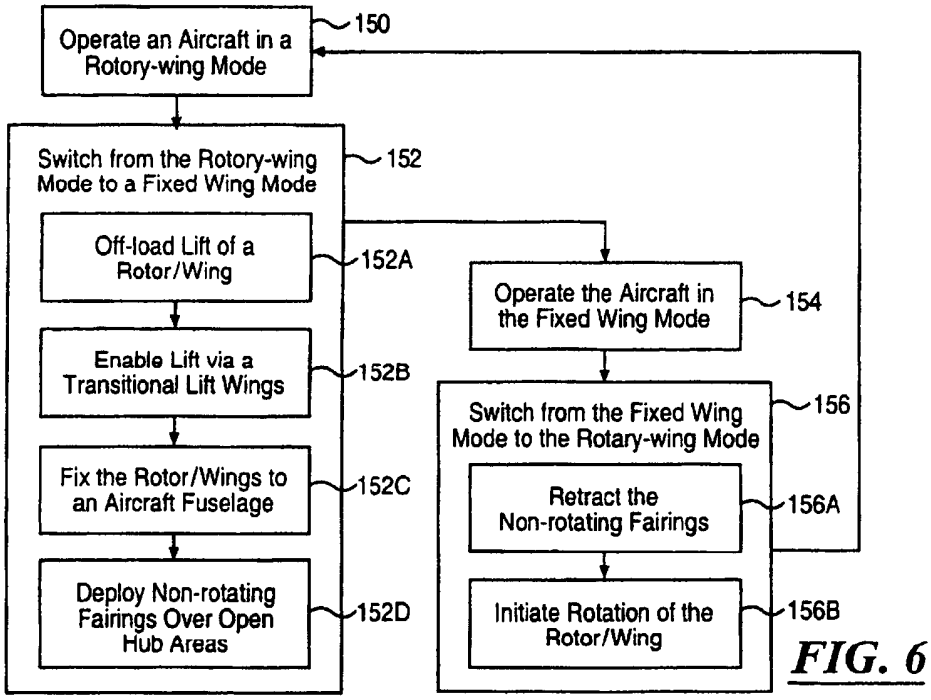
Operate an Aircraft in a Rotory-wing Mode
150
Switch from the Rotory-wing Mode to a Fixed Wing Mode
152
Off-load Lift of a Rotor/Wing
152A
Enable Lift via a Transitional Lift Wings
152B
Fix the Rotor/Wings to an Aircraft Fuselage
152C
Deploy Non-rotating Fairings Over Open Hub Areas
152D
Operate the Aircraft in the Fixed Wing Mode
154
Switch from the Fixed Wing Mode to the Rotary-wing Mode
156
Retract the Non-rotating Fairings
156A
Initiate Rotation of the Rotor/Wing
156B

FIG. 6

Description

Powerfish - Combination Hydroelectric Hydrothermal Unit

Background

The importance of producing sustainable and low-emission forms of energy is made increasingly apparent in the face of climate change and pollution problems. There is a need to develop technologies that make more efficient use of the forms of sustainable energy generation available.

The particular processes described below are ideal for harnessing the energy of a river's flow, and for the purpose of the following description the system is located both in the riverbed and an adjacent commercial or even domestic property.

Statement of Invention

This system operates on the principle of combining the flow of hydraulic fluid through the system to convey both hydraulic pressure and the transference of heat from one point to another.

The starting point of this system will be a hydraulic pump fixed to a variable pitch impeller. This unit can be located in the mouth of the penstock. The penstock itself is laid in the bed of a river. At this point the hydraulic fluid is warmed to the ambient temperature of the river. It is then sent under pressure to the sub-station, where the hydraulic energy is converted into electrical energy by the use of a turbine and generator. The heat from the hydraulic fluid is extracted via a hydrothermal heat extraction unit.

Advantages

Because it is possible to submerge a hydraulic pump below water without any detrimental environmental effects – the installation costs of this system will be minimal.
Although this system has the disadvantage of energy loss at the initial point of take-up, it has the advantage of

transferring the heat from the take-up point to the end-use point, without any further loss of pressure in the system.

The features of this system will now be described by referring to the accompanying diagrams:

Diagram 1 illustrates stage one of the process; which is heat and power extraction from the river.

Diagram 2 illustrates the method of extracting heat and power from the hydraulic fluid at a remote location.

Key to Diagrams & Explanation of Component Parts

Diagram 1

1.Direction of River Flow

2.Penstock Filter: This removes debris from the water before it enters the penstock.

3.Penstock: This transports water from the penstock filter to the impeller.

4.Riverbed

5.Low Pressure Hydraulic Pipe: This carries cold hydraulic fluid from the sub-station to the heat exchanger located inside the penstock, before it enters the hydraulic pump.

6.High Pressure Hydraulic Pipe: This carries hydraulic fluid from the high-pressure pump to the sub-station.

7.Drive Shaft: Between the impeller and the pump.

8.Hydraulic Pump: Delivers high-pressure hydraulic fluid from the pump to the substation.

9.Impeller: This removes energy from the running water and delivers it via the drive shaft of the hydraulic pump.

10.Diffuser: This controls the flow of water back to the river.

11.Length of Penstock In Metres: 150m

12.Head of Water: 4m

13.Flow: $1m^3/s$

Key to Diagrams & Explanation of Component Parts

Diagram 2

1.High Pressure Hydraulic Feed Pipe: This carries the hydraulic fluid from the pump to the turbine.

2.Control Valve: This controls the speed of the flow of the hydraulic fluid.

3.Hydraulic Turbine: This converts hydraulic energy into mechanical energy.

4.Drive shaft: This transfers rotary mechanical energy to the generator.

5.Generator: This transforms mechanical energy to electrical energy.

6.Electric Cable: This transfers electricity from the generator to the fuse box.

7.Turbine Discharge Pipe: This takes hydraulic fluid from the turbine to the expansion tank.

8.Expansion Tank: This acts as a reservoir for the hydraulic fluid; and is a convenient place to locate the heat-exchanging coil for the hydrothermal unit. It also allows hydraulic fluid to vent to atmosphere.

9.Low Pressure Return Pipe: This pipe conveys low-pressure cooled hydraulic fluid from the expansion tank, which is located in the sub-station, to the heat exchanger, which is located in the penstock.

10.In-Line Filter: Located in the low-pressure return pipe.

11.Heat Exchange Coil Located In Expansion Tank This coil takes heat from the hydraulic fluid and transfers the heat to

the domestic heat exchanger (domestic central heating system).

12.Central Heating Heat Exchanger

13.Feed and Return Pipes for Domestic Central Heating System

Claims

Powerfish - Combination Hydroelectric Hydrothermal Unit

1. The combination hydroelectric hydrothermal unit operates on the principle of combining the flow of hydraulic fluid through the system to convey both hydraulic pressure and the transference of heat from one point to another.

2. The heat from the hydraulic fluid is extracted via a hydrothermal heat extraction unit.

3. This system has great flexibility for installation because the heat exchange unit can be located remotely from the generation unit if so desired.

4. This unit will produce electricity and heat with little detrimental effect to the environment, and will do so at a much-reduced financial cost compared to conventional hydro-systems.

Application No: GB0619167.0 **Examiner:** Mr Nithi Nithiananthan

Claims searched: 1-25 **Date of search:** 5 July 2007

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	WO2004/024558 A2 (White) -
A	-	US5454530 A (Mc Donnell) -
A	-	US6170779 B1 (Mc Donnell) -

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

B64C

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
B64C	0027/30	01/01/2006