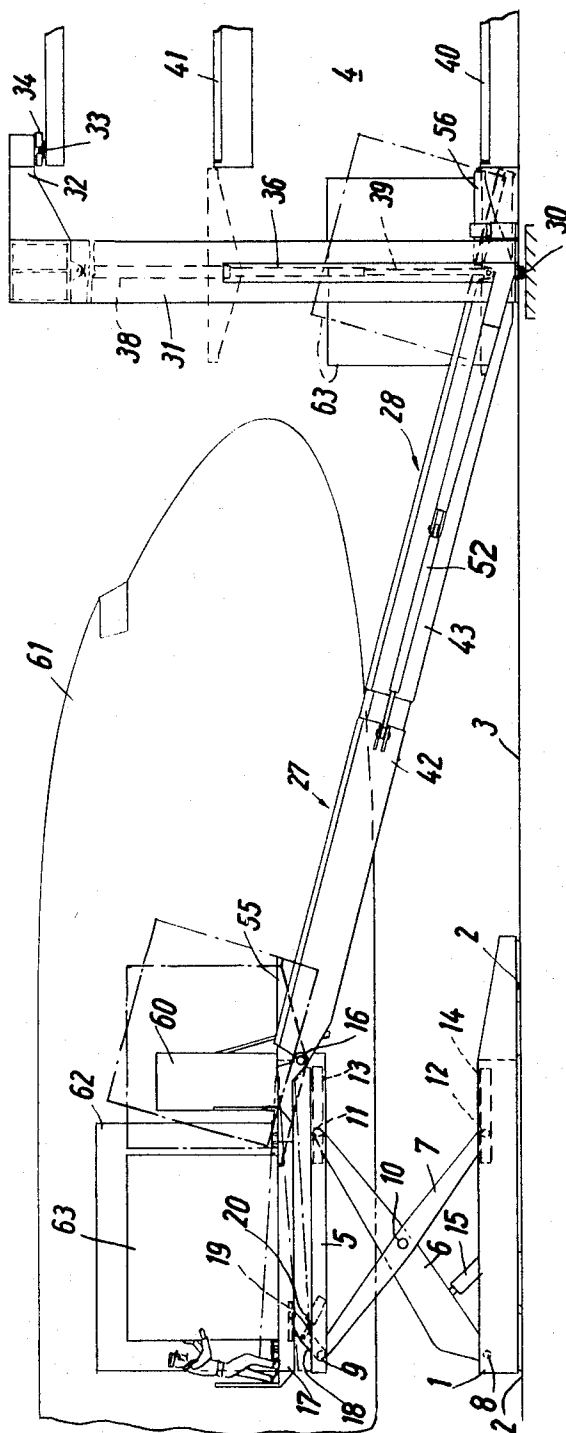


Fig. 1



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 [32] Priority **Aug. 6, 1968**
 [33] **Germany**
 [31] **P 17-56 943.6**

[50] Field of Search..... 193/35, 35
 T, 35 F, 35 J; 214/41, 44; 244/137, 114, 118;
 198/82, 88, 89, 92, 96, 97, 127

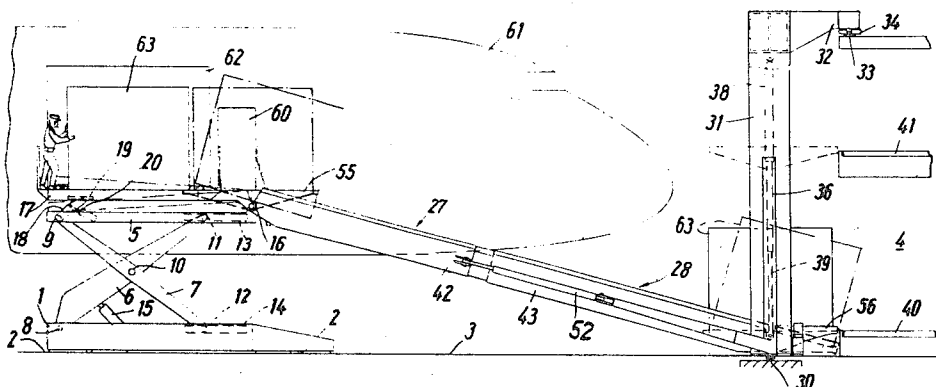
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[54] **APRON TRANSLOADING DEVICE FOR AN AIR**
FREIGHT TRANSLOADING STATION
10 Claims, 10 Drawing Figs.

[52] U.S. Cl..... **193/35,**
214/44, 118/82
 [51] Int. Cl..... **B65g 13/00**

ABSTRACT: Apron transloading device for air freight with a platform which is adjustable as to height and which comprises conveyor means while a bridge with further conveyor means is pivotally connected to said platform. Also pivotally connected to said platform is a tiltable platform which is adjustable selectively so as to form a continuation of the conveyor means on said first mentioned platform or a continuation of an additional conveyor means provided on said bridge.



