

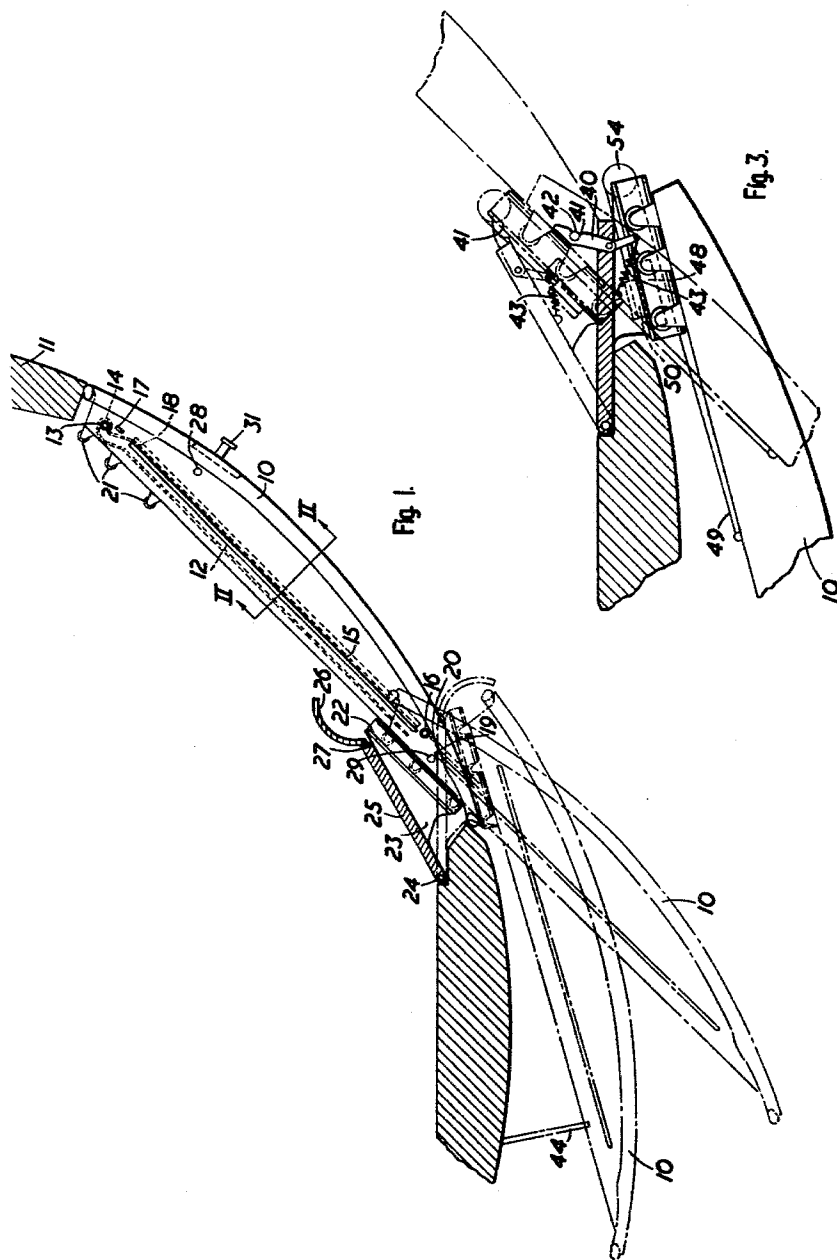
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DOOR CONSTRUCTIONS

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2 Sheets-Sheet 1



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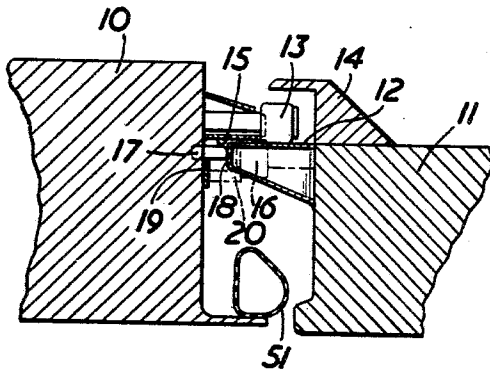


Fig. 2.

