Dec. 21, 1937. F. DITCHFIELD 2,103,000

LIFT DOOR

Filed May 31, 1935 2 Sheets-Sheet 1

FIG. 1

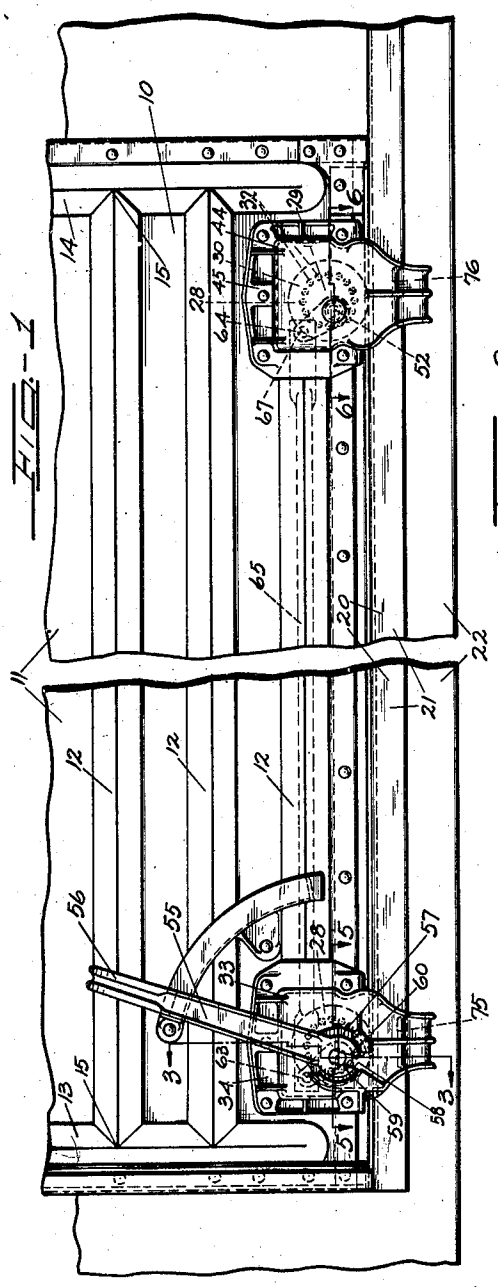
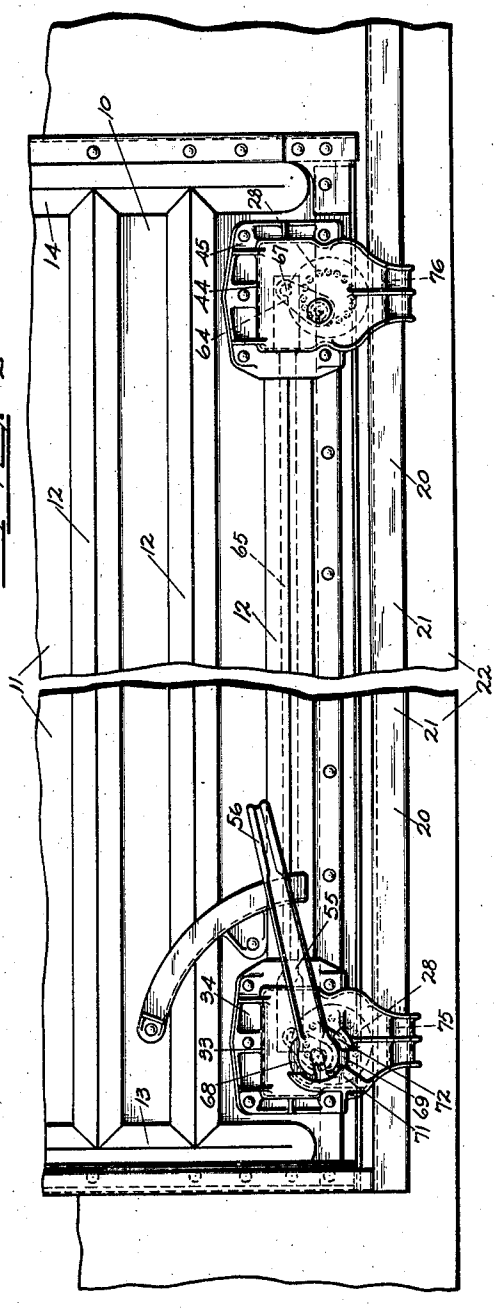