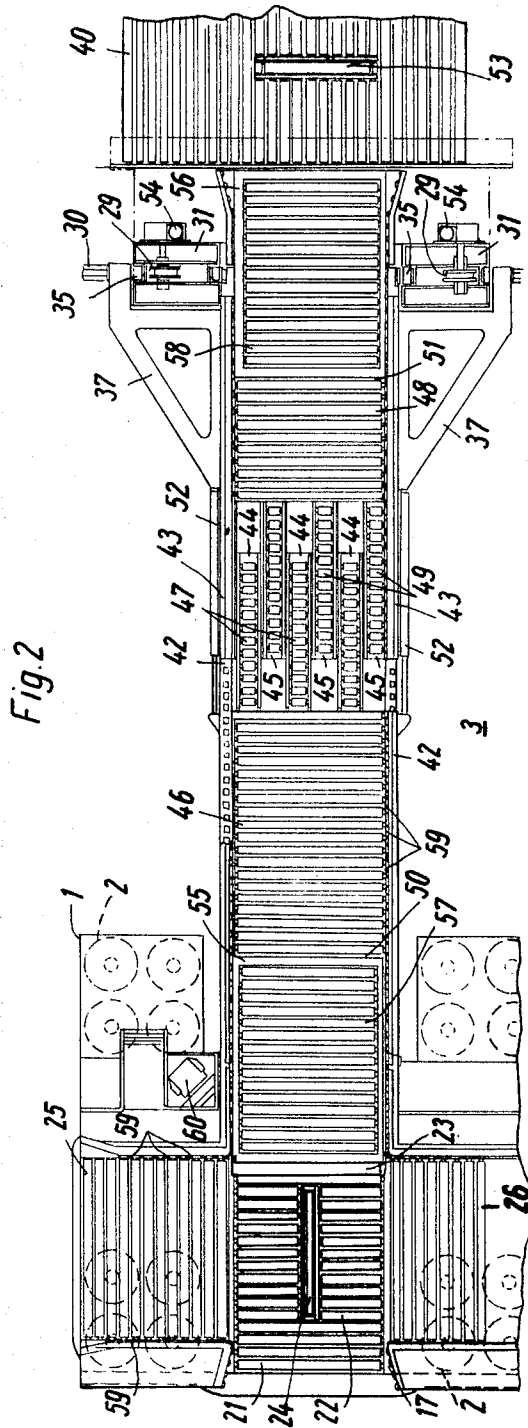


Fig. 2

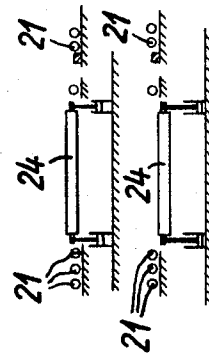
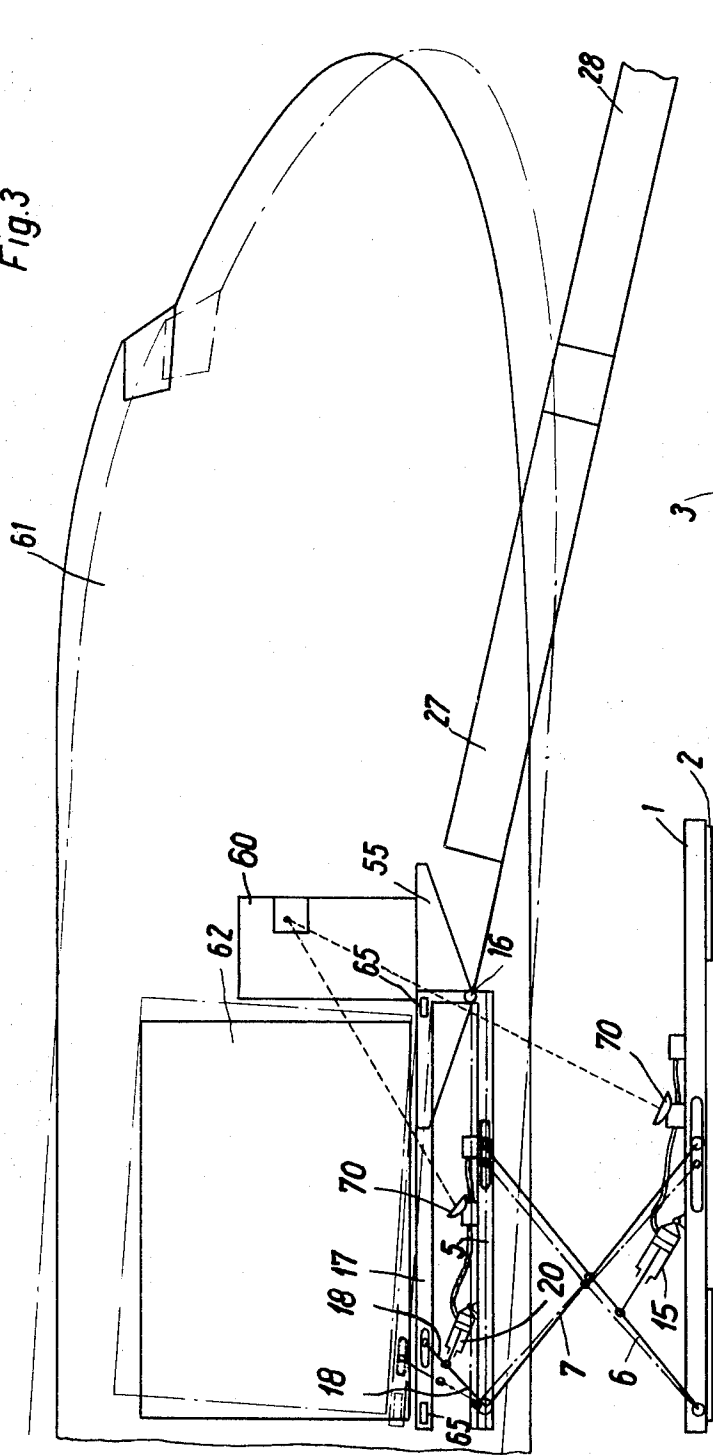