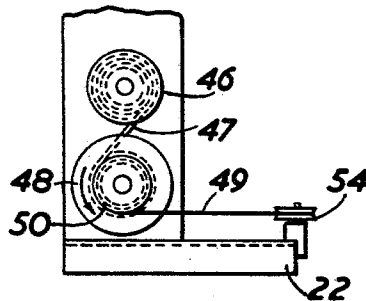


Fig. 4.

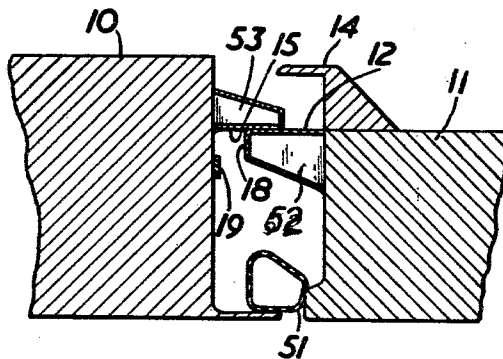


Fig. 5.

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DOOR CONSTRUCTIONS

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The present invention relates to door constructions, and is particularly though not exclusively concerned with freight-door construction for pressurised fuselages of aircraft.

According to the present invention there is provided a door construction comprising a door arranged to fit in an opening in a supporting structure and to be guided by guide tracks along two opposite sides of the opening so that it can be moved translationally substantially in its own plane from the closed position to an intermediate position in which it is caused to engage a hinged carrier pivoted on the supporting structure, and from which position it can be angularly moved to an open position by pivoting movement of the hinged carrier.

In a preferred embodiment of the invention as applied to an aircraft, the door construction is located to one side of the aircraft fuselage in a low region thereof, and the door is arranged to slide downwardly from the closed position on side tracks on opposite sides of the opening to a position in which the upper end engages a hinged carrier located at the base of the opening and so arranged as to allow the door to be angularly moved with it to a stowed position close to the underside of the fuselage. In this arrangement, when the door is in the stowed position, the hinged carrier serves as a platform extending outwardly from the opening to facilitate the loading and unloading of freight.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which,

FIG. 1 is a schematic sectional view of an aircraft freight-door construction according to the present invention,

FIG. 2 is a part sectional view of the door construction shown in FIG. 1 taken on the lines II—II in FIG. 1, with the door in an intermediate position during openings,

FIG. 3 is a schematic sectional view of part of the door construction shown in FIG. 1, embodying a device for locking the door in the open position,

FIG. 4 is a scrap plan view of a spring counter-balancing arrangement for balancing the weight of the door and

FIG. 5 is a view similar to that shown in FIG. 2 with the door in the closed and sealed position.

Referring first to FIGS. 1 and 2, an aircraft freight door 10 of generally rectangular outline fits into a corresponding opening in the air frame. A roller track 12 is provided down each side of the opening and is engaged by a roller 13 extending from the side of the door 10 in the upper region thereof. The roller track 12 in the upper region of the opening terminates in a recess 14 into which the door roller 13 can move and prevent the door 10 from inadvertent downward displacement. As best seen in FIG. 2, a roller track 15 is provided down each side of the door 10 and is engaged by a roller 16 extending into the opening from each side of the opening in the lower region thereof. The arrangement is such that when the door 10 is moved downwardly, the tracks 15 thereon ride on the two fixed lower rollers 16 and prevent outward displacement of the bottom of the door while the rollers 13 on the upper end of the door 10 ride on the tracks 12 down each side of the opening and likewise prevent out-

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ward displacement of the upper end of the door. In addition, a similar arrangement of side tracks and rollers is provided to prevent sideways displacements of the door, further upper rollers 17 on the door 10 cooperating with further tracks 18 down the sides of the opening and further side tracks 19 on the door 10 cooperating with further rollers 20 in the lower region of the opening.

