Nov. 13, 1951 J. E. TILLOTSON 2,575,201

CURVED TRACK OVERHEAD DOOR

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Fig. 1.

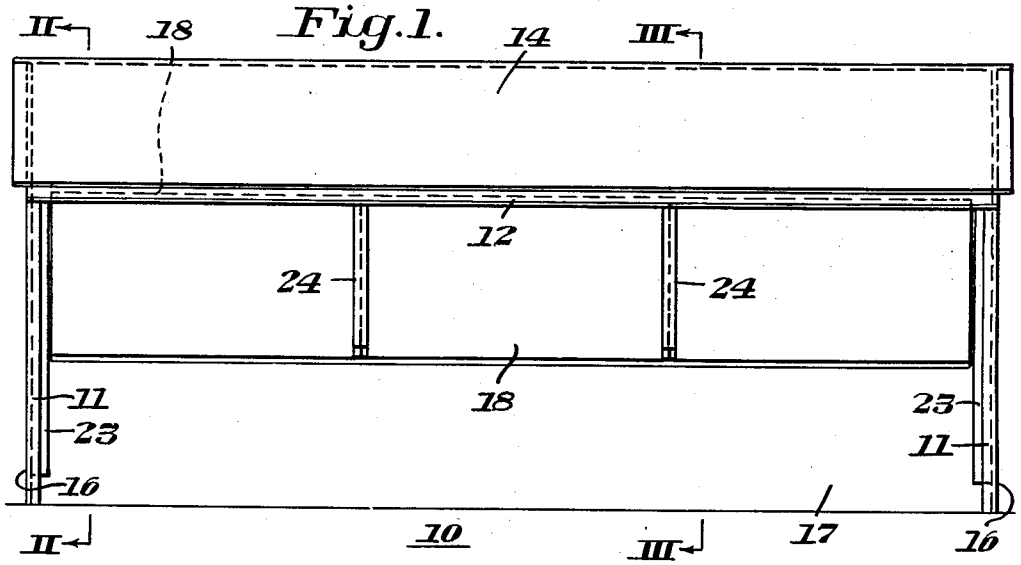


Fig. 2.

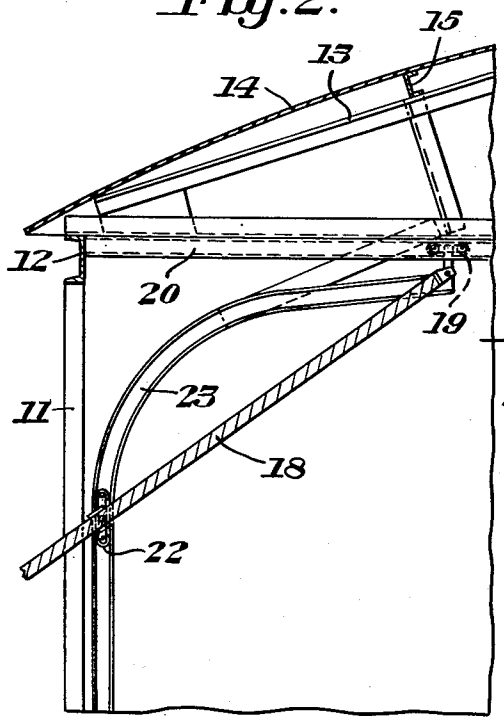
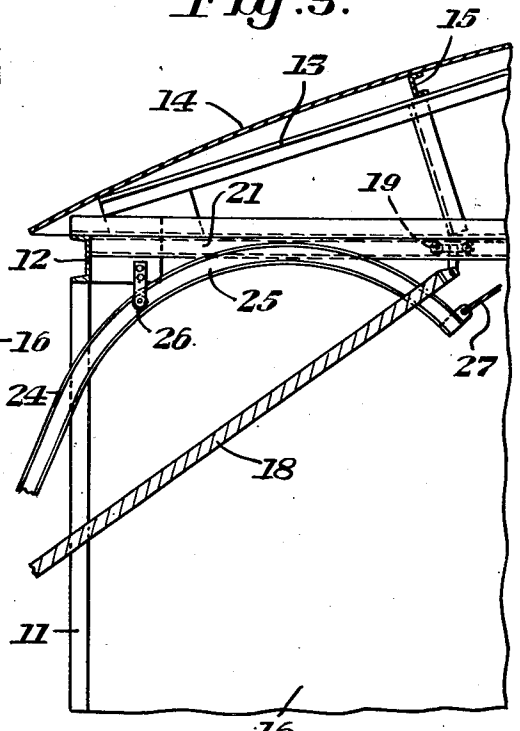


Fig. 3.