Fig. 2a

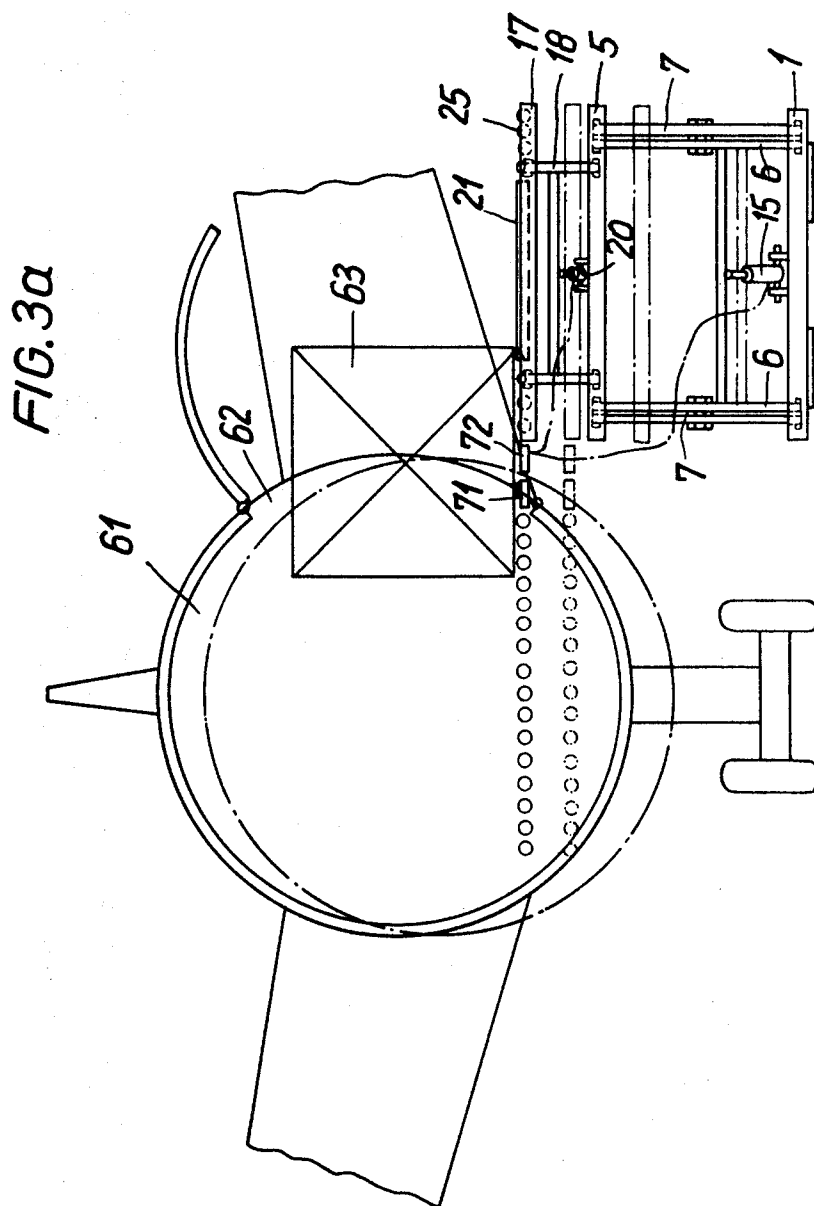
Fig. 2b

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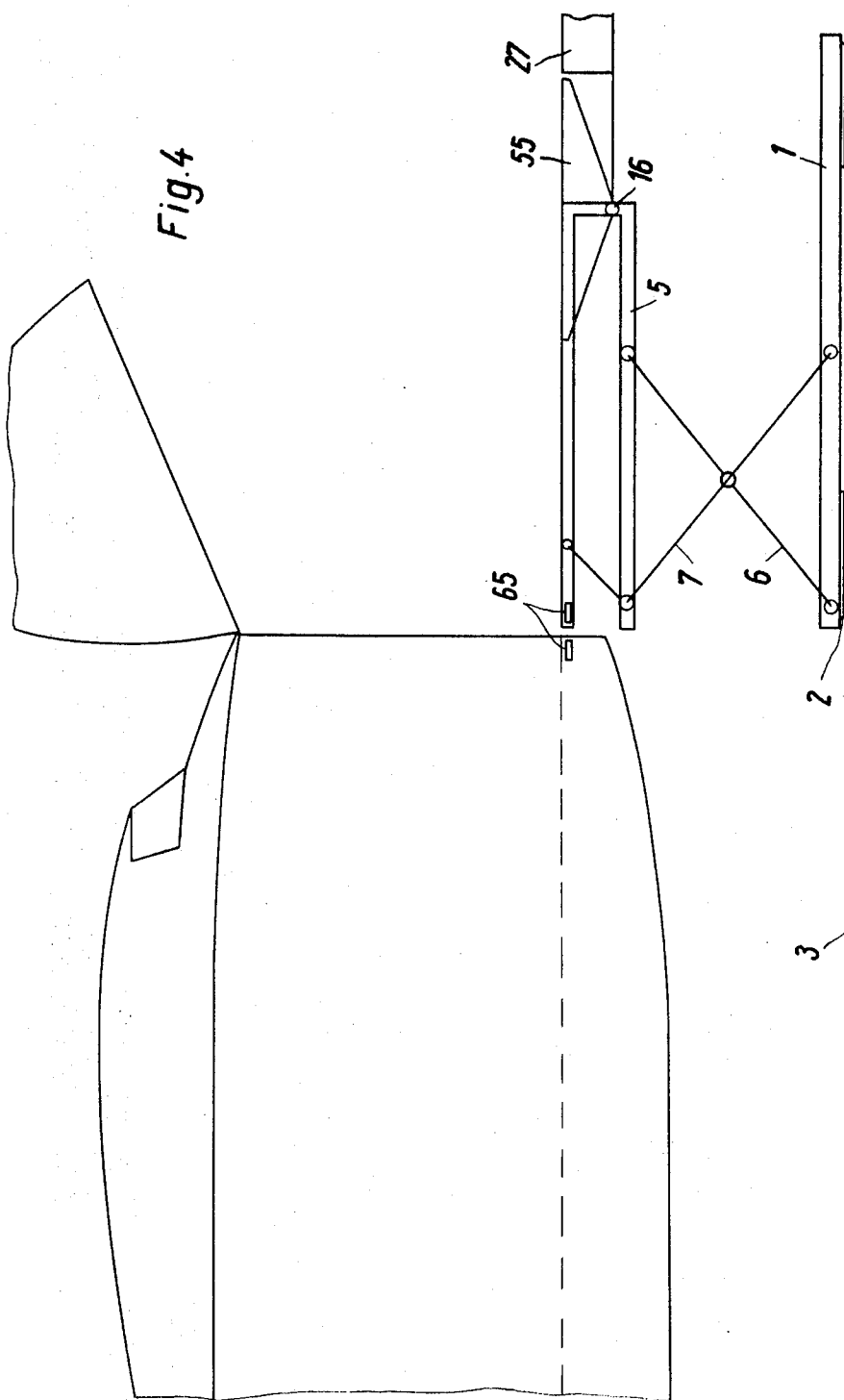
Fig. 3