On the inside face of the door 10 at each side, in the upper region thereof, there is provided a set of three spaced rollers 21 arranged in line one beneath the other, and the arrangement is such that when the door 10 is moved downwardly, each set of rollers 21 engages in an aligned channel 22 formed in a hinged carrier 23 mounted at the base of the opening for pivotal movement about a horizontal axis 24 extending across the base of the opening. The carrier 23 is held in the aligned position until the sets of door rollers 21 engage with it, when it is automatically released. With the door 10 in this position, the cooperating rollers and tracks controlling the sliding movement of the door have disengaged, so that the door 10 can then be moved angularly with the hinged carrier 23 to a position close to the underside of the fuselage 11.

The hinged carrier 23 is provided with a platform 25 extending across the base of the opening, and it is arranged that the platform 25 takes up a horizontal disposition when the door 10 is in the fully open position.

As shown in FIG. 3, the door 10 is secured in the open position by a member 40 pivoted on each side of the hinged carrier 23, each member 40 being formed with a slot 41 which engages with spigot 42 extending into the door opening from the fuselage 11. A spring 43 ensures that the member 40 is brought to bear on the spigot 42 as the hinged carrier 23 nears the horizontal position with the door 10 fully open and that the member 40 locks in the engaged position with the spigot when the fully open position is reached.

As shown in FIG. 1, the door may be additionally secured by a retractable support 44 withdrawn from the door 10 and anchored to the airframe 11. In addition, an arcuate door shield 26 is hinged along the outermost edge 27 of the platform 25 so that it automatically moves to a position protecting the upper edge of the open door 10 from damage by freight during loading and unloading.

In the closed position the door 10 is locked by two upper bolts 28 and two lower bolts 29 housed within the door and adapted to be projected into holes in the sides of the airframe opening by turning a handle 31 which is mounted on the outside of the door 10 and which is retractable within the door when not in use. The upper two bolts 28 prevent the door 10 being pushed inwards which must be done before the door 10 can be lowered, and will also prevent the downward movement of the door 10 in the event of the upper recess 14 or rollers 13 failing. With the bolts 28 and 29 removed from their locking position, the door 10 remains in the closed position until the upper end is pushed inwardly so as to move the upper door-guiding rollers 13 from the retaining recesses 14 in the side tracks 12 of the airframe opening. With the rollers 13 clear of the retaining recesses 14 the door 10 may be then moved downwardly.

Two conventional spring-motors are provided to counterbalance the weight of the door 10. One of these motors is shown in FIG. 4 and comprises a drum 46 on which is coiled a spring 47, the inner end of which is anchored to the centre of the drum 46 and the outer end of which is anchored to a further drum 48 for winding thereon. A spool 50 is mounted coaxially with respect to the drum 48 for rotation therewith and a cable 49 is anchored at one end to the spool 50 for winding thereon. The other end of the cable 49 passes over a guide pulley 54 mounted on the channel 22 and is attached to the door 10, the arrangement being such that when the door

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10 is lowered the cable 49 is withdrawn from the spool 50 and the spring 47 unwound from the drum 46 and wound on to the drum 48.

A conventional inflatable sealing strip 51 is provided round the edges of the door.

As best seen in FIG. 5 the airframe opening is provided with a plurality of spaced lugs 52 down each side thereof, the inward faces of which are opposed by the outward faces of correspondingly arranged lugs 53 down the side of the door when the latter is in the closed and sealed position. Outwardly-directed loads on the door 10 due to pressurisation of the fuselage 11 are thus taken by the lugs 52 along the sides of the opening. The lugs 53 down each side of the door and the lugs 52 down each side of the opening are however covered with sheet metal which forms a continuous strip down the door and down the side of the opening and it is arranged that the parts of the strips covering the opposing faces of the lugs serve as the two roller guiding tracks 15 and 12 preventing outward displacement of the door 10. That part of the strip covering the ends of the lugs 52 serves as the roller track 18 preventing sideways displacement of the door 10, while the other roller track 19 preventing sideways displacement in the opposite sense is provided by the strip 19 down the side of the door.