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CURVED TRACK OVERHEAD DOOR

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Fig. 5.

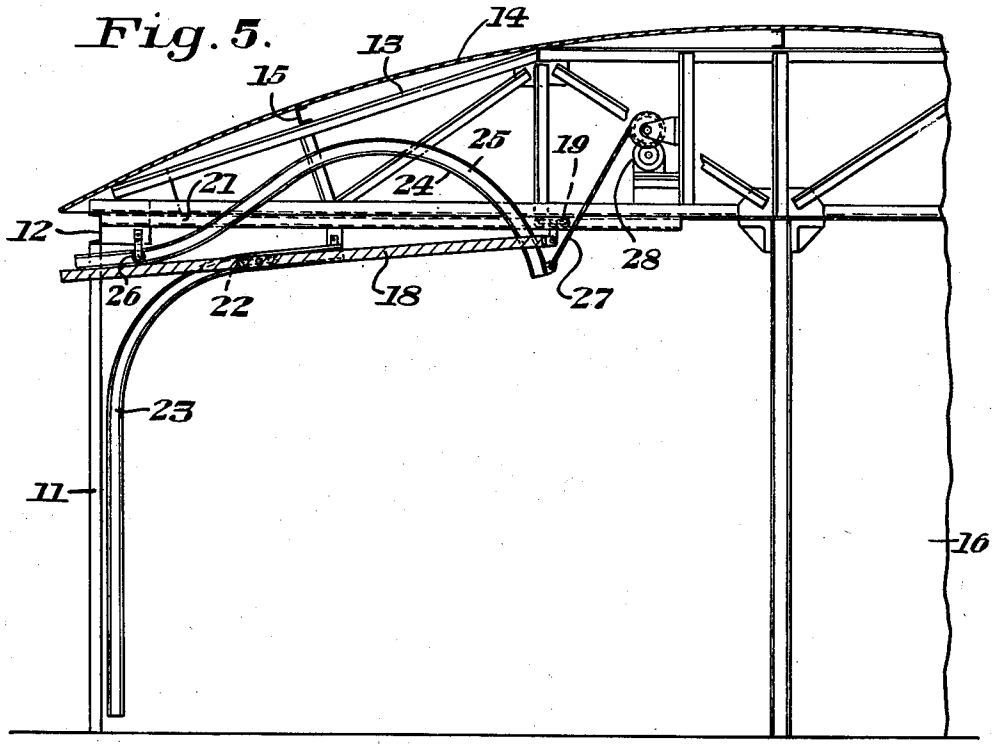

Fig. 4

