A Cover Assembly

Technical Field

The present invention generally relates to a cover assembly.

Background

It is sometimes necessary to cover an opening that extends through a body. For example, an opening will sometimes be made to the skin of an aircraft to allow access to the interior of the aircraft skin. The opening is made through the aircraft skin to enable wires and cables to be routed therethough for connection of on-board instruments to equipment located external to the aircraft during maintenance.

Openings provided on the skin of the aircraft for maintenance purposes are typically made by drilling or cutting a hole through the skin of the aircraft. At the end of maintenance, the opening must be covered. One known cover assembly for covering a hole on an aircraft will be described with reference to Fig. 1. Fig. 1 shows a exploded perspective view of a cover assembly 10' for a hole 12' extending through the surface of an aircraft skin 9'. The opening 12' is used to allow access for cables, wires and the like to the interior of the aircraft skin 9'. A blanking plate 14' is used to cover the opening 12' by drilling four holes 16' around the opening 12'. The opening 12' is covered by placing blanking plate 14' over the opening 12' and then driving screws 18' through washers 19' to secure the blanking plate 14' to the aircraft skin 9'.

A problem with the cover assembly 10' disclosed in Fig. 1 is that it is necessary to drill four holes 16' through the skin 9' of the aircraft around the opening

12'. The four holes 16' weaken the structural strength and integrity of the aircraft skin 9'. Another disadvantage of the assembly 10' is that the screws and washers may that directly abut the surface of the aircraft skin 9' may potentially scratch and possibly damage the surface of the aircraft skin.

There is a need to provide a removable cover assembly that overcomes or at least ameliorates one or more of the disadvantages described above.

Summary

According to a first aspect, there is provided a cover assembly for an opening extending through a body, the cover assembly comprising:

a cover capable of covering the opening on a first side of the body;

a retainer member capable of extending across the opening on a second side of the body, opposite to the first side; and

a connector for connecting the cover and the retainer member, the connector being capable of moving the cover and the retainer member toward each other for locking engagement of the body between the cover and the retainer member, the connector having at least one bolt extending through respective holes provided on the cover and the retainer member and at least one locking member capable of reducing rotation of the bolt as it is turned, and the connector capable of moving the cover and the retainer member away from each other for disengagement of the body.

According to a second aspect, there is provided a removable cover assembly for an opening extending through a body, the removable cover assembly comprising:

a cover capable of covering the opening on a first side of the body;

a retainer member capable of extending across the opening on a second side of the body, opposite to the first side; and

a connector for connecting the cover and the retainer member, the connector being capable of moving the cover and the retainer member toward and away from each other for respective locking engagement and disengagement of the body between the cover and the retainer member, the connector having at least one bolt extending through respective holes provided on the cover and the retainer member and at least one locking member capable of reducing rotation of the bolt as it is turned.

According to a third aspect, there is provided a removable cover assembly for covering an opening extending through the skin of an aircraft, the removable cover assembly comprising:

a cover capable of covering the opening on a first side of the aircraft skin;

a retainer member capable of extending across the opening on a second side of the aircraft skin, opposite to the first side; and

a connector for connecting the cover and the retainer member, the connector being capable of moving the cover and the retainer member toward and away from each other for respective locking engagement and disengagement of the aircraft skin between the cover and the retainer member, the connector having at least one bolt extending through respective holes provided on the cover and the retainer member and at least one locking member capable of reducing rotation of the bolt as it is turned.

According to one embodiment, there is provided a method for covering an opening extending through a body, the method comprising the steps of:

locating a cover capable of covering the opening on a first side of the body;

locating a retainer member capable of extending across the opening on a second side of the body, opposite to the first side;

connecting the cover and the retainer member using a connector; and

moving the cover and the retainer member toward each other using the connector to lockingly engage the body between the cover and the retainer member.

According to another embodiment, there is provided a method for covering an opening extending

through the skin of an aircraft, the method comprising the steps of:

locating a cover capable of covering the opening on a first side of the aircraft skin;

locating a retainer member capable of extending across the opening on a second side of the aircraft skin, opposite to the first side;

connecting the cover and the retainer member using a connector; and

moving the cover and the retainer member toward each other using the connector to lockingly engage the aircraft skin between the cover and the retainer member.

