March 21, 1944. R. A. SHIELDS 2,344,903

DOOR LIFTING AND TILTING DEVICE

Filed March 5, 1942 2 Sheets-Sheet 1

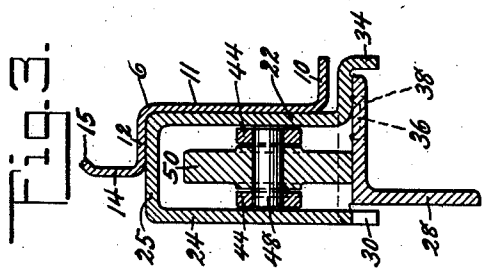


Fig. 3.

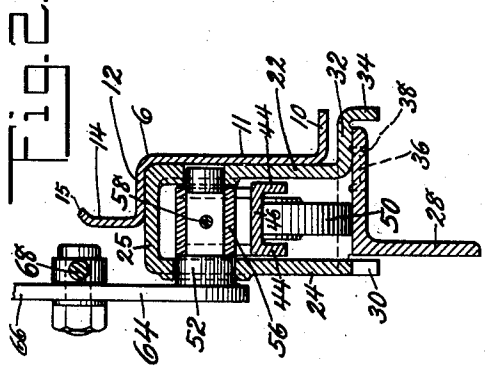


Fig. 2.

Fig. 1.

Fig. 4.

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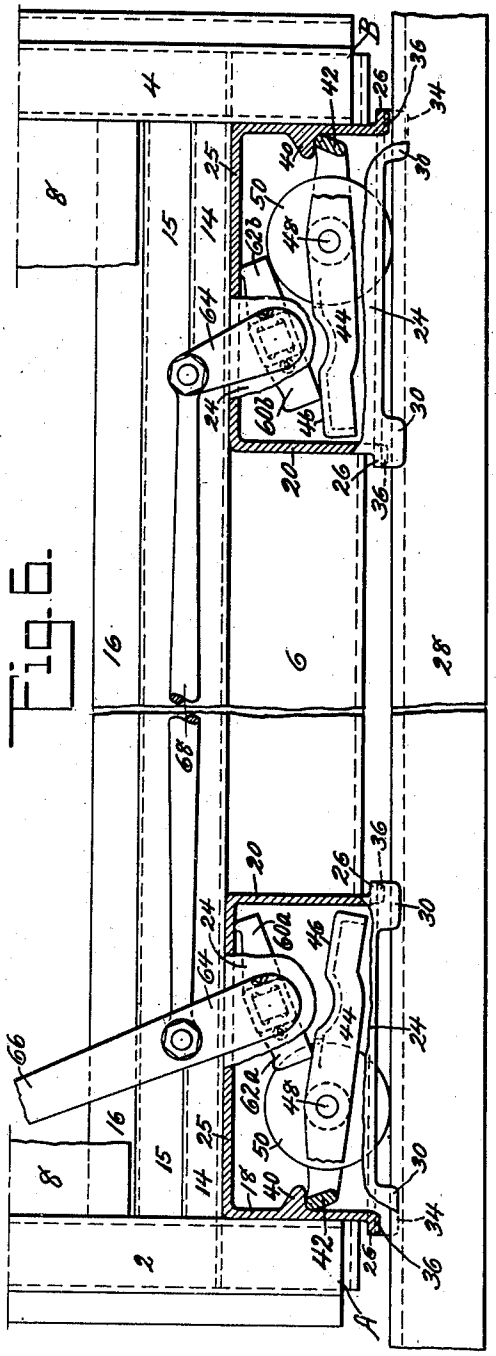


Fig. 6.

