

- [54] AIRCRAFT LOADING RAMPS
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- [58] Field of Search.....14/71, 72

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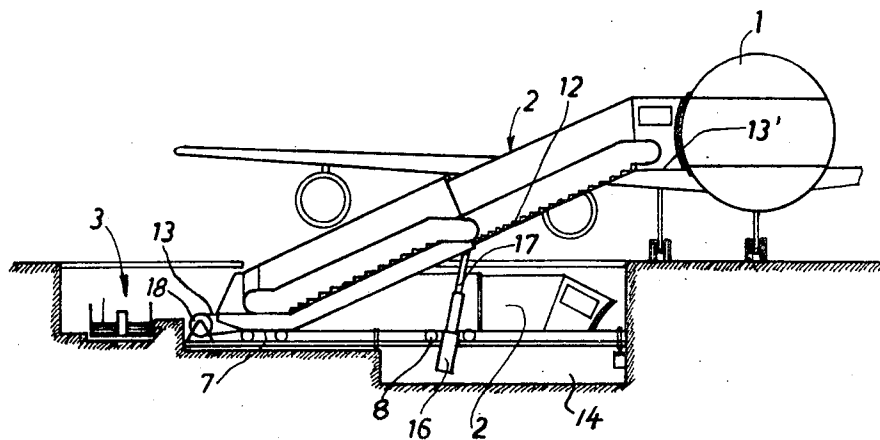
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[57] ABSTRACT

An arrangement on an airport having underground corridor means arranged underneath a portion of the airport terrain and leading to an airport terminal, in which gangway means adjustable in the direction of the longitudinal extension thereof has one end portion connectable to an entrance in an airplane while the other end portion is selectively movable into alignment with said corridor means, said gangway means being pivotable upwardly along a vertical plane from a position in a pit and is also adapted selectively to be lowered into said pit which then may be covered up and driven over, said gangway means also being movable along a horizontal plane.

