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(54) Title: STABILIZER SACRIFICIAL SURFACES

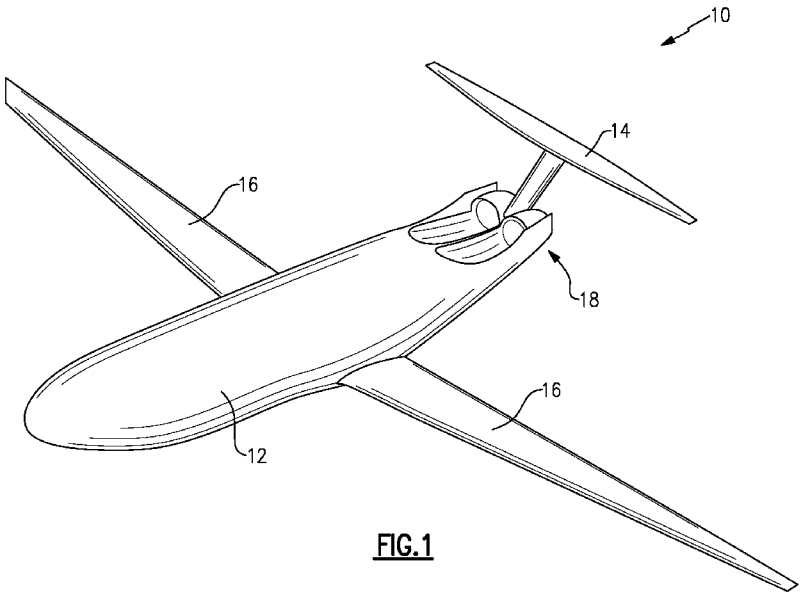

FIG.1

(57) Abstract: An aircraft assembly is disclosed and includes a fuselage including a turbine engine mounted within the aft fuselage. A burst zone is defined about the turbine engine and a tail is disposed at least partially with the burst zone. The tail includes primary control surfaces and sacrificial control surfaces. The sacrificial control surfaces can break away in a defined manner to maintain integrity of the primary control surfaces outside of the burst zone.

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STABILIZER SACRIFICIAL SURFACES

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to United States Provisional Application No. 61/725,129 filed on November 12, 2012.

BACKGROUND

[0002] Conventional aircraft architecture includes wing mounted gas turbine engines. In some aircraft architectures gas turbine engines are mounted atop the fuselage or on opposite sides of the aircraft fuselage.

[0003] Commercial aircraft typically utilize gas turbine engines that in include a fan section driven by a core engine or gas generator. The core engine includes a compressor section, a combustor section and a turbine section. Air entering the compressor section is compressed and delivered into the combustion section where it is mixed with fuel and ignited to generate a high-speed exhaust gas flow. The high-speed exhaust gas flow expands through the turbine section to drive the compressor and the fan section through a driven shaft.

[0004] Alternate aircraft architectures may require alternate mounting locations of the gas turbine engines to enable specific wing and fuselage configurations. However, conventional gas turbine engine configurations have been developed to operate with conventional aircraft architectures.

[0005] Accordingly, alternate gas turbine engine configurations may be required and developed to enable implementation of favorable aspects of alternate engine architectures.

SUMMARY

[0006] An aircraft according to an exemplary embodiment of this disclosure, among other possible things includes a fuselage, and a tail extending from the fuselage. The tail includes one or more sacrificial control surfaces and primary control surfaces. The primary control surfaces maintain aircraft controllability upon failure of the sacrificial control surfaces.

[0007] In a further embodiment of the foregoing aircraft, the tail includes a horizontal stabilizer and the sacrificial control surfaces and primary control surfaces are part of the horizontal stabilizer.

[0008] In a further embodiment of any of the foregoing aircrafts, the horizontal stabilizer is supported on a vertical stabilizer.