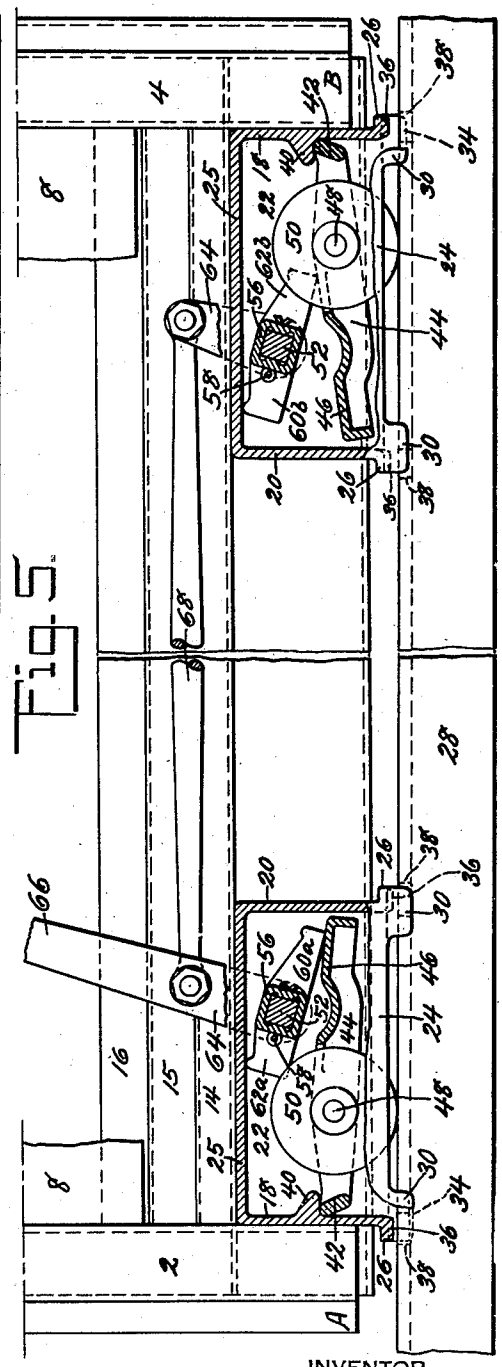


Fig. 5.

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Patented Mar. 21, 1944

2,344,903

UNITED STATES PATENT OFFICE

2,344,903

DOOR LIFTING AND TILTING DEVICE

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Application March 5, 1942, Serial No. 433,527

5 Claims. (Cl. 16—99)

This invention relates to door lifting devices in general and in particular to lifting devices used in connection with sliding doors on railway freight cars.

The bulk of freight car doors are now equipped with lift devices which operates to lift the doors vertical. With such lifting devices the operator must not only overcome the weight of the door but must slide the sealing edges of the door along the cooperating parts of the door posts. This vertical lifting of the doors will break any ice or rust at the sealing edges but does not in any way relieve the gripping effect of the sealing edges which in some cases are provided with springing connections to effect a waterproof seal. It has been proposed to lift the freight car doors only at one corner thus causing a slight tilting of the door, but to insure proper closing of the door this lifting of a single corner must occur at the forward or closing edge of the door. When the lifting device is located at the forward or closing edge of the door then the upper forward corner of the door is pried away from the door post but the leverage for prying this corner away is greatly reduced due to the extreme distance to the fulcrum point, namely, the trailing or back edge of the door. Maximum efficiency in lifting and tilting of the door can be obtained if the leading edge of the door can be lifted more than the trailing edge, irrespective of the direction of the door's travel; in other words, if the forward edge of the door is lifted more than the rearward edge during closing and the rearward edge is lifted more than the forward edge during opening of the door. With the door lifted and tilted as mentioned, the lower forward corner of the door is pried away from the door post during opening and is the first to contact the door post during closing of the door. It is an object, therefore, of the present invention to provide a door with lift devices which will tilt the door during lifting and so that the leading edge of the door is always lifted a greater amount than the trailing edge of the door, irrespective of the direction of door travel.

A further object of the invention is the provision of door lifting devices which will lift and tilt the door in such a manner that the bottom forward corner of the door is the first to leave contact with the door post in opening of the door and also the first to contact the door post on closing of the door.

A still further object of the invention is the provision of simple door lifting means which will automatically tilt the door away from the direction in which the door is to be moved.

A yet further object of the invention is the provision of simple door lifting devices permitting of the most efficient manner of lifting and starting the opening movement of a sliding door.

These and other objects of the invention will be apparent to persons skilled in the art from a study of the following description and accompanying drawings, in which:

Fig. 1 is a side view of the lower portion of the door and supporting track with parts broken away to better disclose the mechanism for lifting and tilting the door;

Fig. 2 is a sectional view taken substantially on line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 1;

Fig. 4 is a plan view of the roller carriage;

Fig. 5 is a side view of the lower portion of the door similar to Fig. 1 but showing the door in a lifted and tilted position for opening movement of the door, and

Fig. 6 is a similar view showing the door lifted and tilted for a closing movement of the door.

Referring now to the drawings in detail, it will be seen that the door is formed with an angular form front stile 2 and an angular form rear stile 4 joined together by an angular form bottom rail 6, to all of which is rigidly attached the door panel sheet 8. The angular form of the front and rear stiles is immaterial as is also the exact form of the bottom rail which may be independent or integral with the door panel sheet. In the present form, however, the bottom rail is independent of the door sheet and is formed, as clearly shown in Figs. 2 and 3, with an inturned bottom flange 10 at the lower edge of a vertical portion 11. The vertical portion merges into a horizontal shoulder portion 12 joined by vertical and inclined portions 14 and 15 respectively to a flange 16 (Fig. 1), to which the lower edge of the door sheet is attached. For convenience in later describing the portion of the door lift mechanism, the forward lower corner of the door has been designated by letter A, while the rearward lower corner of the door has been designated by letter B.