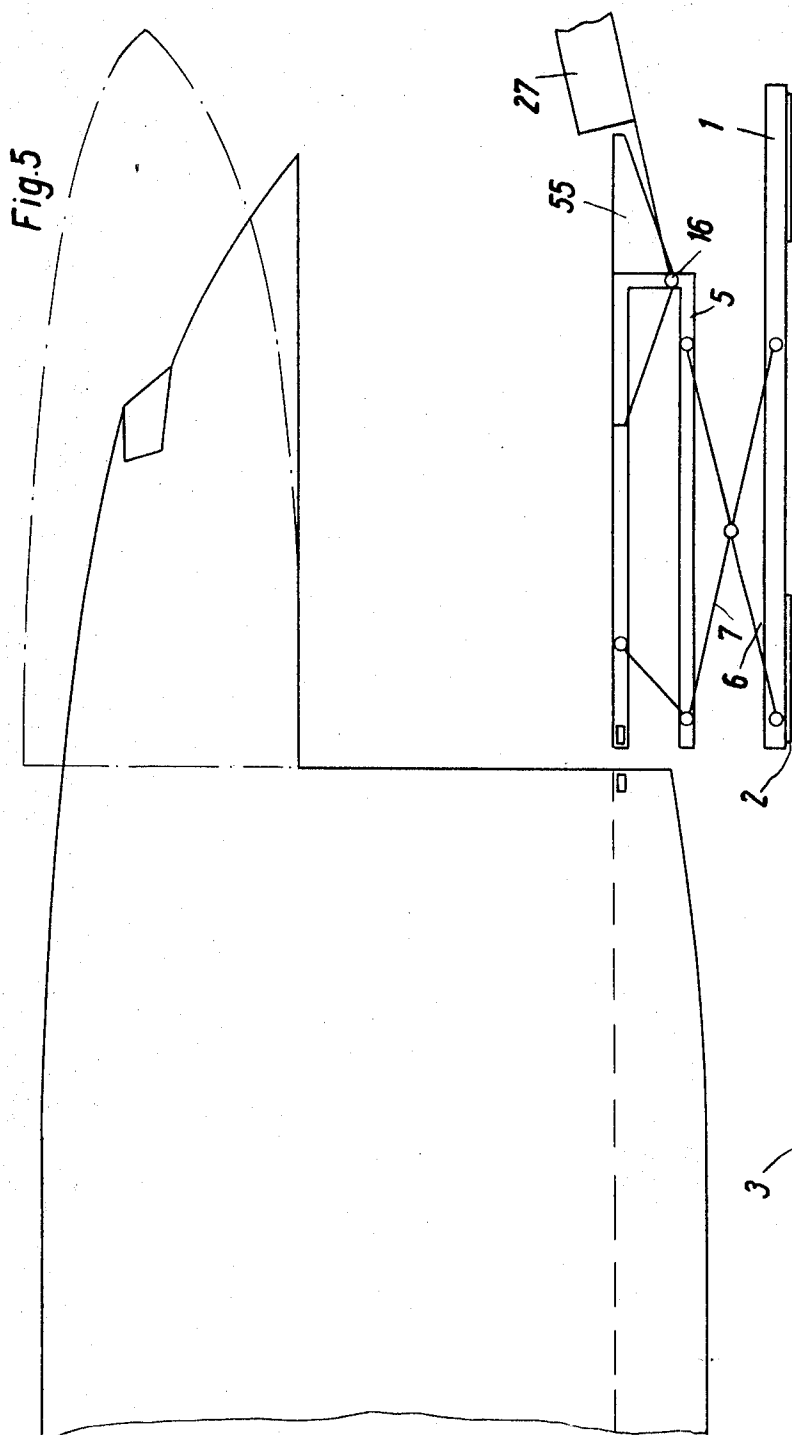
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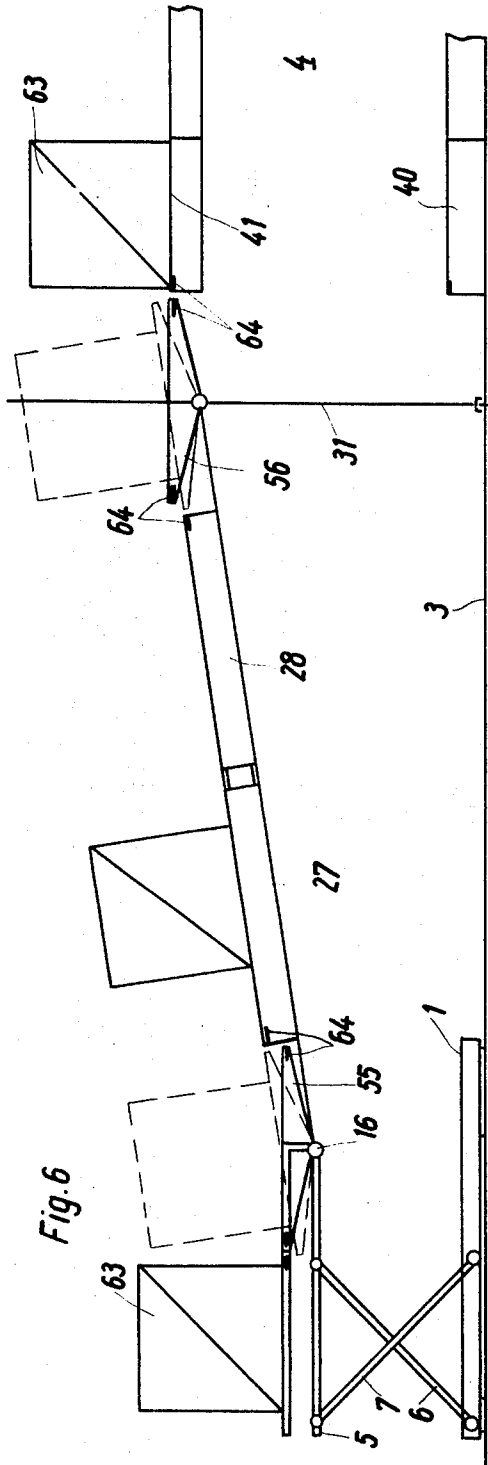