[0009] In a further embodiment of any of the foregoing aircrafts, the horizontal stabilizer is spaced apart from the fuselage in a direction that is substantially perpendicular to a longitudinal centerline of the fuselage.

[0010] In a further embodiment of any of the foregoing aircrafts, includes a propulsion system mounted to an aft end of the fuselage and a burst zone defined about the propulsion system that encompasses the sacrificial control surfaces.

[0011] In a further embodiment of any of the foregoing aircrafts, the propulsion system includes a gas turbine engine including a core engine disposed about a first axis driving a fan section disposed about a second axis angled relative to the first axis.

[0012] An aircraft assembly according to an exemplary embodiment of this disclosure, among other possible things includes a fuselage including a forward portion and an aft portion. A turbine engine is mounted within the aft portion. A burst zone is defined about the turbine engine. A tail is disposed at least partially with the burst zone. The tail portion includes primary control surfaces and sacrificial control surfaces. The sacrificial control surfaces break away in a defined manner to maintain integrity of the primary control surfaces outside of the burst zone.

[0013] In a further embodiment of the foregoing aircraft assembly, includes a horizontal stabilizer with the primary control surfaces and the sacrificial control surfaces disposed on the horizontal stabilizer.

[0014] In a further embodiment of any of the foregoing aircraft assemblies, includes a vertical stabilizer extending from the aft portion of the fuselage. The horizontal stabilizer is supported on the vertical stabilizer.

[0015] In a further embodiment of any of the foregoing aircraft assemblies, the sacrificial control surfaces are disposed at distal ends of the horizontal stabilizer.

[0016] In a further embodiment of any of the foregoing aircraft assemblies, the primary control surface is disposed between sacrificial control surfaces.

[0017] In a further embodiment of any of the foregoing aircraft assemblies, the turbine engine includes first and second turbine engines defining corresponding first and second burst zones.

[0018] In a further embodiment of any of the foregoing aircraft assemblies, the first and second turbine engines include corresponding core sections disposed about different axes that are angled away from each other.

[0019] In a further embodiment of any of the foregoing aircraft assemblies, the turbine engine includes a fan section disposed about a first axis driven by a core engine disposed about a second axis angled relative to the first axis.

[0020] Although the different examples have the specific components shown in the illustrations, embodiments of this disclosure are not limited to those particular combinations. It is possible to use some of the components or features from one of the examples in combination with features or components from another one of the examples.

[0021] These and other features disclosed herein can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Figure 1 is a schematic view of an example aircraft.

[0023] Figure 2 is a schematic view of an example propulsion system.

[0024] Figure 3 is a schematic view of an example burst zone of the propulsion system.

[0025] Figure 4 is another schematic view of the example burst zone.

[0026] Figure 5 is a schematic view of an example aircraft tail with sacrificial control surfaces.

[0027] Figure 6 is another view of the example aircraft with sacrificial control surfaces.

DETAILED DESCRIPTION

[0028] Referring to the Figures 1 and 2 an aircraft 10 includes a fuselage 12 having wings 16 and a tail 14. A propulsion system 18 is mounted aft end of the fuselage 12. The propulsion system 18 includes first and second gas turbine engines. The gas turbine

engines include first and second core engines 20a-b that drives corresponding first and second fan sections 22a-b.

[0029] Each of the first and second core engines 20a-b are disposed about an engine axis A and drive the corresponding fan sections 22a-b about a second axis B. The first axis A and second axis B are angled relative to each other. The example core engines 20a-b are commonly referred to as reverse flow engines and include a compressor 24, a combustor 26 and a turbine 28. Air is drawn in through inlets 32a-b to the compressor 24 is compressed and communicated to a combustor 26. In the combustor 26, air is mixed with fuel and ignited to generate a high pressure exhaust gas stream that expands through the turbine 28 where energy is extracted and utilized to drive the compressor 24 and corresponding fan 22a-b.