Roller housings are attached to the door stiles and to the bottom rail to support the door through suitable mechanism later to be described. Each of the housings are of substantially inverted open box formation having outer end walls 18, inner end walls 20, inner and outer side walls 22 and 24 respectively and upper wall

25. The outer end walls 18, inner walls 22 and upper or top wall 25 are connected to the stiles and bottom rail of the door, as clearly shown in the figures. The end walls 18 and 20 are provided with upturned flange portions 26 adapted to rest on the top surface of a door track member 28 connected to the car structure in any suitable manner. The front side walls 24 are provided with slight downward extensions 30 adapted to overlap the track slightly and prevent inward shifting of the door and housing relative to the track. As clearly shown in Figs. 2 and 3, the inner side walls 22 are formed with flanges 32 adapted normally to rest upon the track and also with downwardly directed flanges 34 overlapping the side of the track and preventing outward shifting of the door relative to the track. The flanged portions 26 may be left plain or, as shown, they may be provided with downwardly projecting lugs 36 adapted to engage openings 38 formed in the track surface of the supporting track rail. It is, of course, obvious that with the lugs engaging the openings when the door is in lowered position sliding motion of the door is impossible but in some cases it may be desirable to eliminate the lugs and openings and rely on the friction between the door and track to prevent movement of the door during shunting of the cars. It also may be desirable in some cases to let the entire lower edge of the door rest upon the track but these are mere matters of design.

The end walls 18 of the housings are provided with projecting ribs 40 forming a trunnion bearing for the forward edge 42 of a roller carriage having sides 44 joined together by the trunnion piece and by an end upper wall 46, part of which is depressed in order to clear the operating mechanism later to be described. The carriage sides are pierced to receive an axle 48 on which is journaled a roller 50. The roller carriage is entirely free of any direct connection with the roller housing and accordingly the roller can be assembled in the carriage and the entire carriage inserted into the housing when the door is lowered upon the track. The inner and outer side walls of each of the housings are pierced to receive a stub shaft 52 (see Fig. 2). The inner end of the stub shaft is of reduced diameter and rotatably mounted in the side wall 22, while the outer end of the stub shaft is of larger diameter and rotatably mounted in the side wall 24. The portion of the stub shaft intermediate the bearing portions is squared to receive the hub portion 56 of an operating member held in place on the stub shaft by means of a cotter or other device 58. Each of the operating members is formed with arms 60 and 62 projecting inwardly and outwardly respectively from the hub portion. For convenience in description, these arms are marked 60 and 62 *a* or *b*, dependent upon whether they are located adjacent the A or B edge of the door. The arms 62 are spaced apart so as to receive therebetween the rollers 50 and so as to bear upon the upper edges of the side pieces 44 of the roller carriage. The arms 60 may also be spaced apart but it is preferable that they be joined together permitting them to bear upon the upper wall 46 of the roller carriage. As clearly shown in the drawings, the stub shafts 52 are formed integral with the lower ends of cranks 64 located outwardly of the outer walls 24 of the housings. It will be seen that the stub shafts need merely to be inserted through the hub 56 integral with the operating arms and the cotter 58 inserted to lock the stub shaft and cranks together and hold them in place in the housing. In the present instance one of the cranks is made long to provide a handle 66 for the operator, while the other crank is made relatively short and connected by a tie bar 68 extending between it and a portion of the crank which is extended for use by the operator.