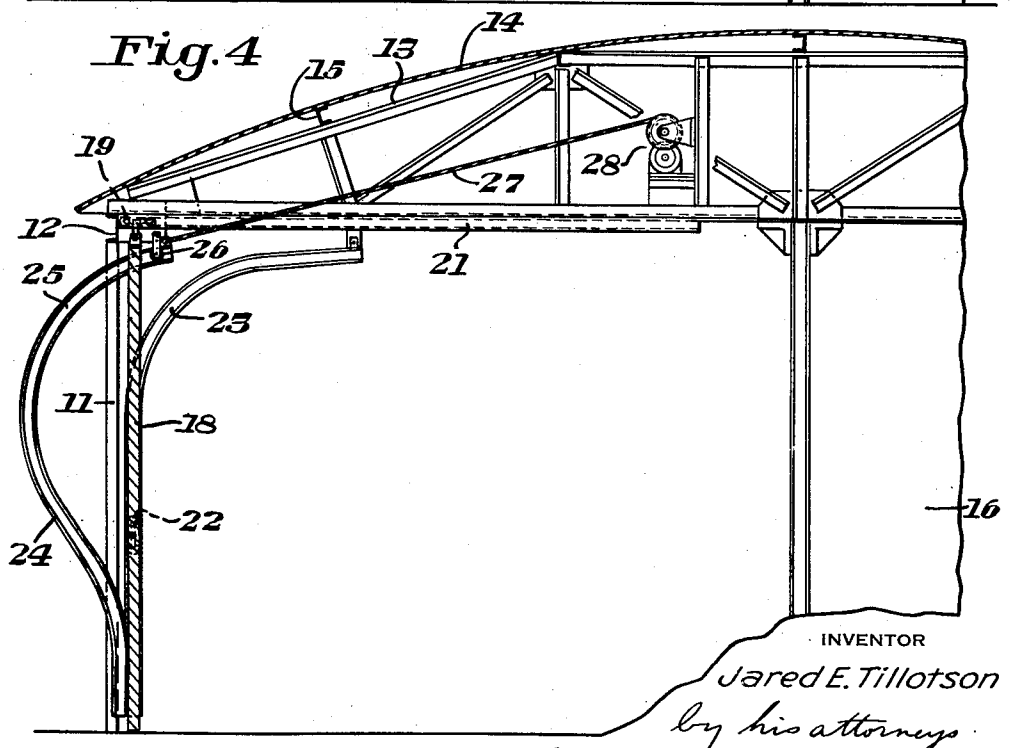

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Fig. 6.

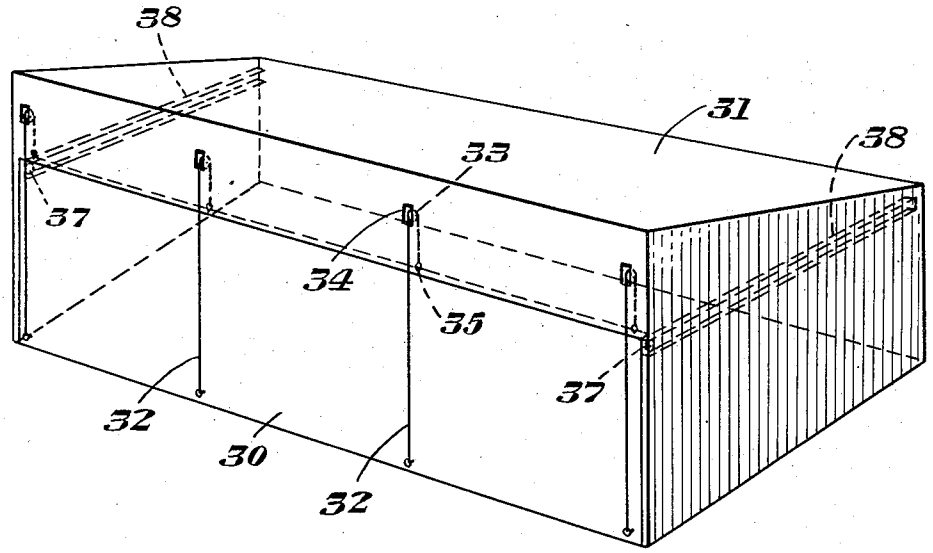
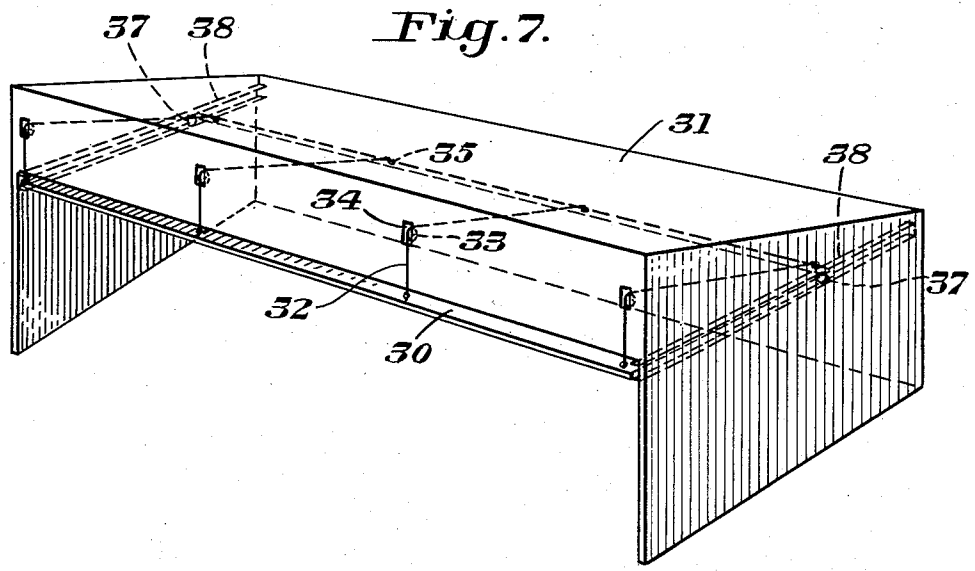


Fig. 7.