Detailed Disclosure of Embodiments

Exemplary, non-limiting embodiments of a removable cover assembly will now be disclosed.

The cover assembly may be a removable cover panel assembly.

The connector may comprise at least one bolt. In one embodiment, the connector may comprise two bolts. The retainer member may comprise one or more holes. The cover may comprise one or more holes. In one embodiment, the one or more holes of the retainer member and the cover may be configured for receiving the shaft of the one or more of the bolts. The holes may be dimensioned to receive the shaft of the one or more bolts in locking engagement.

In one embodiment, the cover and the retainer member move relative to each other as the one or more bolts are screwed into, or out of, the one or more holes.

The one or more bolts may comprise a bolt head at a proximal end of the bolt shaft. The one or more bolts may comprise a stop at a distal end of the bolt shaft to prevent further turning of the bolt through the hole of the retainer member. The stop may be a pin that extends

through a hole extending through a distal end of the bolt shaft.

The retainer member may be a substantially longitudinal bracket that is dimensioned to extend across the opening on the second side of the body. The bracket may be in the form of a c-shaped bracket.

The cover may be a cover panel having a surface profile on a first side to allow the cover panel to be fastened to the first surface of the body in a substantially flush manner. The cover panel and the first surface of the body may both have planar surface profiles. In another embodiment, the first surface of the cover panel has a substantially concave-shaped profile and the first surface of the body may have a corresponding convex-shaped profile.

The body may be the body of a vehicle such as an automobile body, a marine vessel body or an aircraft vessel body. In one embodiment, the body is the skin of an aircraft. The cover assembly may be releasable to allow the cover to release from the skin of the aircraft to permit access to the interior of the aircraft skin via the opening.

The opening may be substantially round. In one embodiment there may be provided plural openings extending through the body that may be covered by a single cover panel.

The may cover assembly may comprise at least one locking member for at least reducing rotation of the at least one bolt as it is turned. The locking member may be a second bolt provided in addition to a first bolt.

The cover assembly may also comprise a deformable material disposed between the cover and the first surface of the body to protect the first surface. The deformable material may protect the first surface as the panel cover

is biased toward the first surface. In one embodiment, the deformable material may extend around the opening. The deformable material may also act as a sealant to prevent the ingress of fluid into the opening.

In another embodiment, a sealant material may be provided between the first surface and the cover and may extend around the opening to prevent the ingress of fluid into the opening.

Brief Description Of Drawings

Accompanying Figs. 2-4 illustrate a disclosed embodiment and serve to explain the principles of the disclosed embodiment. It is to be understood, however, that the drawings are designed for purposes of illustration only and not as a definition of the limits of the invention.

Fig. 1 shows a schematic exploded assembly view of a known cover assembly for covering an opening extending through the skin of an aircraft;

Fig. 2 shows a schematic exploded assembly view of a cover assembly for covering an opening extending through the skin of an aircraft in accordance with a disclosed embodiment;

Fig. 3 shows a cross-sectional side-view of the cover assembly of Fig. 2 when the cover is in the engaged configuration with the aircraft skin; and

Fig. 4 shows a perspective view of the rear side of the aircraft skin of Fig. 2 when the cover assembly is in the engaged configuration.

Detailed description of embodiment

A non-limiting, exemplary embodiment will be further described, which should not be construed as in any way limiting the scope of the invention.

Referring to Figs. 2-4 there is shown a removable cover assembly 10 for covering an opening 12 extending through the skin 9 of an aircraft. The removable cover assembly 10 includes a cover in the form of circular cover plate 14 that is able to cover the opening in the form of round hole 12. The cover plate 14 is dimensioned to cover the hole 12. The dimensions of the cover plate 14 ensure that its edges extend around the perimeter of the hole 12 and contact the outer surface 9A of the aircraft skin 9.