When the door is in its normal open or closed position the handle 66 is vertical and the arms 60 and 62 substantially horizontal and clear of weight-bearing engagement with the arms of the roller carriage. When the door is in this normal position its entire weight is supported on the tracks independent of the roller carriages which support none of the door weight. When it is desired to open the door the handle is grasped by the operator and pulled toward the position shown in Fig. 5. In doing this the operator tends to open the door and the pressure applied while tending to open the door also causes rotation of the operating members and in such a direction that arms 60*a* and 62*b* bear upon the roller carriages forcing them downwardly. Downward movement of the inner ends of the roller carriages will cause them to fulcrum about the axles 48 with the result that the trunnion portion 42 will move upwardly lifting the door. When the parts are rotated as shown in Fig. 5 the arms 62*b* bear upon the roller carriage nearer the corresponding axle 48 than do the arms 60*a*. Accordingly, for the same angular movement of the operating members the B corner of the door is lifted approximately twice as much as the A corner of the door. This higher lifting of the B corner of the door causes the door to be tilted away from the direction in which it is to be moved with the result that the A corner of the door is pulled outward away from the door post with the door as a whole fulcruming about the upper forward corner of the door (not shown). Thus the door is lifted and tilted, with the tilting action tending to tear away the sealing engagement between the door and door post. When the door is open and it is desired to close the same, the operator will pull the handle toward the position shown in Fig. 6, in which case the arms 62*a* and 60*b* contact their respective roller carriages with the result that the A corner of the door is lifted a substantially greater amount than the B corner of the door, thus again the door is tilted away from the direction in which it is to be moved. When the door is pulled toward closed position, with the parts as shown in Fig. 6, the A corner of the door will contact the door post first, then as the operator starts to lower the door the B corner will engage the track preventing shifting of the door along the track and as the A corner falls into position the door will be cammed into tight sealing engagement with the door post. It will be seen from the description of the operation and from the drawings that the A corner of the door is always the first to leave contact with the door post upon opening of the door and the first to make contact with the post upon closing of the door. By lifting and tilting the door in the manner shown and described maximum efficiency is obtained for the lifting and lowering of the door is combined with a tearing and camming action tending to break or make the seal between the door and door post, thus reducing to a minimum the operator's effort necessary to open and close the door.

It will be obvious to persons skilled in the art that various modifications and rearrangements of parts other than those shown and described

may be made but all such modifications and rearrangements of parts are contemplated as will produce the results described and as will fall within the claims defining the invention.

What is claimed is:

1. In a lift device for sliding doors having the bottom portion normally resting on a supporting track, the combination of lift mechanism adjacent the lower corners of the door and each comprising, a roller, an axle extending through the roller, a roller carriage rockably carried by the axle, a roller housing secured to the door and substantially inclosing said roller carriage, a projecting ledge in said housing overlapping and engaging one end of said carriage, operating means overlapping the other end of said carriage and being formed with arms engaging said carriage at varying distances from said axle, and means connecting the operating means to shift the same and cause said arms to rock said carriages varying degrees to lift and tilt the door.

2. In a lift device for sliding doors normally having the bottom portion resting on a supporting track, the combination of a roller carriage located adjacent each of the lower corners of the door and pivotally supporting the door during lift of the door, supporting rollers supporting the carriage on the track for rocking movement about the axes of said rollers, and means bearing on said carriage to rock the same about the roller axes to lift the door, said means including levers adjacent each carriage, each lever bearing on the adjacent carriage at a different distance from the adjacent roller axis and so arranged as to lift the leading edge of the door a greater amount than the trailing edge.

3. In a lift device for sliding doors normally having the bottom portion resting on a supporting track, the combination of a roller carriage located adjacent each of the lower corners of the door and pivotally supporting the door during lift of the door, supporting rollers supporting the carriage on the track for rocking movement about the axes of said rollers, a lever located adjacent each carriage and bearing thereon to rock the same about the roller axes to lift the door, each lever bearing on the adjacent carriage at a different distance from the adjacent roller axis and so arranged as to tilt the door in a direction away from the direction in which it is to be moved.

4. In a lift device for sliding doors normally having the bottom portion resting on a supporting track, the combination of a roller carriage located adjacent each of the lower corners of the door and pivotally supporting the door during lift of the door, supporting rollers supporting the carriage on the track for rocking movement about the axes of said rollers, a pair of lever arms rockably carried by the door adjacent each carriage and alternately bearing thereon to rock the carriage about the roller axes to lift the door, and operating means to simultaneously rock said lever arms and bring one arm of each pair into bearing contact with the adjacent carriage but at different distances from the adjacent roller axis to thereby tilt the door during lift.

5. In a lift device for sliding doors normally having the bottom portion resting on a supporting track, the combination of a roller carriage located adjacent each of the lower corners of the door and pivotally supporting the door during lift of the door, supporting rollers supporting the carriage on the track for rocking movement about the axes of said rollers, a pair of lever arms rockably carried by the door adjacent each carriage and alternately bearing thereon to rock the carriage about the roller axes to lift the door, and operating means to simultaneously rock said lever arms to bring one arm of each pair into bearing contact with the adjacent carriage, the lever arm adjacent the leading edge of the door bearing on the adjacent carriage at a point closer to its supporting roller axis than the point at which the lever arm located adjacent the trailing edge of the door bears on its adjacent carriage.

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