

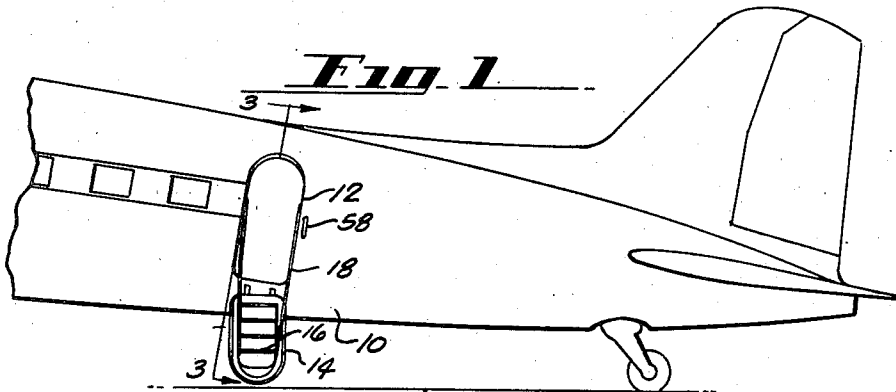
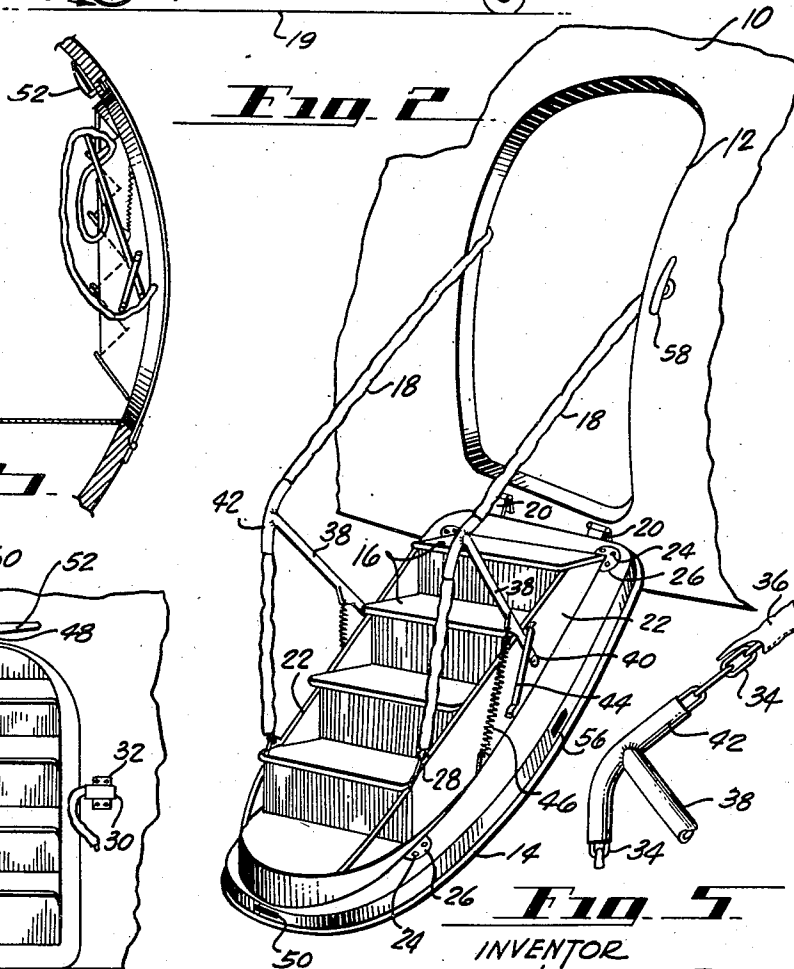
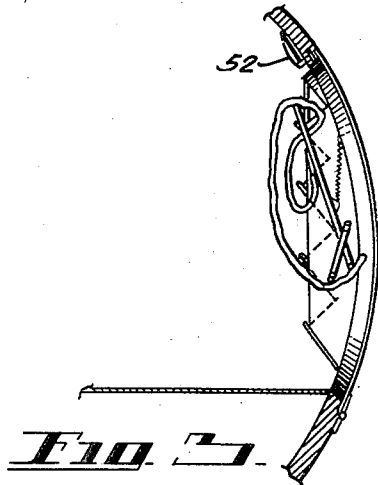
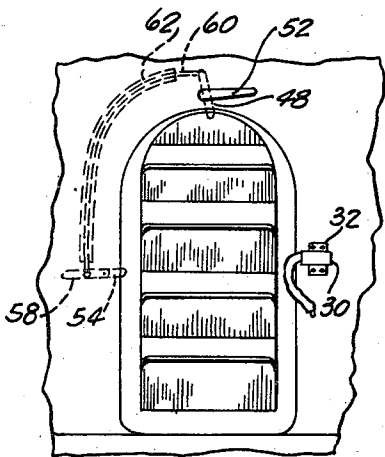
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AIRCRAFT DOOR