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UNITED STATES PATENT OFFICE

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CURVED TRACK OVERHEAD DOOR

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Application January 8, 1946, Serial No. 639,854

5 Claims. (Cl. 20—19)

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This invention relates to a tilting-lift door and, in particular, to a door adapted for buildings where a very wide, unobstructed opening is desired.

Doors of great width are necessary in certain types of industrial buildings, for example, airplane hangars, in which it is necessary to provide a wide span free from obstructions to permit the entry and exit of aircraft having a long wing spread. Many of these doors are of the tilting-lift type, i. e., they are supported adjacent their upper corners by trolleys secured near the upper edge and traveling on substantially horizontal tracks. Additional trolleys pivoted to the sides of the door on a horizontal axis parallel to the bottom edge of the door and spaced thereabove, travel on tracks curving upwardly and inwardly so that, as the upper edge or head of the door is pulled inwardly, as by a series of cables and winches or the like, the door moves from a vertical position closing the wall opening to a generally horizontal position inside the building and just below the roof trusses.

Doors of the type mentioned may easily be made rigid enough to prevent objectionable deflection when disposed in a vertical plane and supported at their ends, by reason of their considerable height. When tilted to open position, however, objectionable deflection may occur unless special precautions are taken in the design. Usually these result in a heavy massive construction. While additional supporting rollers traveling on horizontal tracks between the side edges of the door may be provided for supporting the upper edge, the lower edge of the door is without support between the upwardly and inwardly curving guide tracks at the extreme sides of the opening in the building wall.

I have invented a novel form of tilting-lift door provided with auxiliary suspension members for supporting the door panel at points intermediate the side edges thereof, whereby excessive deflection is avoided without requiring the construction to be such as to increase the weight of the door as a whole. In a preferred embodiment, I provide suspension members secured at their ends to the door panel adjacent the upper and lower edges thereof, and traveling on fixed rollers. The portions of the suspension members intermediate their ends are spaced from the door panel on the external side thereof. The suspension members may be in the form of a rigid curved track or a flexible cable and, in either case, serve to support the door panel intermediate its side edges and avoid excessive deflection thereof.

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A complete understanding of the invention may be obtained from the following detailed description which refers to the accompanying drawings illustrating a preferred embodiment and a modification. In the drawings,

Figure 1 is a diagrammatic elevation of a building having a door embodying the invention, the door being shown in partly open position;

Figure 2 is a partial section taken along the plane of line II—II of Figure 1;

Figure 3 is a similar section taken along the plane of line III—III of Figure 1, parts beyond the plane of section being omitted;

Figure 4 is a section similar to Figure 3 showing parts beyond the plane of section, the door being in closed position;

Figure 5 is a view similar to Figure 4 showing the door in open position;

Figure 6 is a diagrammatic perspective view showing a modified construction with the door closed; and

Figure 7 is a similar view showing the door open.

Referring now in detail to the drawings and, for the present to Figures 1 through 5, a building 10, for example, an airplane hangar, comprises structural columns 11, lintel beams 12 carried thereby and roof trusses 13 extending between the beams. A roof covering 14 is carried by purlins 15 extending across the trusses 13. The ends 16 and one side 17 of the building may be closed by any desired construction. The other side of the building is open between corner columns 11. A tilting-lift door panel 18 is adapted to close the open side of the building.

The panel 18 has trolleys 19 secured thereto adjacent the upper corners. The trolleys 19 travel on tracks 20 extending inwardly from the lintel beam 12. Similar trolleys may be secured to the upper ends of the panel between the side edges thereof for traveling movement along tracks 21. Trolleys 22 pivoted to the side edges of the door panel on an axis spaced above the lower edge travel in upwardly and inwardly curving tracks 23 secured inside the ends of the building to guide the lower portion of the panel upwardly as the head or upper edge moves inwardly. The construction described thus far is more or less conventional and forms no part of my invention.

My improvement in the means for supporting the panel 18 comprises one or more suspension means 24, preferably spaced inwardly from the side edges of the panel. In the form of the invention illustrated in Figures 1 through 5, each suspension means comprises a curved track 25

secured to the panel adjacent the upper and lower edges thereof but spaced from the panel at points between said edges. Specifically, the tracks **25** are curved beams bowed outwardly from the door panel on the external side thereof. The tracks **25** ride on fixed trolleys **26** carried by the building frame. The curvature of the tracks **25** is such that the rollers **26** will carry a portion of the weight of the panel at all points in its upward tilting movement to open position. That is to say, the curvature of the beams is defined by the locus of the axis of rollers **26**, if the door were held stationary and the building revolved relative thereto.