5 Claims, 4 Drawing Figures



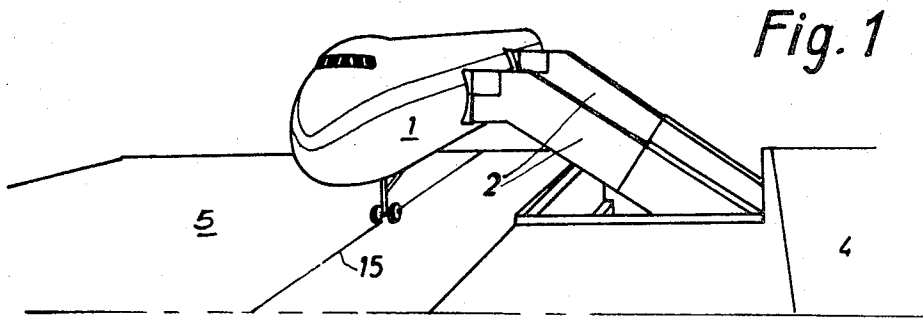


Fig. 1

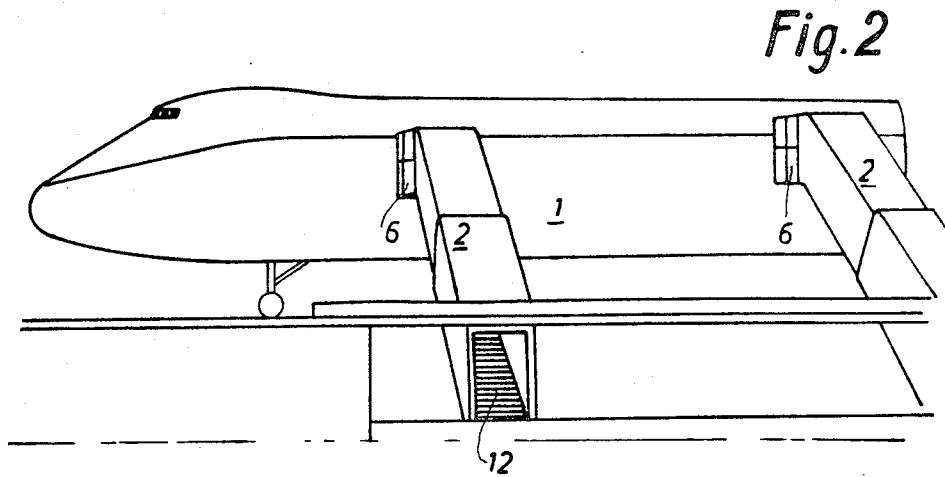


Fig. 2

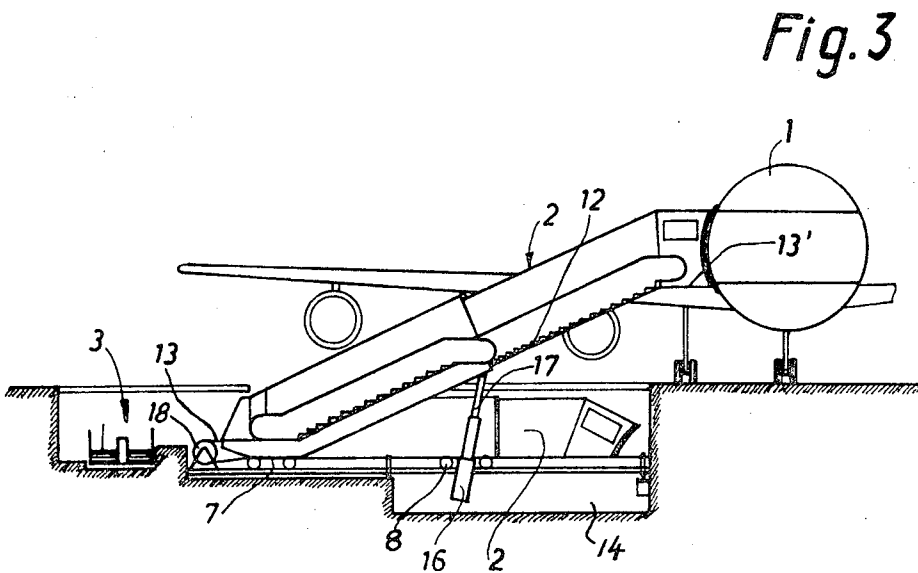
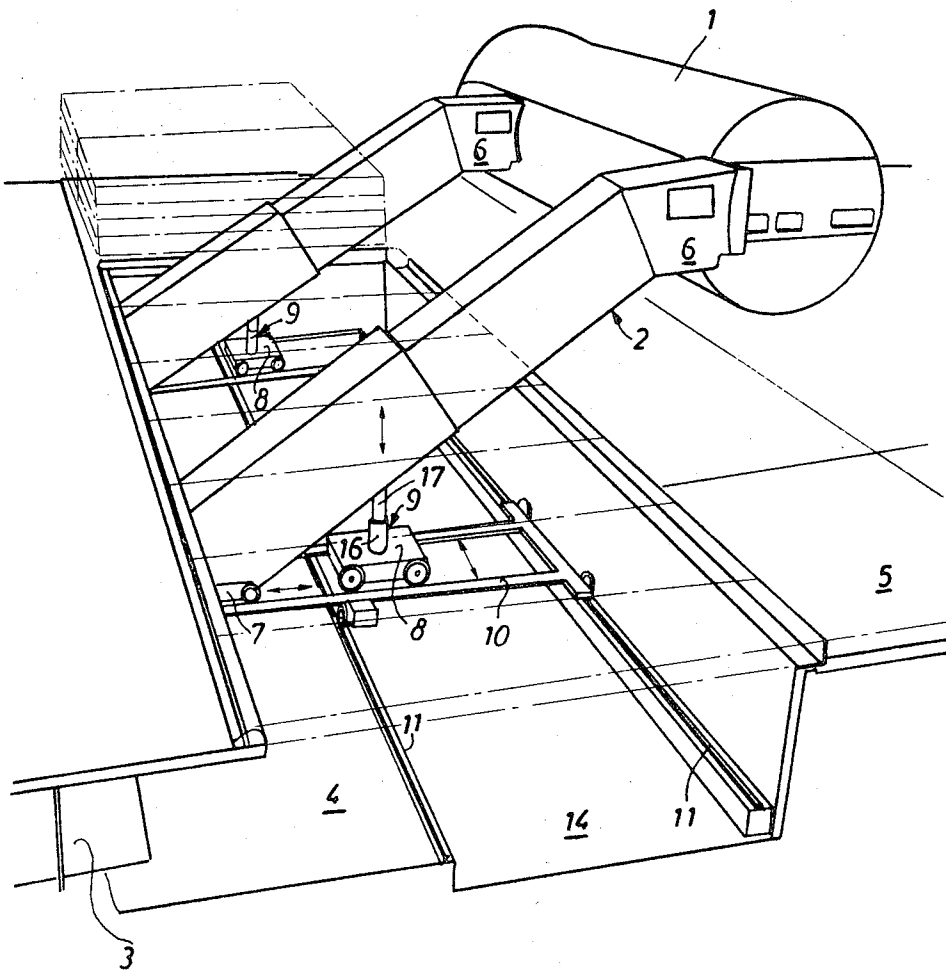