The cover assembly 10 also includes a retainer member in the form of C-shaped bracket 22 that extends across the hole 12 and contacts the inner surface 9B of the aircraft skin 9 as shown in Fig. 4.

The cover assembly 10 also includes a connector in the form of two bolts 18. The shafts of the bolts 18 extend through both the cover plate 14 and the top surface 22A of the C-shaped bracket 22. The bolts 18 each have an octagonal head 18A on a proximal end of the bolt shaft and washers 18B between the bolt heads 18A and the cover plate 14.

The bolts 18 each have a stop in the form of stop wires 20 on the distal end of the bolt shaft. The stop wires 18 are flexible wires that extend through holes provided approximate to the distal end of the shaft 18. The stop-wires 20 are bent around the shaft 18 and are dimensioned to prevent the shaft of the bolt 18 from releasing from the top surface 22A of the c-shaped bracket 22 as will be described further below.

In use, the cover assembly 10 is initially not attached to the aircraft skin 9. The bolts 18 are

unscrewed from the cover plate 14 and the c-shaped bracket 22 so that there is a gap between the cover plate 14 and the top surface 22A of the c-shaped bracket 22. The gap between the cover plate 14 and the top surface 22A is sufficient to allow one of the end edges of the c-shaped bracket 22 to be slid into the opening 12 and behind the inner surface 9B of the aircraft skin 9 so that the top surface 22A abuts the inner surface 9B, as shown in Fig. 4. The inserted end of the c-shaped bracket is slid further along to enable the opposite end to be inserted into the hole 12 so that the whole c-shaped bracket 22 resides on the inner surface 9B of the aircraft skin 9 and the cover plate 14 resides on the outer surface 9A of the aircraft skin 9.

Torque is applied to the bolt heads 18A by turning the bolt 18 shafts in a clockwise direction to drive the bolt 18 through the openings located on the c-shaped bracket 22. This causes the cover plate 14 to move toward and contact outer surface 9A of the aircraft skin 9 and thereby caused the cover plates to bias against the outer skin 9. At the same time, the c-shaped bracket 22 is caused to move toward the inner surface 9B of the aircraft skin 9 and bias against the inner surface 9B of the aircraft skin 9. This mutual biasing causes clamping of the aircraft skin 9 between the c-shaped bracket 22 and the cover plate 14 so that the cover plate 14 covers the hole 12. This securely clamps the cover plate 14 over the hole and thereby ensures that the hole 12 is securely covered by the cover plate 14.

It should be realised that the provision of two bolts 18 in the cover assembly allows one of the bolts to be turned in either a clockwise or anti-clockwise direction while at the same time, the bolt not being turned acts as a locking mechanism to prevent the cover

assembly from turning in the direction of the turning bolt.

If the cover assembly 10 needs to be released from the aircraft skin 9, torque is applied to the bolt heads 18A to turn them in an anti-clockwise direction to drive the bolt 18 out of the openings located on the top surface 22A c-shaped bracket 22. This causes the cover plate 14 to move away from the outer surface 9A of the aircraft skin 9 and thereby caused the cover plates to release from the outer surface 9A of the skin 9. At the same time, the c-shaped bracket 22 is caused to move away from the inner surface 9B of the aircraft skin 9. The cover assembly 10 can be removed from the hole 12 by ensuring that a sufficient gap exists between the plate 14 and the stop upper surface 22A of the c-shaped bracket 22 to thereby allow removal of one end of the c-shaped bracket 22 from the hole 12.

It will be appreciated that the stop wires 20 prevent additional turning of the shaft of the bolts 18 from the openings extending through the top surface 22A. The stop wires 20 prevent the bolts 18 from disengaging from the bracket 22.

A deformable material (not shown) may be provided around the perimeter of the hole 12 to protect the outer surface 9A of the aircraft skin 9. An exemplary deformable material that can be used is a gasket. A sealant may also be provided around the perimeter of the hole 12 to prevent the ingress of air. An exemplary sealant that can be used is SKYFLEX™ aircraft sealant available from W. L. Gore & Associates, Inc of Elkton, of Maryland, United States of America.