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AIRCRAFT DOOR

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This invention relates to a door for a passenger carrying airplane and more particularly to a door provided with means for facilitating entrance and egress of passengers.

Commercial passenger carrying airplanes are quite large at the present time and are continually increasing in size. The floor levels of such large airplanes, when the latter are at rest on the ground, are at a substantial distance from the ground, varying from about three feet to as high as nine feet. All of such airplanes now in use are provided with conventional side opening doors, similar to those of a house or building.

There are two major disadvantages to such an arrangement. One is that a large and cumbersome specially constructed ramp or gangplank must be provided to furnish means for passengers to climb up and down, and the ramp must be brought out to the airplane and later taken out of the way for every loading or unloading operation. The other is that, if a door is opened by a passenger in the aircraft while it is on the ground, there is a grave danger of falling from the doorway and sustaining serious injury.

The present invention completely obviates both of these difficulties as well as increasing the speed and efficiency of loading and unloading, which latter is a very important factor since time spent on the ground does not produce revenue. The invention provides a door which serves as its own ramp or gangplank, thus eliminating the necessity for additional ground facilities. Since the ramp is automatically in place as soon as the door is opened, the danger mentioned above cannot exist.

In general the invention consists in providing a passenger door which is pivotally mounted adjacent its lower edge so as to swing outwardly and downwardly when released. The inner face of the door is provided with a series of steps which are appropriately positioned for use when the door is swung to its lowermost position. Means are provided to limit the lowering of the door so that it will clear the ground under all normal circumstances, and these means at the same time serve as guards and handrails to assist the passengers during use of the ramp.

Convenience is further served by locating the latches and latch operating handles on the fuselage rather than on the door. One operating handle is located inside the fuselage above the doorway and the other is located on the outside of the fuselage about halfway up the door frame where it may be readily operated by an attendant standing on the ground.

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While the arrangement may take various forms, the presently preferred embodiment of the invention is illustrated in the attached drawing in which:

5. Fig. 1 is a side elevational view of the rear portion of an airplane, showing the door in open position ready for use as a ramp;

10. Fig. 2 is a fragmentary perspective view of a portion of the airplane of Fig. 1 in the region of the doorway showing the detailed construction of the door and its supporting means;

15. Fig. 3 is a fragmentary sectional view on line 3—3 of Fig. 1, illustrating the position of the door and its accessories when retracted;

20. Fig. 4 is a fragmentary elevational view of the door in retracted position taken from inside the fuselage; and

25. Fig. 5 is a detailed view of the upper end of the spacing link for the hand rail.

30. A portion of an airplane is shown in Fig. 1, wherein the fuselage 10 is provided with a doorway or passageway 12 adapted to be closed by a door 14 pivoted adjacent the bottom of the passageway. Steps 16 are provided on the inner surface of the door and guards or hand rails 18 are shown at each side to assist passengers in entering or alighting. It will be noted that, while the passageway is at an acute angle to the groundline 19, the door, serving as a ramp when lowered, is at a right angle to the ground line so that the step treads will be horizontal.

35. It will be seen in Fig. 2 that the lower edge of the door has attached thereto a pair of hinges 20, which in turn are secured to the fuselage. The hinge straps are of different length and their axis is at an acute angle to the lower edge of the passageway so that, as the door swings downwardly, it swings thru a compound angle with respect to the passageway, thus producing a correct attitude with respect to the ground.

40. The steps 16 are built up into a unitary self supporting structure including side plates 22, and this structure is then attached to the normal door structure by means of bolts 24 passing thru attaching plates 26. The door structure proper is rather weak in bending, while the step structure with its side plates 22 is quite rigid. With the arrangement shown, the step structure substantially reinforces the door and takes practically the entire bending load imposed on the combination.

