

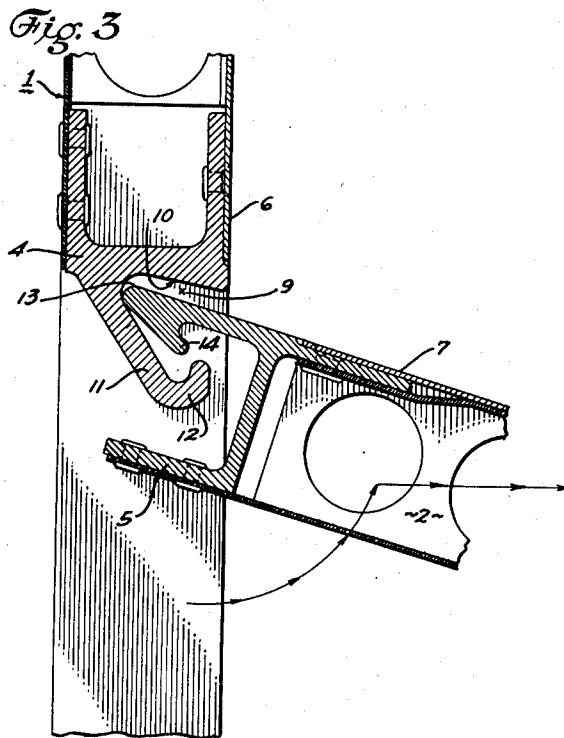
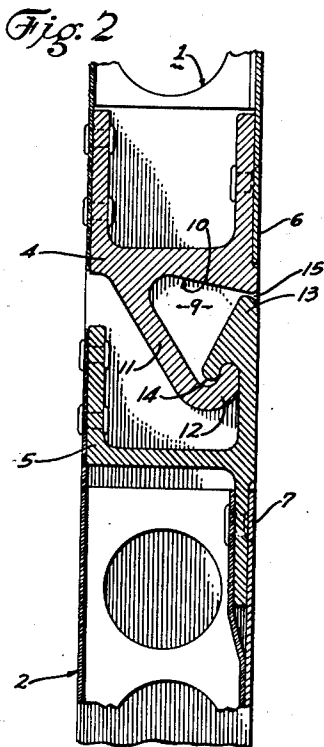
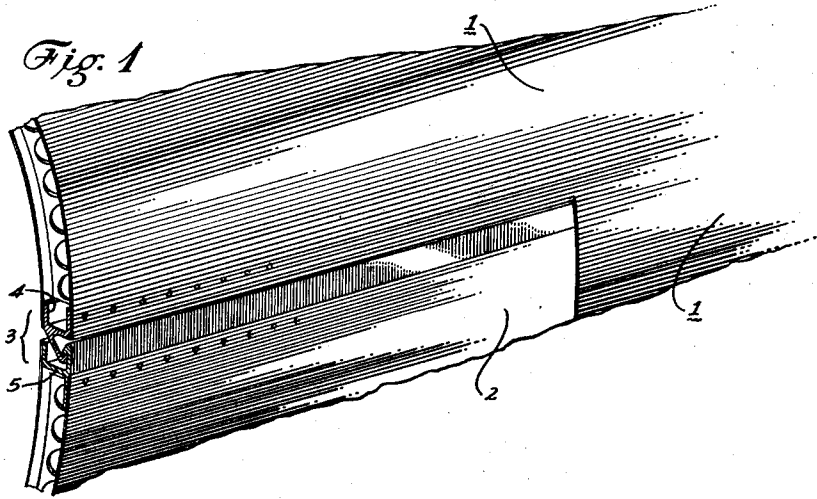
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PANEL HINGE

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PANEL HINGE

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This invention relates to hinges, and more particularly, to a non-binding continuous hinge, for a removable aircraft panel or the like, which takes loads in both tension and compression.

In the surface of an airplane, there are located various access doors, covers, and inspection panels. For ease of operation, certain panels and cowls are frequently hinged along one edge. On the larger panels, a continuous type hinge is desired because of the relatively smaller transverse space occupied and its adaptability to an outside surface flush with the external mold lines. It is also frequently desirable to be able to readily remove the entire panel while working on interior equipment, for example, and certain hinge constructions have been proposed which comprise two parts adapted to be disengaged.

Such removable hinges generally consist of two hook-like members which require a definite engagement operation, in assembling, prior to the actual swinging motion.

It is an object of the present invention to provide a continuous hinge giving entrance guidance so that positive engagement of the hinged parts is accomplished rapidly together with the closing operation of the movable member.