In the event of the icing up of the pressure faces between door and opening, the operation of initially pushing in the top of the door to open, peels away the two faces rather than shearing the ice. The edges of the door and door opening which form the sealing faces are slightly tapered from top to bottom, such that after the initial travel of the door, the seal moves clear of the sealing face.

The door construction hereinbefore described has the following advantages:

(1) In the closed position, it is an effective internal plug under fuselage pressurisation. There are no linkages or mechanisms taking load, i.e. the door is positively held by fixed airframe structure when the fuselage is pressurised.

(2) The door nevertheless opens outwardly and so avoids the wastage of freight space resulting from the use of inwardly opening doors.

(3) The door, when open, takes up a position in which it does not obstruct the loading of freight in any way.

(4) The door opens to a position in which it sustains no damage during freight loading.

(5) All mechanisms incorporated in the door may be of a simple design and fewer in number than in other types of freight doors hitherto proposed. All such mechanisms may also be completely protected against damage.

(6) In the event of freight becoming unlashed and moving in the freight bay, tending to jam the door, it is possible to lower the door sufficiently to reach over the top and free the obstruction.

What I claim as my invention and desire to secure by Letters Patent is:

1. A door and supporting structure combination, comprising: a curved wall forming part of the fuselage of an aircraft, said wall having an exterior convex surface and having a relatively low portion located adjacent to an underside of said fuselage and formed with a door opening, a door having a closed position located in and substantially filling said opening, said door also having

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an open position located outside of said opening, guide means carried in part by said wall at said opening thereof and in part by said door for guiding said door for shifting, substantially planar downward movement from said closed position to an intermediate position between said closed and open positions, hinged carrier means carried by said wall in region of said opening thereof, and connecting means carried in part by said door and in part by said hinged carrier means for connecting said door to said hinged carrier means when said door has been displaced from said closed position to said intermediate position, said hinged carrier means, when said door is thus connected thereto by said connecting means when said door reaches said intermediate position, supporting said door for swinging movement to said open position, said door in said open position being located closely adjacent to said underside of said fuselage.

2. The combination of claim 1 and wherein said hinged carrier means swings, during movement of said door from said intermediate to said open position thereof, to a position extending substantially horizontally across an edge portion of said opening to serve as a platform facilitating loading and unloading through said door opening, said hinged carrier means having an outer shelf which extends over an edge portion of said door when the latter is in said open position thereof to protect said door from damage during loading and unloading.

3. The combination of claim 1 and wherein said wall, at said door opening thereof, and said hinged carrier means carry a stop and latch means, respectively, which engage each other when said door reaches said open position thereof for preventing movement of said hinged carrier means and said door to a location where said door is situated beyond said open position thereof.

4. The combination of claim 1 and wherein said guide means has at an upper portion thereof, located in the region of an upper part of said door when said door is in its closed position, a curved configuration which prevents downward movement of said door from said closed position thereof unless said upper portion of said door is first pushed inwardly.

5. The combination of claim 1 wherein said guide means includes a plurality of lugs carried by said door, a plurality of lugs carried by said wall at said door opening thereof, and elongated continuous sheet metal strips covering the lugs carried by said door and covering the lugs carried by said wall and forming tracks of said guide means, said lugs of said door being aligned with and located inwardly of the lugs of said wall when said door is in said closed position, for preventing displacement of said door out of said opening due to a force exerted on said door at the interior of the fuselage and tending to push said door out of said opening.

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