45. The lower limit of movement of the door is determined by the extension of flexible elements 18 which are connected at their outer ends to attachment lugs 28 and at their inner ends to an-

chorges within the fuselage (shown in Fig. 4) consisting of tubular members 30 having attachment plates 32. In a preferred form each flexible element consists of a chain made up of a plurality of links 34 covered by a tubular shield 36 of leather or other suitable material.

It is desired to make use of element 18 not only to limit opening of the door but also to serve as a hand rail. To accomplish this, link 38 is provided. The link consists of an appropriate length of rigid tubing pivotally attached at 40 to the step structure and carrying at its upper end a short length of tubing 42 curved to form a definite bend in the hand rail and rigidly attached to link 38, as best shown in Fig. 5, by welding, brazing, or other suitable means. The link 38, the lower portion of the hand rail, and the intermediate portion of the step structure thus form a triangle in which the only flexible side is in tension. The member 42 will therefore be fixed in space and can be so located that the upper portion of element 18 will be substantially parallel to the angle of the steps and at a suitable distance above them.

A bridge 44 is located over link 38 near its pivoted end to support it in bending against side loads and is of sufficient length to permit the link to retract into a position substantially parallel to the door when the latter is swung to closed position. Tension spring 46, extending between the door and the link 38, is provided to ensure retraction of the latter against the force of gravity when the door is closed.

The position of the door and its accessories in retracted condition is shown in Fig. 3. It will be seen that the step structure protrudes only a very short distance into the cabin and does not interfere with normal use of the rear portion thereof. Link 38 swings to a folded position and the two sections of flexible element 18 hang down out of the way.

Novel latching means, as shown in Fig. 4, are provided for retaining the door in closed position. An upper latch 48 is provided in the side wall of the airplane above the center of the passageway, extending in operative position into a keeper 50 provided in the upper edge of the door 14. Latch operating handle 52 extends into the cabin for access by an attendant within the airplane. A second latch member 54 is mounted in the side wall of the airplane about midway of the height of the passageway and extends in operative position into a keeper 56 formed in a side edge of door 14. A latch operating handle 58 is provided on the exterior of the aircraft for access by an attendant on the ground.

In order that either attendant may operate both latches, a Bowden cable 60 encased in a suitable conduit 62 is provided within the side wall of the aircraft. The cable interconnects the two latch operating mechanisms so that actuation of either handle will operate both latch members.

If an attendant on the ground wishes to open the door, he first turns handle 58 to the release position and, as the door swings down, he controls its movement with his hands until the flexible member 18 is fully extended. The length of elements 18 is so chosen that, when they are fully extended, the free end of the door will clear the ground by three or four inches. This prevents the possibility of any bending or abrasion of the door which might interfere with proper fitting in the door frame.

When the door is opened from the inside the attendant turns handle 52 to the release position and grasps the flexible member 18. As he pays out the member, the door will gradually swing to fully lowered position.

It will be readily appreciated from a reading of the above disclosure that the present invention provides maximum ease and convenience in the loading and unloading of aircraft in addition to its safety and time saving features. Various changes and modifications may be made in the construction and arrangement of parts without departing from the spirit of the invention, and it is intended that all such changes and modifications shall be embraced within the scope of the following claims.

I claim:

1. A door structure for an aircraft comprising: a substantially imperforate structure adapted to close an opening in a side wall of an aircraft fuselage; a structure including side walls and a plurality of step treads mounted on one face of said imperforate structure; a flexible hand rail member having one end attached to said step structure and another end adapted for attachment to an anchorage on an aircraft; a rigid link connected to an intermediate portion of said hand rail member and pivotally attached to said step structure; and resilient means interconnecting said link and said door structure to urge the former toward retracted position with respect to the latter.

2. In an aircraft, in combination: a fuselage; means forming a passageway thru a side wall thereof; a door pivotally mounted adjacent its lower edge to said fuselage and adapted to close said passageway in its upper position and to extend outwardly and downwardly in its lower position; a series of steps formed on the inner wall of said door; a flexible element having its one end attached to the inner surface of said side wall adjacent said passageway and its other end attached to the outer portion of said door; a rigid link connected to an intermediate portion of said flexible element and pivotally connected to said door and adapted, when the latter is in its lower position, to maintain said intermediate portion spaced a substantial distance from said door; and resilient means to urge said link toward substantial parallelism with the plane of said door when the latter is in its upper position.

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