[0030] In the disclosed example, each of the first and second fans 22a-b is mounted substantially parallel to each other about respective second axes B. Gas turbine engines are not typically mounted next to each other due to practical limitations related to overall aircraft survivability in the event of engine failure. A Burst zone is defined around gas turbine engines within which another gas turbine engine is not permitted due to possible fragmentation from one failed engine disabling the second engine.

[0031] The disclosed core engines 20a-b are disposed at an angle relative to the corresponding second axes B and to each other such that neither core engine 20a-b is disposed within a burst zone 34 of the other core engine 20a-b. In other words, each of the core engines 20a-b is disposed at an angle away from the other core engine 20a-b such that each is orientated outside of the others bust zone 34.

[0032] Referring to Figure 3 and 4, in some aircraft architectures, some control surfaces are provided in the example tail 14 may fall within the burst zone 34 defined by the angled orientation of the core engines 20a-b. In this example, the tail 14 includes a horizontal stabilizer 38 supported on a vertical stabilizer 36. The horizontal stabilizer 38 includes primary control surfaces 40 and sacrificial control surfaces 42. The sacrificial control surfaces 42 are disposed within the burst zones 34.

[0033] Referring to Figures 5 and 6 with continued reference to Figures 3 and 4, the sacrificial control surfaces 42 are within the burst zones 34 and are designed to break away should a strike from debris occur. The sacrificial surfaces 42 include a defined frangible connection 44 that breaks away in a controlled manner to enable the aircraft 10 to

maintain stability and control. The non-break away or primary control surfaces 40 maintain the desired aircraft control after the loss of the sacrificial control surfaces 42. Figures 5 and 6 show the loss of one of the sacrificial control surfaces 42 in the event of failure of one of the core engines 20a-b.

[0034] Accordingly, the example aircraft architecture includes features that enable the use and operation of control surfaces within the burst zones by enabling a controlled break away to maintain integrity of control surfaces outside of the burst zones.

[0035] Although an example embodiment has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this disclosure. For that reason, the following claims should be studied to determine the scope and content of this disclosure.

CLAIMS

What is claimed is:

1. An aircraft comprising;

a fuselage; and

a tail extending from the fuselage, the tail including one or more sacrificial control surfaces and primary control surfaces, wherein the primary control surfaces maintain aircraft controllability upon failure of the sacrificial control surfaces.

2. The aircraft as recited in claim 1, wherein the tail comprises a horizontal stabilizer and the sacrificial control surfaces and primary control surfaces are part of the horizontal stabilizer.

3. The aircraft as recited in claim 2, wherein the horizontal stabilizer is supported on a vertical stabilizer.

4. The aircraft as recited in claim 2, wherein the horizontal stabilizer is spaced apart from the fuselage in a direction that is substantially perpendicular to a longitudinal centerline of the fuselage.

5. The aircraft as recited in claim 1, including a propulsion system mounted to an aft end of the fuselage and a burst zone defined about the propulsion system that encompasses the sacrificial control surfaces.

6. The aircraft recited in claim 5, wherein the propulsion system comprises a gas turbine engine including a core engine disposed about a first axis driving a fan section disposed about a second axis angled relative to the first axis.

7. An aircraft assembly comprising

a fuselage including a forward portion and an aft portion;

a turbine engine mounted within the aft portion, wherein a burst zone is defined about the turbine engine; and

a tail disposed at least partially with the burst zone, the tail portion including primary control surfaces and sacrificial control surfaces, wherein the sacrificial control surfaces break away in a defined manner to maintain integrity of the primary control surfaces outside of the burst zone.

8. The aircraft assembly as recited in claim 7, including a horizontal stabilizer with the primary control surfaces and the sacrificial control surfaces disposed on the horizontal stabilizer.

9. The aircraft assembly as recited in claim 8, including a vertical stabilizer extending from the aft portion of the fuselage, wherein the horizontal stabilizer is supported on the vertical stabilizer.