Fig. 6

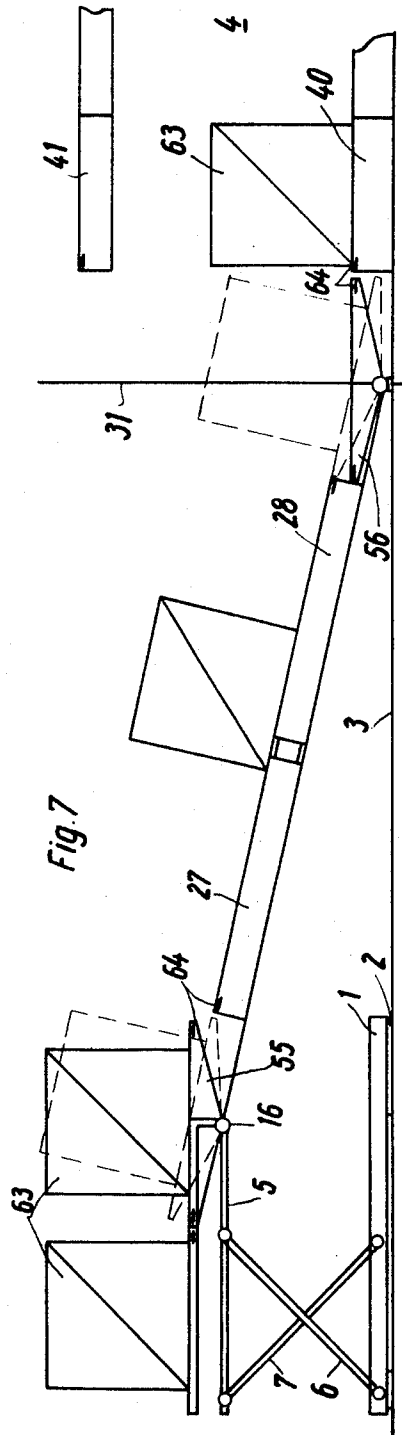


Fig. 7

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APRON TRANSLOADING DEVICE FOR AN AIR FREIGHT TRANSLOADING STATION

The present invention relates to an apron transloading device for an air freight transloading station with a platform which is adjustable as to height and which comprises a conveyor, preferably a roller conveyor, for loading units, as for instance containers, pallets, and the like.

It is an object of the present invention to provide an apron transloading device of the above mentioned general type which will make possible a continuous handling under all conditions occurring during the loading and unloading of freight airplanes and which will assure a uniform support of the base surfaces of the loading units over the entire conveyor path so that loading units of light construction can be employed.

The various conditions are due to different types of airplanes and to the change in the location of the airplanes due to air traffic, and are furthermore due to the changes in the level as well as the pitching motion of the airplane fuselage during the loading and unloading operation, and are finally due to the difference between the levels of the conveying means adjacent the apron. 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 represents a side view of the apron transloading device according to the invention.

FIG. 2 represents a top view of the device of FIG. 1.

FIG. 2a and 2b diagrammatically illustrate the lifting and lowering respectively of the maneuvering roller.

FIGS. 3—7 diagrammatically illustrate a side view of the device of FIGS. 1 and 2 but with parts of adjacent conveying means occupying different positions.

FIG. 3a illustrates the adjustment of a platform and a frame in conformity with the height of the fuselage.