In an airplane panel, one of the hinge requirements is that it be capable of taking both tensile and compressive loads, and, therefore, it is another object of this invention to provide a continuous hinge through which substantial forces can be transmitted both in tension and in compression.

This double rigidity in the hinge suggests a construction wherein the mating parts have closely fitting arcuate surfaces between which the rotation occurs as the door or panel is closed. However, these sliding surfaces present a problem whenever a small amount of dirt or other foreign matter becomes lodged in the hinge, in that binding will result and the hinge is thus liable to become jammed or the parts scored and gouged. Furthermore, binding will occur as a result of slight misalignments along the length of the elongated hinge strips. Also, these misalignments, or lengthwise bowing of the hinge outer edges in any direction, will often make the hinge engagement very difficult.

Accordingly, it is a further object of the present invention to provide a continuous hinge of the removable type wherein a smooth outside surface is obtained, and which will not bind or jam due to a substantial amount of foreign matter in the hinge crevices or due to a more than

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normal amount of misalignment or bowing of the edges.

In brief, the invention comprises an elongated hinge consisting of two members adapted to be secured to two separable parts, said members formed to allow a limited pivoting action and to insure positive engagement, when assembling, by means of lever action tending to move any potential binding surfaces in a tangential manner so as to avoid jamming. One of the members is recessed, with a rounded hook facing outwardly at the free end, the upper wall of the recess being substantially a straight line making a recess angle of more than 90 degrees with the outside surface. The other member is shaped like a one-sided arrow head at the free end and with the barb part forming a rounded hook facing inwardly to mate with the first member when the hinge is closed.

Other objects and features of advantage will be specifically pointed out or noted in the detailed description of a specific apparatus to follow, but it is not intended that the invention be limited to the embodiment herein described, as various forms may be adopted within the scope of the appended claims. Reference is made to the accompanying drawings, shown by way of illustration and not limitation, in which:

Figure 1 is a cross section taken in perspective, showing a removable panel hinged to a fixed panel of an airplane surface by the hinge of the present invention.

Figure 2 is a cross sectional view of the hinge members in Figure 1 on a larger scale, showing the closed position.

Figure 3 is a cross sectional view of the same hinge members showing the disengaging position.

Referring first to Figure 1 for a full description of my invention, the side surface of an airplane fuselage 1 is provided with a removable access panel 2. The panel 2 is secured to the fuselage at its lower edge by suitable locking or latching means (not shown), and is hingedly attached along its upper edge by a continuous hinge assembly 3. The hinge assembly 3 consists of a first member 4 attached to the fixed portion of the fuselage 1 and a second member 5 attached to the removable panel 2. In practice, these members would be several feet long and preferably made of aluminum alloy extrusions.

As shown in Figure 2, the hinge members 4 and 5 are adapted to receive the adjacent edges of a fuselage outer skin 6 and a panel outer skin 7 so that a perfectly smooth exterior surface is

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obtained except for the negligible clearance gap between hinge members.

The first member 4 contains a recess 9 of more or less triangular shape, with the mouth of the recess facing outwardly and being wider than the inner side. An important feature of the recess 9 is the formation of its upper wall 10, which slants noticeably upwardly from outside to inside. A leg 11 forming the lower side of the recess 9 slopes downwardly and outwardly from the inner end of the upper wall 10, and terminates with a short hook 12 curving upwardly. The outer side of the hook 12 lies slightly inboard from the outer skin line, to allow space for the second member 5.

This second member 5 carries a wedge-shaped head 13 at its upper side. The outer side of the head 13 is smooth, to form the exterior surface at this point, and the inner side carries a curved barb 14 at the lower portion of the head 13. The barb 14 mates with the hook 12 on the first member 4, and the apexes and grooves of the hook and barb are rounded to secure a rolling pivoting action when the panel 2 is opened or closed.

Removing and installing the panel 2 is both simple and rapid, due to the operation of the hinge assembly 3. To remove the panel 2, it is first released at its lower edge and then rotated outwardly at the bottom from the closed position shown in Figure 2. As the panel is opened in this manner, the barb 14 pivots about the hook 12 until the head 13 contacts the leg 11 of the first member 4. Lever action of the head 13 against the corner of the recess 9 then raises the barb 14 out of engagement with the hook 12, and the panel 2 is in a position similar to that shown in Figure 3, ready to be withdrawn. The relatively large mouth of the recess 9 precludes any accidental sticking or catching of the hinge parts which would make the removal of the panel a delicate operation.