It should also be realised that the area of the aircraft skin 9 around the hole 12 may be reinforced on either side (9A, 9B) of the aircraft skin 9. The

reinforcement plate is provided to enhance the mechanical strength of the aircraft skin surrounding the hole 12. Reinforcement involves locating a reinforcement plate (not shown) with a hole at least the size of the hole 12 on one side of the aircraft skin (9A,9B). The reinforcement plate is shaped to lie flush against the surface of the aircraft skin (9A,9B). Accordingly, the reinforcement plate may be clamped between the cover 14 and the side 9A or between the cover c-shaped bracket 22 and the side 9B.

Applications

It will be appreciated that the clamp arrangement 10 provides a secure cover over the hole 12 without having to drill any attachment holes through the aircraft skin, which would thereby degrade the structural integrity of the aircraft skin 9.

It will also be appreciated that the cover assembly 10 can be quickly and easily attached and detached from the opening of the aircraft skin 9

Another advantage of the cover assembly 10 is that it is not necessary to use bolts or washers in direct contact with the aircraft skin 9, thereby avoiding any foreign object problems associated with damage to the surface of the aircraft skin.

It will be appreciated that the disclosed embodiment of the cover assembly 10 has been disclosed in relation to an aircraft skin. However, other embodiments may relate to a removable cover for other vehicles such as automobiles and marine vassels.

It will be appreciated that although the disclosed embodiment discloses the cover assembly 10 being used to cover the aircraft skin 9, the cover assembly could be used to cover other holes on the body of an aircraft such as aircraft cowlings and aircraft doors.

It will be apparent that various other modifications and adaptations of the invention will be apparent to the person skilled in the art after reading the foregoing disclosure without departing from the spirit and scope of the invention and it is intended that all such modifications and adaptations come within the scope of the appended claims.

Claims

1. A cover assembly for an opening extending through an aircraft body, the cover assembly comprising:

a cover capable of covering the opening on a first side of the body;

a retainer member capable of extending across the opening on a second side of the aircraft body, opposite to the first side; and

a connector for connecting the cover and the retainer member, the connector being capable of moving the cover and the retainer member toward each other for locking engagement of the body between the cover and the retainer member, the connector having at least one bolt extending through respective holes provided on the cover and the retainer member and at least one locking member capable of reducing rotation of the bolt as it is turned, and the connector capable of moving the cover and the retainer member away from each other for disengagement of the body.

2. The cover assembly of claim 1, wherein the at least one bolt is provided with a stop at a distal end of the bolt shaft to prevent further turning of the bolt through the hole of the retainer member.

3. The cover assembly of claim 1, wherein a deformable material is disposed between the cover and the first surface of the body to protect the first surface.

4. The cover assembly of claim 3, wherein the deformable material extends around the opening.

5. The cover assembly of claim 1, wherein a sealant extending around the perimeter of the opening s disposed between the cover and the first surface of the body to prevent ingress of fluid into the opening.

6. A removable cover assembly for an opening extending through an aircraft body, the removable cover assembly comprising:

a cover capable of covering the opening on a first side of the body;

a retainer member capable of extending across the opening on a second side of the body, opposite to the first side; and

a connector for connecting the cover and the retainer member, the connector being capable of moving the cover and the retainer member toward and away from each other for respective locking engagement and disengagement of the body between the cover and the retainer member, the connector having at least one bolt extending through respective holes provided on the cover and the retainer member and at least one locking member capable of reducing rotation of the bolt as it is turned.

7. A removable cover assembly for covering an opening extending through the skin of an aircraft, the removable cover assembly comprising:

a cover capable of covering the opening on a first side of the aircraft skin;

a retainer member capable of extending across the opening on a second side of the aircraft skin, opposite to the first side; and

a connector for connecting the cover and the retainer member, the connector being capable of moving the cover and the retainer member toward and away from each other for respective locking engagement and disengagement of the aircraft skin between the cover and the retainer member, the connector having at least one bolt extending through respective holes provided on the cover and the retainer member and at least one locking member capable of reducing rotation of the bolt as it is turned.