Fig. 3

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Fig. 4



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AIRCRAFT LOADING RAMPS

The present invention relates to a device for loading and unloading airplanes, especially jumbo planes, and, more specifically, concerns a gangway for connecting the airplane being loaded or unloaded with the interior of the terminal building.

In order, for instance, to protect the passengers when boarding and leaving the airplane against inclement weather, it is known to connect the airplanes by means of gangways with the interior of the airport terminal. Such gangways may consist of telescopically expandable tubes or may be in the form of ramps which are foldable about pivot means.

With a heretofore known telescopically expandable tubular gangway, the tubes consist of a number of telescopically arranged tube sections which together form a gangway closed on all sides. In order to permit a weather-safe and walking-safe connection of such gangway with the terminal building and with the airplane, the gangway has its ends equipped with coupling heads one of which is continually connected to the terminal building whereas the other one is to be connected to the airplane to be loaded or unloaded whenever required. In order to permit a tight connection of that coupling head with the airplane which is to be located adjacent the airplane, said coupling head is equipped with bellows for connection to a frame section of the airplane door.

While with this type of gangway it is possible comfortably to board or leave the airplane, such gangways are no longer sufficient for loading jumbo planes since in order to realize short loading and unloading times it is necessary to admit passengers simultaneously through more than two doors. However, the width of the doors places a definite limit to the number of passengers who can pass through the door per time unit. Even on modern large airports, the heretofore existing loading and unloading installations have been, prior to the present invention, insufficient for the processing of great numbers of passengers within a short time. The necessity of moving the airplanes close to the terminal building places a limit to the number of planes which can be loaded or unloaded at the same time so that in case of a great number of planes landing or departing at the same time, some planes will have to wait until they can be loaded or unloaded.

In order to be able to load and unload those airplanes which at a certain time, due to an excessive air traffic, cannot be moved close to the terminal building, it has been necessary heretofore to use buses which transport the passengers from the plane to the terminal building and vice versa. With this kind of transportation, it is disadvantageous that the passengers are exposed to inclement weather on their way from the airplane to the bus or from the bus to the airplane. A similar situation prevails when the passengers have to walk from the airplane to the terminal building and vice versa.

It is, therefore, an object of the present invention to provide a device which will make it possible, regardless of the space available in front of the terminal building, easily to reach all airplanes through gangways or the like while the possibility exists to process the passengers simultaneously at a plurality of doors.

This object and other objects and advantages of the invention will appear more clearly from the following

specification in connection with the accompanying drawings, in which:

FIG. 1 illustrates an end view of a landed airplane with two passenger gangways according to the invention coupled thereto.

FIG. 2 is a side view of the airplane of FIG. 1 with gangways according to the invention.

FIG. 3 is a section through the airport area with passenger gangways of which one is coupled to the airplane while the other one has been placed in a pit provided in the ground.

FIG. 4 is a perspective view of the passenger gangway on a scale larger than that of FIGS. 1 to 3.

The device according to the present invention for processing airplanes, especially jumbo airplanes, which comprises a gangway adapted during the processing of the airplane to be connected with the interior of the terminal building, is characterized primarily in that one end of the gangway is below the airport ground level connected to the airport terminal building through an underground corridor whereas the other end is adjustable in the longitudinal direction of the gangway and is movable horizontally and vertically so as to be connectable with a door opening in an airplane.

With jumbo planes having a correspondingly great number of doors for the boarding and unloading of passengers, it is possible according to a further feature of the invention, to connect a corresponding number of gangways to the airplane.

In order to be able to reach the doors, which in conformity with the size and height of the respective airplane have different dimensions, it is provided, according to a further feature of the invention, that that end of the gangway which is connectable to the airplane has pivotally connected thereto a one-piece or multi-sectional carriage which is equipped with a hoisting mechanism for the vertical movement of the gangway.

According to still another feature of the present invention, the said carriage is displaceably arranged on a platform which is movable on rails below the airport ground. In this way, the passenger gangway can be displaced selectively vertically and/or horizontally so that that end thereof which has to be connected to the airplane can safely reach the door of the airplane and can be connected to the door frame.