To install the panel 2, the head 13 is merely pushed into the recess 9 and the panel rotated downwardly. No balancing or no definite engagement action on the part of the operator is required. As long as the panel 2 is held with the head 13 in its innermost position in the recess 9, proper engagement of the hinge members is assured. As the panel is being rotated toward the closed position from a point near that shown in Figure 3, it will be noted that there are no close fits where the presence of dirt will cause binding. There are no sliding surfaces such as would be present if the head 13 and recess 9 were shaped to be concentric arcs.

Slight misalignments or bowing of the hinge member edges are corrected during the initial closing rotation of the panel 2. The gradual downward slope of the upper wall 10 causes the head 13 to be levered into the engaged position with the inside edge of the barb 14 sliding nearly tangentially along the inside edge of the hook 12, in case any such interference results. A moderate amount of dirt in the loop of the hook 12 will do no harm, since the barb 14 actually rolls into position over the hook 12.

When in the final closed position, the hinge resists tensile loads through the hook 12 and barb 14, and resists compressive loads through the head 13 bearing on the outer end of the upper wall 10. A small clearance gap 15 (Figure 2) is normally left between the head 13 and the upper wall 10, this gap being to allow for extrusion tolerances so that the two hinge members will not be in interference. When the hinge assembly is under a compressive load, it will not become

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disengaged, because the hook and the barb prevent transverse motion of the parts.

If desired, the first hinge member 4 may be installed on the removable panel 2, and the second member 5 on the fuselage 1, but better entrance guidance is obtained when the male member is on the removable part rather than on the stationary part. This hinge will perform equally as well when installed with the exterior surface line at any other angle of revolution about the longitudinal axis of the assembly. By adding suitable lengthwise retaining means to the members, the hinge assembly will also operate in a vertical position.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

What is claimed is:

1. A hinge, for attaching two parts in pivotal relationship edge to edge, comprising a first hinge member adapted to be attached rigidly to and extend beyond the edge of one of said parts, a recess in said first member opening from the outside thereof, said recess having a wall slanting back toward said one part from the outside thereof, a leg on said first member forming the inside boundary of said recess and slanting from the inside end of said wall away from said one part and toward the outside thereof, a hook formed on the extremity of said leg and pointing back toward said one part to define a groove in the extremity of said recess, a second hinge member adapted to be attached rigidly to and extend beyond the edge of the other of said parts, an elongated head projecting along the outside of said second member away from said other part, a barb formed on the inside of said head and pointing back toward said other part, said head being adapted to enter said recess when said second member is positioned with its outside surface substantially at a right angle with the outside surface of said first member, and said head being adapted to bear against said wall to engage said barb with said hook as said second member is rotated substantially into a straight line with said first member, whereby said other part is removably hinged to said one part.

2. Apparatus in accordance with claim 1 wherein the outside surface of said first member is flush and smooth with the outside surface of said second member when said members are in the engaged position.

3. Apparatus in accordance with claim 1 wherein said hinge members are elongated to extend continuously along the hinged edges of said attached parts.

4. Apparatus in accordance with claim 1 wherein said barb and said hook are formed with

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rounded cusps and grooves to provide substantially a rolling pivot during engagement of said hook and said barb.

5. In combination with the surface of an airplane, an access panel positioned flush with said surface, said panel being removably hinged to said surface along one edge thereof by a hinge assembly comprising two hinge members, one member fixed to said surface and the other member fixed to said panel, a recess in one of said hinge members opening from the exterior side thereof, said recess having a wall slanting back toward the structure to which said one member is attached, from the exterior side thereof, a leg on said one member forming the inside boundary of said recess and slanting from the inside end of said wall away from the structure to which said one member is attached and toward the exterior side thereof, a hook formed on the extremity of said leg and pointing back toward said wall to define a groove in the extremity of said recess, an elongated head projecting along the exterior side of said other hinge member away from the structure to which said other member is attached, a barb formed on the inside of said head and pointing back toward the structure to which said other member is attached, said head being adapted to enter said recess when said panel is positioned with its outside surface substantially at a right angle with

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said airplane surface, and said head being adapted to bear against said wall to engage said barb with said hook as said panel is then rotated to its closed position in said airplane surface.

6. Apparatus in accordance with claim 5 wherein said hinge members are elongated to extend continuously along said edge.

7. Apparatus in accordance with claim 5 wherein said barb and said hook are formed with rounded cusps and grooves to provide substantially a rolling pivot during engagement of said hook and said barb.

8. Apparatus in accordance with claim 5 wherein said hinge members are formed to present a smooth outside surface, flush with said airplane surface and said panel when closed, whereby no departure is made from the exterior contour of said airplane surface.

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