The present invention consists primarily in that with a transloading device of the above mentioned type the platform is provided with a bridge having a further conveyor for loading units which bridge is supported in joints by means of a horizontal axle. Furthermore, a rocker or tiltable table with a conveyor for loading units is adjustably mounted on the platform in such a way that its conveyor is adapted selectively to form a continuation of the conveyor of the platform or a continuation of the conveyor of the bridge. The bridge conveyor is preferably so journaled on the platform that its inclinations relative to the platform can be changed. In this way it will be possible in a simple manner to adapt the conveyor path to the pitching movements of the airplane fuselage during the unloading operation. Preferably, the tiltable table or rocker, the bridge, and the platform conveyor are journaled on the platform in joints with one and the same axis.

That end of the bridge which faces away from the platform may be provided with a further rocker or tiltable table equipped with a conveyor for loading units and adjustable in such a way that its conveyor may selectively form a continuation of the bridge conveyor or a continuation of another conveyor adjacent the bridge. Advantageously, the bridge has that end thereof which faces away from the platform connected through a carriage to a conveyor extending transverse to the bridge. This carriage may be driven while the platform rests on sliding transporting means, which are not driven, as for instance air cushions. That end of the bridge which faces away from the platform is preferably guided for adjustment as to height on a frame work which protrudes upwardly from the carriage.

The bridge may comprise at least two telescopic members with fingers meshing with each other while each finger has short rollers forming components of the conveyor so journaled that they will not interfere with the displacements of the fingers relative thereto.

Referring now to the drawings in detail, the device shown therein has a U-shaped base frame 1 which by means of air cushions 2 rests on the apron 3 of the air freight transloading

station. There are provided four groups each having four air cushions 2 located on the two ends of the U-shaped legs and on the two other corners of the base frame. The roller cushions 2 are in a manner known per se provided with annular marginal strips adapted to slide on the ground while within said marginal strips the air is kept under an overpressure. These air cushions make it possible that the base frame 1 can be displaced in any direction over the apron 3 while encountering a relatively low resistance. In this connection care is taken that the U-shaped opening of the frame 1 always faces toward a freight hall 4 adjacent to the apron 3.

The base frame 1 carries a platform 5 by means of a scissors-shaped support. This support comprises two pairs of strong levers 6, 7 one pair of which is by means of joint bolts 8 connected to the base frame 1, whereas the other pair is by means of joint bolts 9 connected to that side of the platform 5 which faces away from the freight hall 4. The levers 6 and 7 are interconnected approximately at their central portion by means of a pivot bolt 10 and have those ends of the levers 6, 7 which face the freight hall 4 guided in rails 13, 14 by means of rollers 11, 12. The rails 13, 14 respectively arranged on the platform 5 and base frame 1 extend in horizontal direction parallel to the U-shaped legs of the base frame. The levers 6 are engaged by hydraulic power devices 15 by means of which the platform 5 can be lifted and lowered while retaining its horizontal position. At those corners of the platform 5 which face the freight hall 4, there is journaled a frame 17 by means of pivot bolts 16 with an axis parallel to the axes of the bolts 8, 9, 10 and of the rollers 11, 12. This frame 17 is adapted to be a slightly tilted upwardly and downwardly from the position indicated by solid lines. This pivoting operation may be carried out by means of levers 18 which are journaled on the platform 5 coaxially with the pivot bolts 9 and on the other hand by means of rollers guided in longitudinal slots 19 of frame 17, and furthermore by means of hydraulic power operable devices 20 connected to the levers 18.

The frame 17 has a roller conveyor the rollers 21, 22 of which have their axes of rotation parallel to the pivot bolts 16. The roller conveyor extends from that marginal portion of frame 17 which faces away from the freight hall 4 only over a portion of the entire length of the frame 17 so that between the last roller 21 and the pivot bolt 16 there remains free a rectangularly shaped space 23 between the longitudinal bars of frame 17. In the central portion of the roller conveyor between the rollers 22 which are shorter than the rollers 21 there is left free a slot in which is journaled a maneuvering roller 24 which has its axis of rotation arranged at a right angle to the axis of the rollers 21, 22. The arrangement is such that the maneuvering roller 24 may be lifted beyond the rollers 21 and 22 or may be lowered relative thereto.

Within the range of the roller conveyor 21, 22, the frame 17 is at both sides provided with extensions so that it will have a T-shaped basic form. Mounted on said extensions are rollers 25, 26 with their axes of rotation extending at a right angle to the axes of the rollers 21, 22.

The platform 5 is connected to the freight hall 4 by means of a bridge likewise equipped with a roller conveyor. The said bridge comprises two telescopically interengaging members 27 and 28. The member or part 27 has one end resting on the platform 5 in joints coaxial with the pivot bolts 16, whereas the other member or part 28 is at its opposite end supported by a portal frame which at the marginal area of the apron 3, i.e. along the hall 4, is movable on a rail 30 by means of rim wheels 29. The portal has two struts 31 of H-shaped cross section and has its upper end provided with a cantilever 32 which extends over a rail 33 arranged on the roof of the freight hall 4 and parallel to the rail 30. At both sides at the head of rail 33 there are located rollers 34 which are journaled on the bottom side of the cantilever 32 and prevent the portal from tilting.