For safety on the airport landing area, according to further features of the invention, those ends of the gangway which are to be connected to the airplane are stored in underground pits, which pits can be covered and can be driven over when the gangways are stored in said pits.

On giant airports having an extremely great number of planes arriving and departing, it is possible according to still another feature of the invention to provide the landing strips with guiding devices for the airplanes and to direct the landed airplanes to the passenger gangways already placed in readiness. In this way, a friction-free processing of the passengers and planes can be realized so that in conformity with the distance of the landed airplanes from the airport terminal, the respective next processing installation can be approached by the respective airplane.

An arrangement for processing airplanes 1, especially jumbo planes according to the invention comprises one or more processing gangways 2 and passage

way 3 by means of which, the airplane on apron 5 to be processed is to be connected with an airport terminal 4 or the feeding passages thereof and on the other hand is connected to the airplane. In order to be able to provide giant airports with a plurality of plane processing devices according to the invention, those ends of the devices which are to be connected to the airplane are provided with a plurality of gangways 2 which are movable out from beneath the level of the airport and are connectable to the airplane 1. To this end, those ends of the gangways 2 which are to be connected to the airplane are built up of one or more telescopically arranged sections of which the end sections, i.e., those sections respectively facing the airplane are provided with a control head 6 for connecting the gangway to the airplane 1 and at the other end are connected with a joint on a carriage 7. In order in this connection to be able to lift and lower those sections of the gangway which are adjacent to the airplane, to the desired height, each gangway is provided with a further carriage 8 on which is mounted a hoisting mechanism 9 for lifting and lowering the gangway 2. Inasmuch as the carriages 7, 8 are displaceable in the area 4 in one direction only, and since it is necessary to displace the gangways 2 also vertically with regard to this direction, the gangways 2 are, by means of the pertaining carriages, arranged on movable platforms 10 which are displaceable on rails 11 below the ground level of the airport. In this way, those sections of the gangway 2 which face the airplane can be displaced horizontally in two directions so that together with the vertical hoisting movement and the possibility of pulling out the telescopic sections, the processing gangways can be moved to any desired point of the airplane 1. In this way, the control head 6 to be connected to the airplane 1 can easily and quickly be connected to the respective door frame of the airplane door whereby through the intervention of said control head 6 and the gangways 2 and passageway 3 a connection is established between the airplane and the interior of the airport terminal or a processing place thereof.

In order, for instance, to be able to transport the airplane passengers safely to the airplane 1 or from the airplane 1, the gangways 2 are at the airplane side equipped with stairs 12. The stairs 12 may be designed as telescopic units. At the end of these units or stairs 12, a platform 13' may be provided to facilitate the stepping onto the stairs. These platforms 13' may be connectable on one hand to the control head 6 which is connectable to the airplane 1 and on the other hand may be provided at the other end of the stairs 12 which faces toward the airport terminal. The drive 18 of FIG. 3 for the stairs 12 of each gangway 2 is preferably mounted at that end of the stairway which faces toward the gangway 3. This has the advantage that these drives do not have continuously to be moved upwardly and downwardly when the gangway 2 is being moved and furthermore they permit shorter supply lines.

In order to protect the passengers against inclement weather when boarding or leaving the airplane 1, the processing gangways 2 are preferably designed as closed telescopic tubes which, if desired, may be provided with windows for admitting light or may be illuminated exclusively electrically. The control head 6 arranged at the airplane facing end of each gangway 2