10. The aircraft assembly as recited in claim 8, wherein the sacrificial control surfaces are disposed at distal ends of the horizontal stabilizer.

11. The aircraft assembly as recited in claim 8, wherein the primary control surface is disposed between sacrificial control surfaces.

12. The aircraft assembly as recited in claim 7, wherein the turbine engine comprises first and second turbine engines defining corresponding first and second burst zones.

13. The aircraft assembly as recited in claim 12, wherein the first and second turbine engines include corresponding core sections disposed about different axes that are angled away from each other.

14. The aircraft assembly as recited in claim 7, wherein the turbine engine includes a fan section disposed about a first axis driven by a core engine disposed about a second axis angled relative to the first axis.

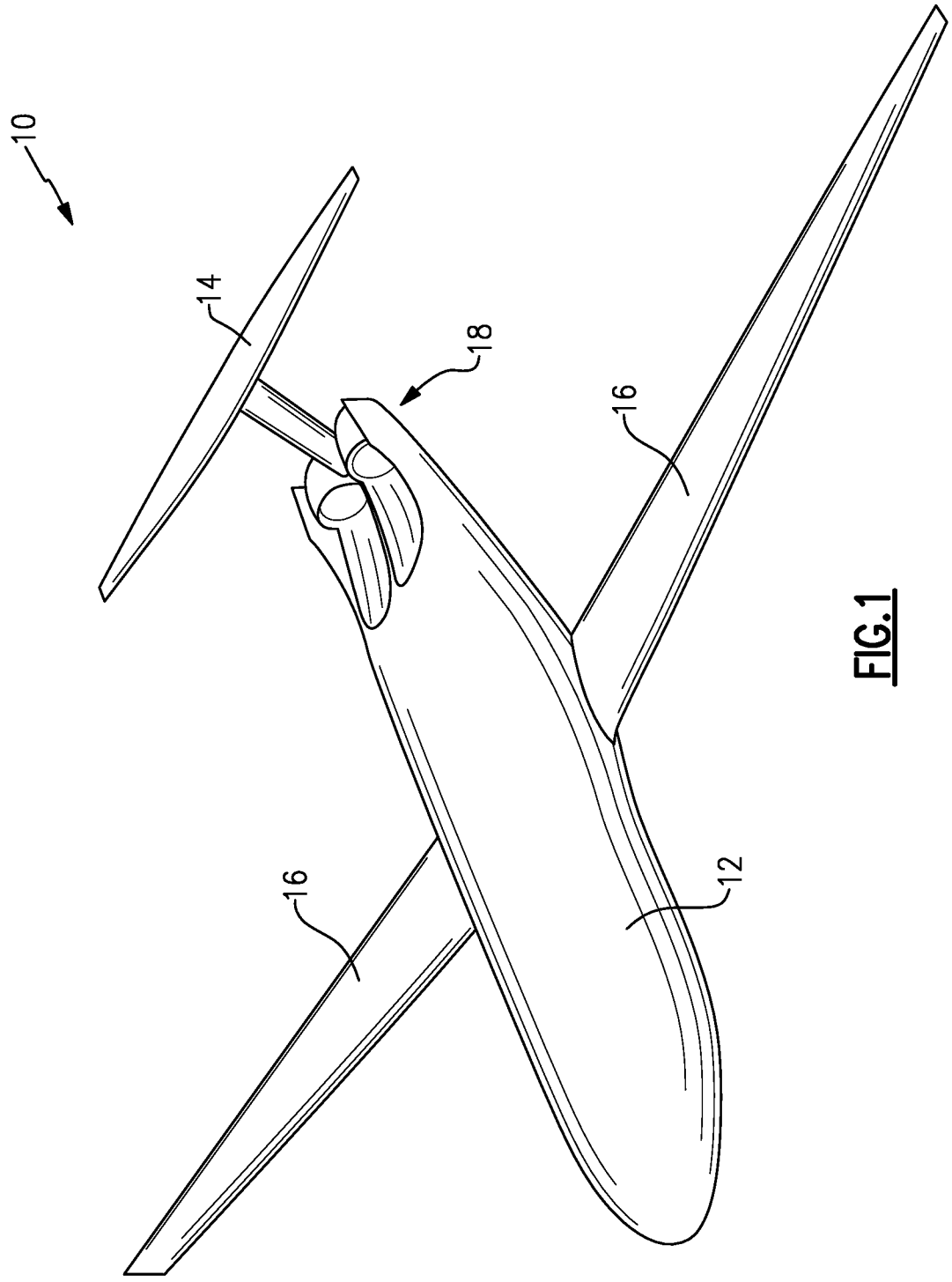

FIG.1

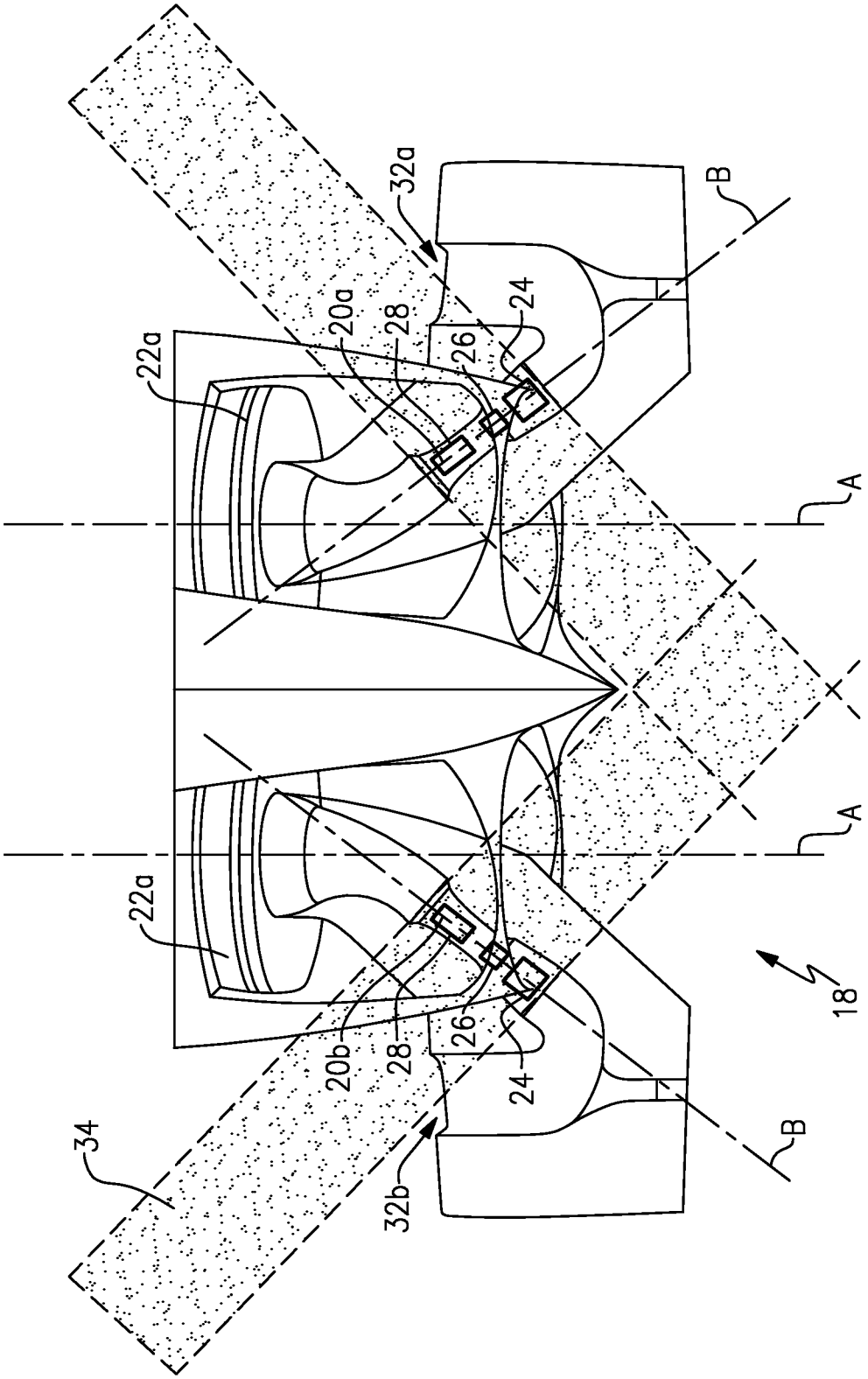

FIG.2

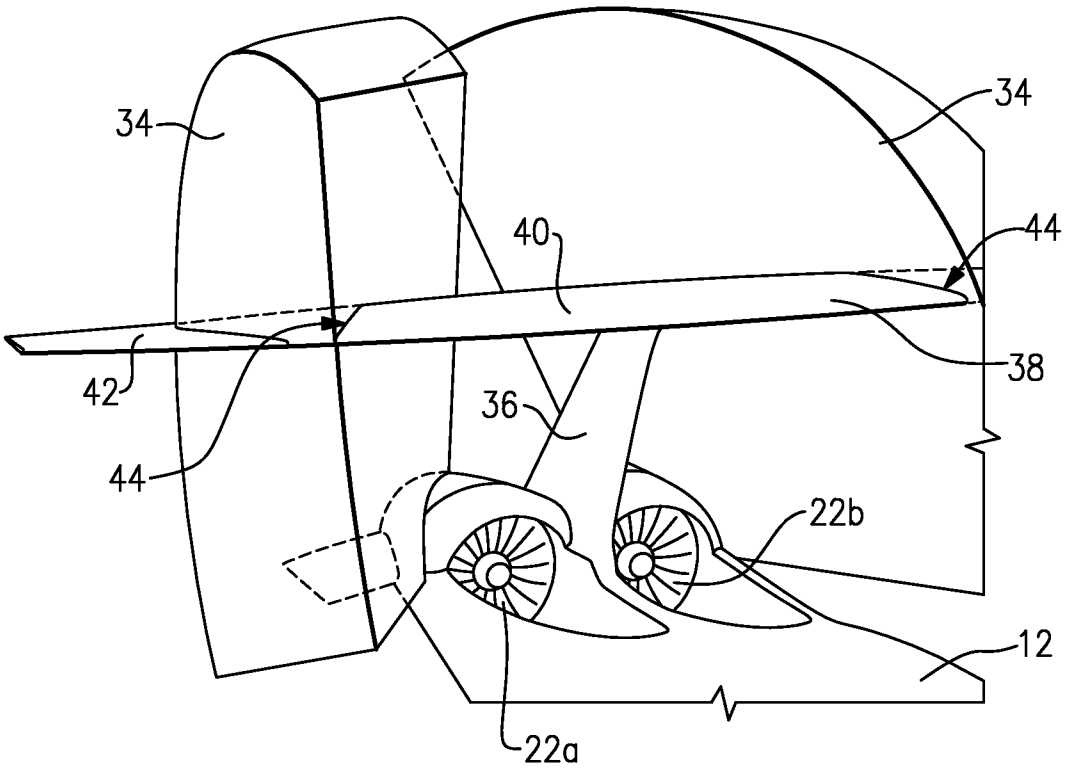

FIG.3

