

A VEHICLE AND MOUNTING SYSTEM FOR A VEHICLE

FIELD OF INVENTION

5 The invention relates to a vehicle and a mounting system for a vehicle.

BACKGROUND

10 An example objective of aircraft design may be to allow easy assembly and dismantling of the aircraft. In a modern context this allows storage in a reduced space or portability in disassembled form.

15 Prior art approaches at solving this problem include foldable or detachable modules. Commonly where a module is provided as removable for disassembly the attachment mechanism must be made robust. Such attachment mechanisms may add weight to the aircraft, which lowers load carrying capacity and/or increases fuel consumption.

20 Unmanned aerial vehicles (UAV) for example may be used for surveillance or monitoring capabilities in remote or demanding locations. It may therefore be desirable to provide a UAV that is easily disassembled and portable yet lightweight.

25 Other vehicles may face similar problems with assembly, disassembly and/or storage.

 A need therefore exists to address at least one of the above problems.

SUMMARY

30 In accordance with a first aspect of the invention there is provided a vehicle including:

 a body;

 a module attached to said body; and

 a track and track follower assembly attaching said module to said body so

35 that said module is movable relative to said body by sliding relative movement between said track and track follower between a first position at which said module is

not attached to said body and a second position at which said module is attached to said body; and

wherein said module is substantially locked to said body in said second position.

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The vehicle may be an aircraft.

The vehicle may further comprise locking means locking said module to said body in said second position.

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Said track may be attached to said body and said track follower may be attached to said module.

Said track may be linear.

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Said track and said track follower may have with a constant longitudinal width.

Said track may have a converging taper towards the direction of motion.

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Said track and/or said track follower may be constructed of a composite material.

Said composite material may include moulded carbon fibre and resin.

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Said module may be a propulsion module.

Said propulsion module may be correctly aligned by engagement in said second position.

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Said track follower may include an upper surface having a substantially curved transverse cross-section engaging an outer skin of said propulsion module, said outer skin of said propulsion module having a curved transverse cross-section matching said upper surface.

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Said track may include an lower surface having a substantially curved longitudinal cross-section engaging an outer skin of said body, said outer skin of said body having a curved longitudinal cross-section matching said lower surface.

Said body may include an internal structure, and said track forms an integrated structural member of said internal structure.

5 Said locking means may comprise a socket in said track that in use receives a projection from said track follower in said second position whereby apertures in said track and said track follower cooperate to receive a locking pin to thereby lock said module to said body in said second position.

10 Said track may extend longitudinally of the aircraft, and wherein the track follower moves from said first position to said second position in a direction opposite to the normal direction of motion.

15 Alternatively said track extends longitudinally of the aircraft, and wherein the track follower moves from said first position to said second position in the same direction as normal motion.

The aircraft may be configured as an Unmanned Aerial Vehicle (UAV).

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will now be described with reference to the enclosed drawings, in which:

25 Figure 1 is a perspective view of an aircraft.

Figure 2 is a perspective view showing operation of a track and track follower assembly.

Figure 3 is a perspective view showing the track follower attached to a propulsion module.

30 Figure 4 is projection view of the track follower

Figure 5 is a perspective view showing the track attached to a centre wing/fuselage.

Figure 6 is projection view of the track.

35 Figure 7 shows a tapering track and track follower assembly, according to a further embodiment.

DETAILED DESCRIPTION

In an example embodiment, an aircraft is provided with attachable or removable modules. For example, the prime mover or propulsion module may be mounted in a sliding manner to the centre wing or fuselage. One application for such an embodiment is use in a modular UAV.

Referring now to Figure 1 an aircraft 102 is shown including a centre wing or fuselage 104, wings 106, a payload unit 108, a propulsion module 110, and tail fins 112. The propulsion module 110 may be affixed atop of the centre wing or fuselage 104 via a sliding track mounting 100, although other locations are also possible. Other modules attached to the aircraft may also employ a sliding track mounting.

The sliding track mounting may be used to connect various modules of an aircraft. A sliding track mounting has the advantage(s) of easy assembly and/or self-alignment once assembled and/or allowing modules to be easily interchanged. For example, the propulsion module will be automatically accurately aligned during mounting for correct and efficient operation and/or can be easily interchanged for replacement or maintenance.

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In Figure 2 the sliding track mounting is shown including a track 202 and a track follower 204 assembly. The track 202 is attached to the upper portion of the centre wing or fuselage 104, near the front. The track follower 204 is attached to the underside of the propulsion module 110. Generally the location of propulsion module 110 is longitudinally balanced about the mass of the fuselage, and laterally central. In this example embodiment the sliding track mounting 100 is predominantly external so it should be aerodynamic to avoid additional air resistance.

In operation the track follower 204 linearly slides into the track 202. In Figure 2a the propulsion module starts in Position A where it is not engaged to the track follower 204. In Figure 2b, the track and track follower are engaged, in position B. In Figure 2c the track follower is finally moved to position C where the propulsion module is properly located on the centre wing or fuselage. A locking mechanism 200 is provided to lock the propulsion module in Position C to the centre wing or fuselage. The track 202 extends longitudinally of the aircraft 102, such that the track follower 204 moves from the position A to the position C in a direction opposite to the normal direction of motion 102.

The track follower (204 in Figure 2) will now be described in more detail with respect to Figures 3 and 4. In Figure 3 the track follower 204 is engaged to the skin 300 of the propulsion module 110.