The part 28 of the bridge is guided on the struts 31 by two rollers 35 each, which with only slight play roll in the vertical grooves 36 formed by the H-profile of the posts or struts 31. On each side of the bridge part 28 there is journaled directly

on said part a roller 35 while another roller 35 is journaled on a support 37 extending around the strut or post 31. For purposes of lifting and lowering that end of the bridge which faces toward the hall 4, there are provided two two-stage hydraulic power devices the cylinders 38 of which are suspended on those sides of the struts 31 which face each other, and are located near the upper ends of said struts 31. The lower ends of the piston rods 39 engage the bridge part 37. In the freight hall 4 there are provided two roller conveyors 40, 41 which are located at two different levels parallel to the front of the hall while also the axes of rotation of their rollers are located at a right angle to the rail 30. The roller conveyor 40 for the first floor of the hall 4 is located only slightly higher than the floor of the apron 3, whereas the roller conveyor 41 for the upper story of the freight hall is mounted on an intermediate floor.

The parts 27 and 28 of the bridge are interconnected by struts 42, 43 which are displaceable in a telescopic manner.

The bridge part 27 is provided with fingers 44 arranged in spaced relationship to each other while fingers 45 extend into the space between the fingers 44 and between the outer fingers 44 and the adjacent struts 42. The fingers 45 are mounted on the bridge part 28. When the two bridge parts 27, 28 are pushed into each other as far as possible, the fingers 44 and 45 almost completely fill the gaps therebetween, whereas when the bridge parts 27, 28 are pulled apart as far as possible, the fingers 44 and 45 still overlap each other to a certain extent. Each of the two bridge parts 27, 28 has a roller bed with rollers 46, 47 and 48, 49 the axes of rotation of which extend transverse to the longitudinal direction of the bridge which means parallel to the axes of the rollers 21, 22. The rollers 47 and 49 are journaled on the fingers 44, 45 and are so short that they do not protrude beyond the fingers. Adjacent the fingers 44, 45 on the bridge parts 27, 28 there are journaled rollers 46, 48 which extend over the width of the bridge. However, the roller beds 46, 48 do not extend to the ends of the bridge parts 27, 28 but leave a rectangular space 50, 51 free between the struts 42, 43.

In the roller conveyors 40, 41 in the longitudinal central portions thereof and at a certain distance from each other there are provided spaces between corresponding short rollers with one maneuvering roller 53 each which extends in the conveying direction. These maneuvering rollers 53 are adapted to be lifted beyond the other rollers or to be lowered relative thereto.

The rim wheels 29 are coupled to driving units 54.

Between the bridge part 27 and the frame 17 and between the bridge part 28 and the roller conveyors 40, 41 there are provided tiltable platforms 55, 56 with rollers 57, 58. The axes of rotation of these rollers are parallel to the axes of rotation of the adjacent roller conveyors of the frame 17 and of the bridge parts 27, 28.

The tiltable platform 55 is tiltable journaled on the platform 5 in joints which are parallel to the pivot bolts 16. The tiltable platform 55 is adapted, depending on its tilted position, with slight play to fill in the space 23 left free by the rollers 23 of the frame 17, and the space 50 left free by the rollers 46 of the bridge part 27. The tiltable platform 58 is journaled in joints on the struts 43 of the bridge part 28, said joints being coaxial with the rollers 35. The platform 58 is adapted with slight play to fill the space 51 left free by the rollers 48 between the struts 43, and depending on the level position of the bridge part 28, extends closely to the roller conveyor 40, 41.

At least one portion of the rollers of the above-mentioned roller conveyors is equipped with driving means, and the rollers of the bridge parts 27, 28 are equipped at least partially with braking devices. The roller conveyors are bordered at both sides by guiding strips with rollers 59 the axes of rotation of which are substantially perpendicular to the plane of the respective roller conveyors. Adjacent the platform 5 and at one side thereof there is provided a platform with a control pulpit 60.

FIGS. 1 and 3 illustrate the adjustments of the transloading device for unloading or loading an airplane located on the apron 3, said unloading and loading being effected through a loading opening 62 located laterally in the airplane fuselage 61. The transloading device is so adjusted that one roller conveyor 25 which is located laterally on the frame 17 is flush with the bottom of the respective loading compartment in the airplane fuselage 61. The adjustment of the transloading device is effected by displacing the portal 31 on the rail 30 if necessary, and the correct length of the bridge parts 27, 28 is adjusted by means of the hydraulic power device 52. The base frame 1 carries out corresponding movements on the air cushion 2, and the platform 5 is by means of the levers 6, 7 and the hydraulic power device 15 moved to the right level while the frame 17 by means of the levers 18 and the hydraulic power device 20 is tilted relative to the horizontal plane into a position which corresponds with the respective inclination of the airplane fuselage 61. FIG. 3 shows in dot-dash lines that during the progress of the unloading or loading operation the airplane fuselage 61 carries out a pitching movement so that the bottom of the freight compartment is inclined. The frame 17 will have the same inclination.

The described adjustment of the transloading device is remote controlled by the control pulpit 60. The adjustment as to height of the platform 5 and the inclination of the frame 17 are controlled automatically by means of optical reflect switches 70 or inductive approximating switches (Näherungsschalter) so that the roller conveyors of the frame 17 will always occupy their proper position with regard to the bottom of the cargo compartment regardless of whether during the unloading or loading of the airplane fuselage 61 the level thereof changes and the fuselage carries out pitching movements. Therefore, it will be assured that the rolling of the cargo units from the bottom of the cargo compartment to the roller conveyor of frame 17 and vice versa will always be effected in a shock-free manner. Alternatively FIG. 3a shows a switch 71 at the lower edge of opening 62 and in front of this switch a switch 72 on the upper edge of frame 17 these switches cooperating for automatically adjusting frame 17 and platform 5 by means of hydraulic power devices 15 and 20.