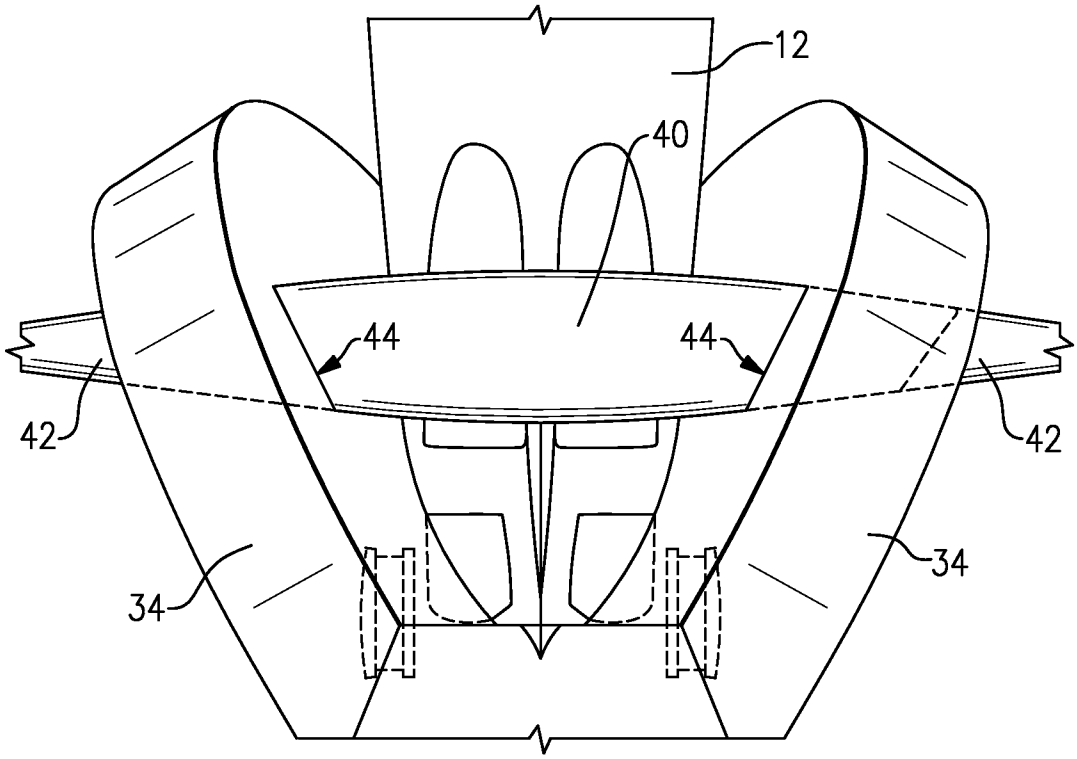

FIG.4

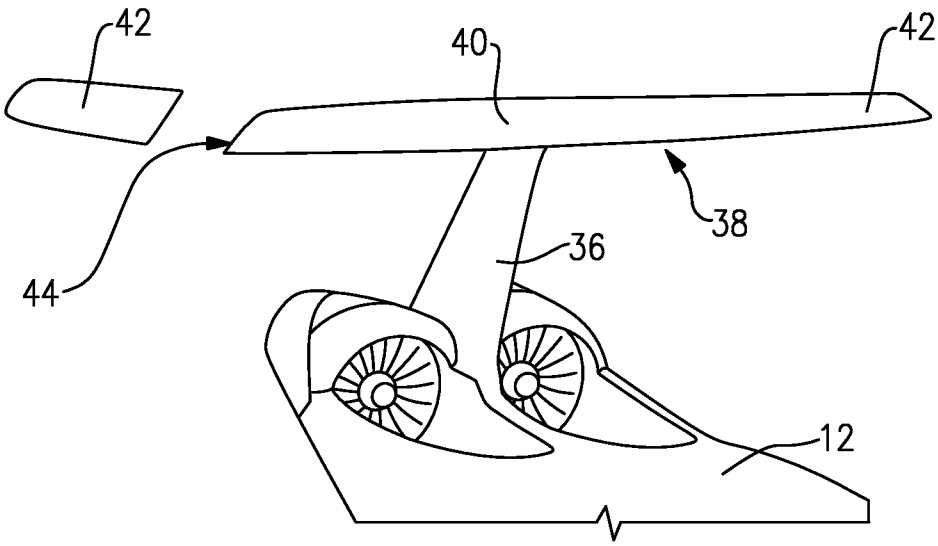

FIG.5

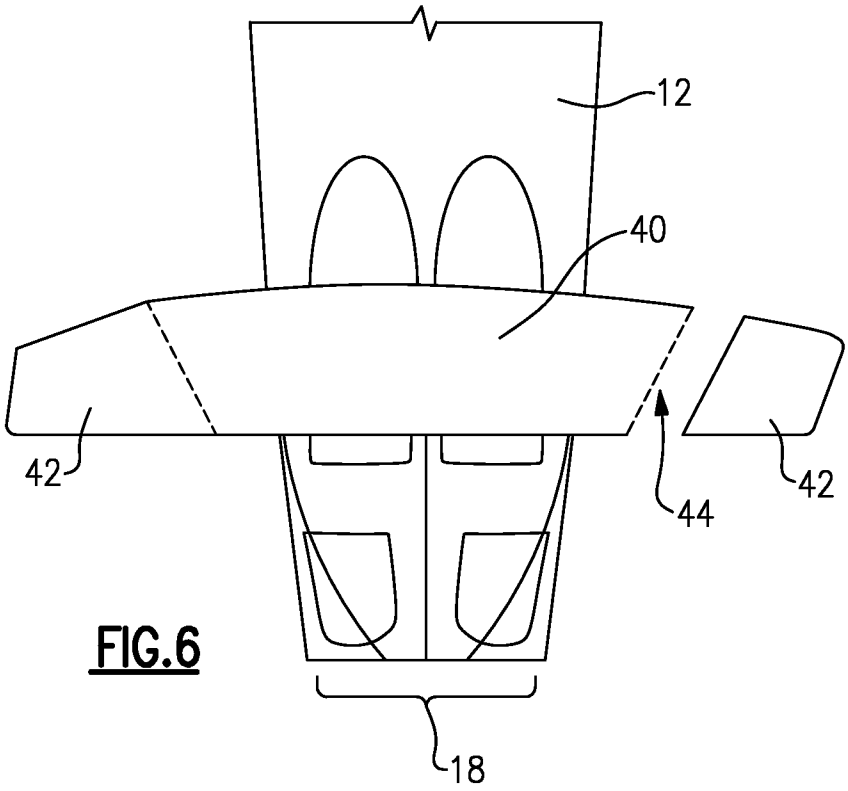

FIG.6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/032028

A. CLASSIFICATION OF SUBJECT MATTER

B64C 5/02(2006.01)i

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)
B64C 5/02; B64D 27/00; B64D 27/02; B64C 21/00; B64C 29/04; B64C 27/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: aircraft, fuselage, tail, stabilizer, sacrificial control surface, primary control surface, and burst zone

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009-0020643 A1 (GALL et al.) 22 January 2009 See abstract, paragraphs [0027]-[0032], and figures 1-7.	1-14
A	EP 1046577 A2 (CONWAY HOLDINGS, LTD.) 25 October 2000 See paragraph [0018] and figures 1-4.	1-14
A	US 4291853 A (SIGALLA, ARMAND) 29 September 1981 See column 3, line 53 - column 4, line 49 and figures 1-5.	1-14
A	US 2008-0073459 A1 (CAZALS et al.) 27 March 2008 See paragraphs [0022]-[0031] and figures 1-5.	1-14
A	US 4500055 A (KROJER, HUBERT) 19 February 1985 See column 3, lines 15-60, column 5, lines 8-34 and figures 1-2, 12-13.	1-14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family 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 application or patent but published on or after the international filing date
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 December 2013 (03.12.2013)	**04 December 2013 (04.12.2013)**

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2013/032028

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