Cables **27** secured to the upper edge of the door panel are taken up by motor-driven winches **28** when it is desired to open the door. The winches may conveniently be carried by the roof trusses **13**. As the cables **27** are wound up by the winches, the upper edge or head of the door panel is drawn inwardly from the position shown in Figure 4 to the intermediate position shown in Figures 1 through 3 and, finally, to the fully open position shown in Figure 5.

It will be appreciated that the rollers **26** support a portion of the weight of the panel **18**, thus reducing the span between points of support from the distance between the tracks **20** to the distance between them and the suspension means or beams **24**. This materially reduces the deflection of the panel between supports and permits a much lighter construction to be employed than would otherwise be necessary to keep the deflection below the permissible maximum. As the panel **18** approaches the fully open position of Figure 5, the support afforded by the rollers **26** is applied adjacent the lower edge of the panel. The trolleys like those shown at **19** cooperating with the intermediate horizontal tracks **21** will support the upper edge of the panel in open position. Instead of relying on tracks **21**, the winches **28** may be disposed as shown in the drawings so that when the door is open, the cables **27** exert a substantial vertical component of force on the suspension means or beams **25**, thus making it unnecessary to provide the tracks **21** and trolleys cooperating therewith.

When it is desired to close the door, operation of the winches **28** to pay out the cables **27** permits the panel to travel downwardly in the tracks **23** and tilt back to vertical position as it descends. The beams **24** continue to support the panel intermediate the tracks **23** particularly in that portion of the travel of the panel before it reaches substantially vertical position. It will be evident that the beams **24** may be provided with lattice members to constitute a truss, instead of using the simple bow-shaped beams illustrated in the drawings.

Figures 6 and 7 show a modified construction of the door panel **30** adapted to close the open side of a building **31**. The panel has cables **32** secured adjacent the lower edge thereof at points spaced across its width. The cables are trained around sheaves **33** journaled inside the building adjacent openings **34** through which the cables extend. The other ends of the cables are secured to the upper edge of the panel as at **35**. Rollers **37** at the upper corners of the panel travel in horizontal tracks **38**.

It will be apparent that when the upper edge of the door panel is drawn inwardly as by the cable and winch arrangement referred to above, the cables **32** will support the panel at the extreme side edges thereof and also at the intermediate positions occupied by the cables and sheaves. In other words, the construction of Figures 6 and 7 dispenses with the necessity for the trolleys **22** and the guide tracks **23** of the construction first described, yet supports the panel at intermediate points as well as the side edges thereby materially reducing the span between points of support and likewise reducing the maximum deflection of the panel between supports.

It will be apparent from the foregoing that the invention is characterized by important advantages over tilting-lift doors as previously constructed, particularly in the case of doors having a large span, such as those required for airplane hangars. By means of the construction described, such doors are supported at points between the side edges thereof. The intermediate supports are effective at the upper edge of the door in the beginning of the tilting movement of the panel but remain fixed as the panel continues to move and approach the lower edge as the panel moves into substantially horizontal position in which the deflection thereof between supports under its own weight is a maximum. The invention is simple and inexpensive, the additional parts and structural members required being simply the suspending beams or cables with their supporting rollers or sheaves. By virtue of these intermediate supports the door may be made lighter and less rigid than heretofore since the possible deflection of the panel when in horizontal position is greatly reduced by the intermediate suspension means.

Although I have illustrated and described but a preferred embodiment of the invention and a modification, it will be recognized that changes in the arrangement of the parts or details of construction may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a tilting-door assembly for wide panel doors or the like supported in a structure and adapted to be in generally vertical position when closed and to be tiltable inwardly and upwardly into generally horizontal position when opened to provide a clear opening, in combination, interengaging means respectively connected to the door adjacent the upper edge thereof and to the structure for guidably supporting said door inwardly upon being opened, a rigid curved track fixed on the outside of said door and bowing outwardly intermediate the sides thereof and spaced laterally relative said interengaging means, said curved track lying in a substantially vertical plane, a depending, laterally projecting member connected to said structure and supportably engaging said track, the engagement of said track and projecting member and said interengaging means defining the position of said door, and means connected to said door adjacent the upper portion thereof to move said upper portion inwardly upon the opening of said door, whereby wide panel doors or the like receive laterally intermediate support during the opening and closing thereof without requiring any obstruction in the doorway.