may be equipped with control devices which are adapted either manually or fully automatically to move the gangway in conformity with a programmed control device. The supply passages connected to the airport terminal may preferably be equipped with endless conveying devices so that in this way an uninterrupted discharge and loading of airplane passengers can be maintained. For purposes of storing those processing gangways 2 which face the airplane, the area below the airport level is provided with pits 14 located within the region of the gangways. The said gangways are, after use, stored in said pits and may be left there until they are used again. These pits 14 can be covered and driven over so that the area above the pits and in the plane of the remaining airport area can be used for the respective traffic. For purposes of a fully automatic control of the entire airport operation, the landing airplanes 1 may be controlled according to FIG. 1 by a guiding coordinate or line 15 which guides the operation of airplanes represented in the drawing to the respective free processing gangway 2. By means of a pulse emitted by the guiding coordinate or line 15 after the intended unloading or loading area of the airplane has been reached, the processing gangway may be actuated automatically again to be moved out of the pit 14. This automatic control and guiding device can act upon further conveying devices in such a way that the airplane passengers are being directed only to the processing area in readiness. As a result thereof, blockage in the flow of the incoming or outgoing passengers is prevented and the processing times, which is important for the intercontinental and the continental flight can be considerably shortened. With jumbo or giant planes 1 having a great capacity, it is suggested according to the invention in order to assure a fast boarding and unloading of the passengers in conformity with the respective doors that a corresponding number of airplane gangways 2 be coupled to the airplane. In this way, the airplane can be loaded and unloaded in an uninterrupted manner so that the processing gangways 2 can be placed into readiness for loading and unloading of the next airplane, within a very short period of time. The lifting or hoisting mechanism 9 for lifting and lowering each airplane gangway 2, the hoisting mechanism 9 which is mounted on the carriage 8 and can be moved together with the latter may be hydraulically, mechanically or electrically operated.

When designing this hoisting mechanism 9 as hydraulic mechanism, it will be customary to employ a piston cylinder drive in which the cylinder 16 is connected to the carriage 8 while the piston 19 is connected to one of the parts of the gangway 2. When employing a mechanical hoisting mechanism 9, for instance, a gear rack lifting mechanism, the gear racks with the part to be lifted of the gangway 2 and the pinion meshing with said rack may be provided on the carriage 8. Of course, it is also possible to employ a flexible or jointed gear rack in order in this way to keep the excavations in the pit 14 for storing the otherwise rigid gear rack to a minimum.

Inasmuch as with air traffic, in addition to the passengers also freight and food have to be loaded onto or from the airplane 1, it is suggested that adjacent to the gangways 2 equipped with stairs 12, conveyor belts or the like are provided for a quick loading and unloading

of the airplane. These conveyor belts may preferably be connected to the length side of the airplane where no stairs are located for the passengers so that the passengers or the traffic of the passengers is not impeded.

As to the respective end of the gangway 2 which is to be connected to the airplane, this end may be equipped with stairs, preferably an escalator or an elevator as, for instance, a so-called cable lift or self service type device in Europe termed a Paternoster, in other words an elevator means which is continuously in motion and/or ready for available use.

As will be seen from the above, in view of the arrangement according to the invention it is no longer necessary to connect the gangways only to the airport terminal. A plurality of gangways may be installed which lead directly into the airport terminal or are connected to common passengers passages leading to the terminal building below the airport ground. This has the advantage that a correspondingly great number of processing gangways can be installed on the airport area so that all airplanes can easily be reached through these passages. Independently of the place of the landed airplane or the airplane about to leave, the airport passenger can reach his airplane through passenger processing gangways without being exposed to inclement weather.

In view of the fact that the passenger gangways are equipped with escalators or conveyor belts or the like and the passenger is moved via roller tracks to said escalator gangways or off the plane to the airport terminal, no stoppage in the flow of the passengers can occur. In this way, a continuous processing of the passengers will be assured. In order to reduce the respective waiting time, the passengers can be directed on said passages in such a way that they arrive at a respectively empty or not crowded processing area.

It is, of course, to be understood that the present in-

vention is, by no means, limited to the particular showing in the drawings, but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. In an airport facility for loading and unloading aircraft, an underground pit below the ground surface adjacent an aircraft parking apron and connecting to a corridor to a terminal building, an extensible gangway movable from said underground pit into engagement with an aircraft on said apron, carriage means in said pit supporting said gangway for movement toward and away from said aircraft, said carriage means being mounted for movement parallel to said aircraft, and means mounted on said carriage means for raising and extending said gangway from said pit into engagement with said aircraft.

2. In an airport facility as claimed in claim 1, in which the extensible gangway comprises tubular telescoping sections, with one section pivoted to said carriage means so that the gangway may be telescoped in said one section to be received in said pit.

3. In an airport facility as claimed in claim 1, in which said carriage means comprises a first carriage movable longitudinally along the airplane on the apron and a second carriage mounted on the first carriage with the gangway pivoted thereon and movable transversely to the airplane to move the gangway toward and away from the airplane.

4. In an airport facility as claimed in claim 3, in which the means for raising said gangway is carried by a third carriage mounted on said first carriage for movement transversely of said airplane.

5. In an airport facility as claimed in claim 1, in which a plurality of extensible gangways are mounted on a plurality of carriage means, and said carriage means are movable on rails along said airplane.

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