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Figure 4 shows the track follower 204 having an upper surface 402 that is curved (in transverse cross section) to mate with the outer curvature of the propulsion module skin. A longitudinal central member 404 supports the curved upper surface 402. The curved upper surface 402 flares away from the central member 404 at the sides 406 towards an acute tip 408. The central member 404 supports the propulsion module 110 by resting on the upper face of the track. An outward facing lip 406 runs longitudinally along the side of central member 404. The lip 406 slides and engages the track to hold the track follower in place and provide the sliding engagement. At one end of the central member 404 is a projection 410, with a lateral aperture 412 through the projection 410.

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The track, 202 will now be described in more detail with respect to Figures 5 and 6. In Figure 5, the track is engaged to the internal structure of the centre wing or the fuselage 104.

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Figure 6 shows the track including a lower surface 606, which is curved (in longitudinal cross section) to match the leading edge of the wing. Downwardly extending flanges 610 at each side 608 attach to internal ribs and outwardly extending brackets 612 at each side 608 attach to internal spar within the centre wing or fuselage 104. The track may function as an integrated structural member of the internal structure of the centre wing or fuselage.

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A flat middle upper surface 602 extends longitudinally for the track follower central member to rest on. At either side of the upper surface 602, longitudinally extending slots 604 are provided to mate with track follower lip to provide the sliding connection. A socket 616 is provided at one end to receive the track follower projection 410 to provide a means of locating the track follower in the position C. A lateral aperture 614 cooperates with the track follower lateral aperture 412 to receive a locking pin, thereby locking the track follower 204 in the position C.

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Either or both of the track 202 and track follower 204 may be constructed of lightweight yet robust materials. Either or both may be constructed of a composite

material. For example the composite material may include carbon fibre and resin. Other example materials include fibreglass, Kevlar and machined aluminium.

Referring to Figure 7 a further embodiment is shown with a tapering track and track follower assembly. The track 700 is attached to the centre wing or fuselage 104 and the track follower is attached to the propulsion module 110. The track 700 extends longitudinally of the aircraft 102 such that that the track follower 702 slides into the track 700 in the same direction as normal motion. The taper converges towards the direction of motion such that it exhibits a self locking/ wedging effect. In the locked position a projection 704 at the trailing end of the track follower 702 seats within a socket 706 at the trailing end of the track 700. The driving force from the propulsion unit is transferred to the aircraft through the projection/socket and/or the wedging of the track and track follower assembly, which avoids any loading on the locking pin. Alternatively, a separate locking mechanism may not be required; depending on the operational requirements and loadings on the assembly.

It will be appreciated that the invention may also be applicable to modular devices for vehicles generally where there is a need for accurate alignment, and/or fast assembly. One skilled in the art will also appreciate other applications are appropriate.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the embodiments without departing from the spirit or scope of the invention as broadly described. The embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A vehicle including:
a body;
a module attached to said body; and
5 a track and track follower assembly attaching said module to said body so that said module is movable relative to said body by sliding relative movement between said track and track follower between a first position at which said module is not attached to said body and a second position at which said module is attached to said body; and
10 wherein said module is substantially locked to said body in said second position.
2. The vehicle claimed in claim 1 wherein said vehicle is an aircraft.
- 15 3. The aircraft claimed in claim 2 further comprising locking means locking said module to said body in said second position.
4. The aircraft claimed in claims 2 or 3 and said track is attached to said body and said track follower is attached to said module.
- 20 5. The aircraft claimed in claim 4 wherein said track is linear.
6. The aircraft claimed in claim 5 wherein said track and said track follower have with a constant longitudinal width.
- 25 7. The aircraft claimed in claim 5 wherein said track and said track follower have a converging taper towards the normal direction of motion.
8. The aircraft claimed in any one of claims 2 to 7 wherein said track and/or said
30 track follower are constructed of a composite material.
9. The aircraft claimed in claim 8 wherein said composite material includes moulded carbon fibre and resin.
- 35 10. The aircraft claimed in any one of claims 2 to 9 wherein said module is a propulsion module.

11. The aircraft claimed in claim 10 wherein said propulsion module is correctly aligned by engagement in said second position.

12. The aircraft as claimed in claim 11 wherein said track follower including an upper surface having a substantially curved transverse cross-section engaging an outer skin of said propulsion module, said outer skin of said propulsion module having a curved transverse cross-section matching said upper surface.

13. The aircraft as claimed in claim 12 wherein said track including an lower surface having a substantially curved longitudinal cross-section engaging an outer skin of said body, said outer skin of said body having a curved longitudinal cross-section matching said lower surface.

14. The aircraft as claimed in claim 13 wherein said body including an internal structure, and said track forms an integrated structural member of said internal structure.

15. The aircraft as claimed in claim 3 wherein said locking means comprises a socket in said track that in use receives a projection from said track follower in said second position whereby apertures in said track and said track follower cooperate to receive a locking pin to thereby lock said module to said body in said second position.

16. The aircraft as claimed in any one of claims 2 to 15 wherein said track extends longitudinally of the aircraft, and wherein the track follower moves from said first position to said second position in a direction opposite to the normal direction of motion.

17. The aircraft as claimed in any one of claims 2 to 15 wherein said track extends longitudinally of the aircraft, and wherein the track follower moves from said first position to said second position in the same direction as normal motion.

18. The aircraft as claimed in any one of claims 2 to 17 configured as an Unmanned Aerial Vehicle (UAV).