2. In a tilting-lift door assembly for wide panel doors or the like supported in a structure and adapted to be in generally vertical position when closed and to be tiltable inwardly and upwardly into generally horizontal position when opened to provide a clear opening, in combination, interengaging means respectively connected to the door respectively adjacent the upper and lower

edges thereof and to the structure for guiding said door upon movement thereof, a rigid curved track fixed on the outside of said door and bowing outwardly intermediate the sides thereof and spaced laterally relative said interengaging means, said curved track lying in a substantially vertical plane, a depending, laterally projecting member connected to said structure and supportably engaging said track, the engagement of said track and projecting member and said interengaging means defining the position of said door, and means connected to said door adjacent the upper portion thereof to move said upper portion inwardly upon the opening of said door, whereby wide panel doors or the like receive laterally intermediate support during the opening and closing thereof without requiring any obstruction in the doorway.

3. In a tilting-lift door assembly for wide panel doors or the like supported in a structure and adapted to be in generally vertical position when closed and to be tiltable inwardly and upwardly into generally horizontal position when opened to provide a clear opening, in combination, interengaging means respectively connected to the door adjacent the upper edge thereof and to the structure for guidably supporting said door inwardly upon being opened, a rigid bow-shaped track fixed on the outside of said door intermediate the sides thereof and spaced from said interengaging means, said bow-shaped track lying in a substantially vertical plane and bowing outwardly and downwardly, said bow-shaped track further having the channel thereof facing one of the sides of said door, a relatively fixed hook-shaped member connected to said structure and supportedly engaging said channel of said bow-shaped track, the engagement of said bow-shaped track and hook-shaped member and said interengaging means defining the position of said door, and means connected to said door inwardly of and above said door to move the upper portion of said door inwardly upon the opening thereof, whereby wide panel doors or the like receive laterally intermediate support during the opening and closing thereof without requiring any obstruction in the doorway.

4. In a tilting-lift door assembly for wide panel doors or the like supported in a structure and adapted to be in generally vertical position when closed and to be tiltable inwardly and upwardly into generally horizontal position when opened to provide a clear opening, in combination, spaced trolleys respectively connected to the door adjacent the upper edge thereof, generally horizontal tracks for said trolleys connected to the structure adjacent the upper edges of said doors and adapted to engage said trolleys to guide the upper portion of said door, a rigid bow-shaped and laterally channeled track fixed on the outside of said door intermediate the sides thereof and spaced from said trolleys, said bow-shaped track lying in a substantially vertical plane, a relatively fixed trolley depending from said structure and supportably engaging the channel in said bow-

shaped track, said tracks and said trolleys respectively defining the position of said door, and means connected to said door inwardly thereof and adjacent the upper portion of said door to move said door at least upon the opening thereof, whereby wide panel doors or the like receive laterally intermediate support during the opening and closing thereof without requiring any obstruction in the doorway.

5. In a tilting-lift door assembly for wide panel doors or the like supported in a structure and adapted to be in generally vertical position when closed and to be tiltable inwardly and upwardly into generally horizontal position when opened to provide a clear opening, in combination, spaced trolleys respectively connected to the door adjacent the upper edge thereof, generally horizontal tracks for said trolleys connected to the structure adjacent the upper edges of said doors and adapted to engage said trolleys to guide the upper portion of said door, trolleys connected to said door adjacent the lower portions of the respective sides thereof, upwardly and inwardly curved tracks connected to said structure adjacent the respective sides of said door and adapted to engage said last-mentioned trolleys, said respective tracks and trolleys defining the position of and guiding said door during the movements thereof, at least one rigid bow-shaped and laterally channeled track fixed on the outside of said door intermediate said respective first-mentioned tracks and trolleys, said rigid bow-shaped track lying in a substantially vertical plane, a fixed trolley connected to said structure and supportably engaging the channel of said bow-shaped track in substantially all of the positions of said door determined by said respective guiding tracks and trolleys, and means connected to said door inwardly and adjacent the upper portion thereof to move said door at least during the opening thereof, whereby wide panel doors or the like receive laterally intermediate support during the opening and closing thereof without requiring any obstruction in the doorway and a regulator roof may be provided on said structure.

JARED E. TILLOTSON.

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