It may be assumed that a container 63 is rolled out of the cargo compartment through the loading opening 62. From the rollers 25 the container 63 moves onto the roller 24 which first occupies an elevated position. This roller 24 may have, for instance, a rubber mantle and may be driven. When in this manner the container 63 has moved far enough over the rollers 21, 22, the maneuvering roller 24 is lowered so that the container will now rest on the rollers 21, 22. The roller conveyor 57 of the tiltable platform 55 is adjusted so as to be flush with the rollers 21, 22. The container 63, therefore, can roll in a shock-free manner onto the tiltable platform 55 as is clearly shown in FIG. 7 without protruding beyond the platform 55. The platform 55 with the container 63 is then tilted to such an extent that its roller conveyor 57 is flush with the roller conveyor 46 of the bridge part 27. Subsequently, the container 63 will, as will be seen from FIG. 7, roll over the bridge 27, 28 and onto the adjacent tiltable platform 56 which is so adjusted that its roller conveyor 58 is flush with the roller conveyor 48 of the bridge part 28. Thereupon the tiltable platform with the container is so tilted that its roller conveyor 58 is flush with the roller conveyor 40 in the freight hall 44. The container will then through the intervention of the maneuvering roller 53 adjusted to a higher level be rolled onto the roller conveyor 58 and after the roller 53 has been lowered, the container is transported further onto the roller conveyor 40.

In this connection it is important that the container 63 throughout its entire above mentioned path is always properly supported by adjacent rollers engaging the base surface of the container 63. Therefore, the bottom of the container is not subjected to bending stresses to any material extent. Consequently, loading units of light structure, as for instance palettes, may be employed.

FIG. 6 illustrates that the bridge in the portal 31 is lifted up to the level of the roller conveyor 41 in the hall 4 and that the tiltable platforms 55, 56 each with a container 63 are so adjusted that their roller conveyors alternately are flush with the respective preceding and then with the respective succeeding roller conveyor.

The loading of the airplane will thus be effected in opposite directions of movement.

The adjustment of the platforms 55 and 56 in the respective position so that a loading unit can be moved in a shock-free manner from the preceding roller conveyor to the roller conveyor of the tiltable platform and from the latter to the adjacent roller path is effected automatically by the employment of limit switches and inductive approximating switches which are designated with the reference numerals 64 in FIGS. 6 and 7.

Finally, FIGS. 4 and 5 show how with such freight airplanes the loading openings of which are located on the bow, the transloading device is so adjusted that the roller conveyor of frame 17 is flush with the bottom of the freight compartment in the airplane fuselage. According to FIG. 5, the airplane fuselage occupies a particularly low position to which the transloading device can adapt itself by lowering the platform 5. In view of the described moveability of the transloading device not only in longitudinal direction of the freight hall 4 along the rails 30 and 33 but also at a right angle thereto in view of the telescopic displacement of the bridge parts 27, 28 and the displacement in all directions of the base frame 1 on the air cushion 2, it will be possible to move the transloading device always into the proper position with regard to the airplane to be unloaded or loaded. This will be possible also when airplanes with different wing span are parked at different distances from each other on the apron.

It is, of course, to be understood that the present invention is, by no means, limited to the particular construction shown in the drawings but also comprises any modifications within the scope of the appended claims.

What we claim is:

1. An apron transloading device for air freight transloading installations which includes: a first platform, first conveyor means supported by said first platform, adjusting means operatively connected to said first platform for adjusting the latter as to height, bridge means linked to one end portion of said first platform so as to be pivotable about a substantially horizontal axis, second conveyor means supported by said bridge means, a second platform pivotally connected to said first platform for pivoting about an axis substantially parallel to said substantially horizontal axis about which said bridge means is pivotable, said second platform being adjustable selectively so as to form a continuation of said first conveyor

means or a continuation of said second conveyor means.

2. A device according to claim 1, in which said first conveyor means is variable as to its angle with regard to said first platform.

3. A device according to claim 1, in which the pivot axes about which said first and second platform and said bridge means are pivotable form extensions of each other.

4. A device according to claim 1, which includes: third conveyor means arranged at that end of said bridge means which is located remote from said first platform, and a third platform tiltable about a horizontal axis and arranged adjacent that end of said bridge means which is remote from said first platform, and fourth conveyor means provided on said third platform and pivotable selectively into a first position so as to form a continuation of said second conveyor means or into a second position so as to form a continuation of said third conveyor means.

5. A device according to claim 4, which includes inductive proximity initiators respectively arranged on marginal areas of said pivotal second platform and of said pivotal third platform on one hand and on the respective adjacent marginal areas of said first conveyor means and of said second conveyor means and of said third conveyor means on the other hand for adjusting the second and third platform so as to form a continuation of the respective adjacent conveyor means.

6. A device according to claim 1, which includes guiding means extending transverse to said bridge means and adjacent that end thereof which is remote from said first platform, and carriage means arranged at said last mentioned end of said bridge means and movable on said guiding means.

7. A device according to claim 6, which includes driving means associated with said carriage means, and freely movable supporting means movably supporting said first platform.

8. A device according to claim 6, which includes a frame work extending upwardly from said carriage means and adjustably supporting that end of said bridge means which is remote from said first platform for adjustment as to height.

9. A device according to claim 1, in which said bridge means comprises at least two sections telescopically movable relative to each other and respectively equipped with interengaging fingers, each of said fingers comprising roller means forming part of said second conveyor means.

10. A device according to claim 1, in which said first conveyor means includes central roller means and lateral roller means arranged on opposite sides of said central roller means, the direction of rotation of said lateral roller means being at a right angle to the axis of rotation of said central roller means, and lifting and lowering means associated with at least one of said central roller means for selectively lifting and lowering at least one of said central roller means.

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