FIG. 2



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LIFT DOOR

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FIG. 4

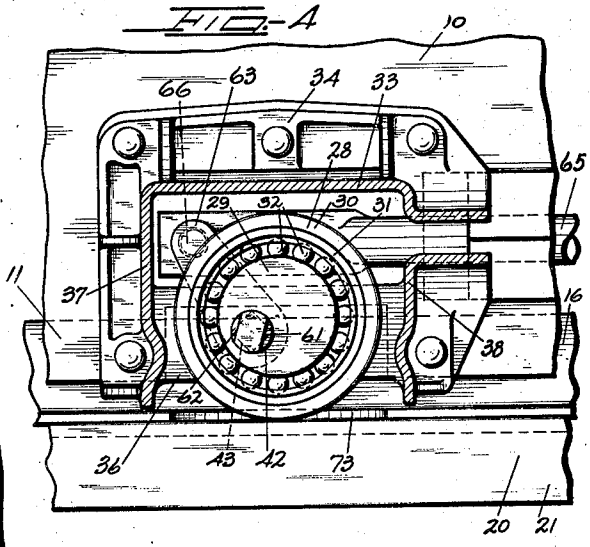


FIG. 3

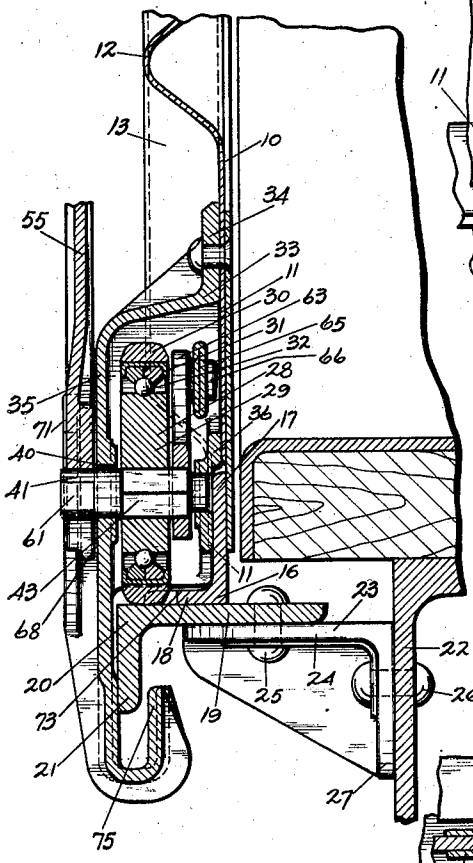


FIG. 5

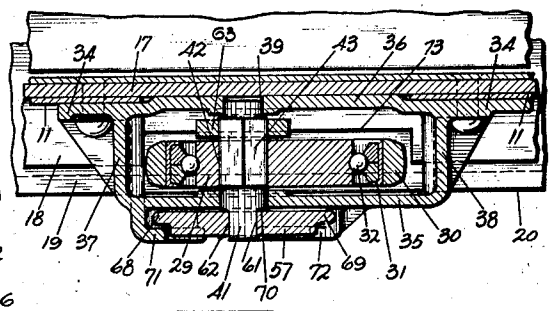
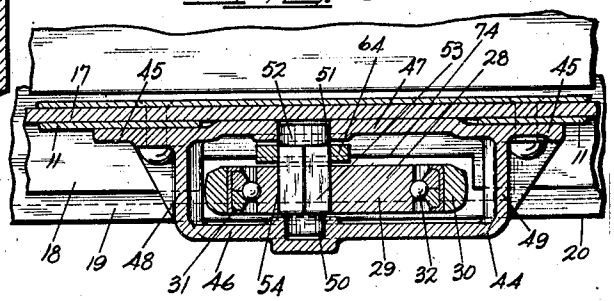


FIG. 6



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UNITED STATES PATENT OFFICE

2,103,000

LIFT DOOR

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Application May 31, 1935, Serial No. 24,225

17 Claims. (Cl. 20—22)

This invention relates to improvements in sliding lift doors, particularly for railway house cars, and is concerned primarily with the lifting mechanism for such doors.

While sliding lift doors for railway cars have been known generally for a number of years, it was not until recently that intensive development has produced a type of lift doors which is commercially acceptable. This class of doors is so designated because in one position thereof, the lowered position, they engage and establish frictional relationship with a supporting track to prevent, or at least retard, movement of the door when the car is subjected to impact. Ease of movement of the door on its track is, however, essential when it is desired to move the door relative to the opening in the car which it controls. At such time the door is supported upon rollers and in the transfer of the door from the track to the rollers the door is lifted above the track to break the frictional relationship therewith. This lifting of the door is effected by mechanism generally denoted as lifting mechanism.

Lifting mechanism for the doors is usually mounted upon the doors. The best known and commercially adopted form of such mechanism embodies rollers mounted upon the doors adjacent to the lower corners thereof. Their mounting is obtained by means of roller housings within which the rollers are secured by pins fixed in said housings. Each of the housings is provided with trunnions journaled in the door and in a bracket secured to the door and covering the housings. The housings are secured together for simultaneous rotation about the rollers which rest upon the track as fulcrums, such rotation being imparted to one of said housings by means engaged therewith. The lifting of the doors takes place about the housing trunnions as the housings are rotated.

Ease of movement of the door upon the rollers depends upon the accurate disposal of the rollers in a vertical plane parallel to the door. This disposal in turn depends upon the accurate alignment of the bearings for the roller housing trunnions. Misalignment of these bearings will result in positioning of the rollers at an angle to the door effecting a consequent impeded movement of the door.

Various attempts are being made to insure proper bearing alignment. It has been proposed to eliminate the bearing in the door entirely and to confine both bearings for the trunnions of the roller housing in the brackets. In carrying out this proposal the bracket has been formed with separate front and back portions in which the bearings are provided. However, in this case these portions must be riveted together and unless proper care be exercised in such riveting, misalignment of the bearings may result. It is, therefore, the main object of this invention to provide a lift door having lifting mechanism so designed that the danger of misalignment of bearings is eliminated to the end that a properly functioning mechanism is obtained.

A further salient object is to provide lift mechanism, the construction of which wholly eliminates the roller housings.

A further object is to provide brackets of integral construction in which rollers of lift mechanism are secured and in which the requisite bearings shall be provided.

A further object is to provide lift mechanism constructed to embody units containing integral brackets and rollers assembled therewith whereby such units may be secured to the door subsequent to the assembly of the rollers in the brackets.

A further object is to provide lift mechanism eliminating roller housings and having brackets with which rollers are assembled by pins journaled in said brackets.

A further object is to provide lift mechanism for sliding car doors embodying rollers having eccentrically mounted inner portions and outer rims concentric with and capable of rotation relative to said inner portions.

A further object is to provide lift mechanism for sliding car doors embodying rollers having eccentrically mounted inner portions, outer rims and anti-friction means disposed between the inner portions of the rollers and the rims.

A further object is to provide lift mechanism for sliding car doors embodying brackets which receive rollers mounted in the brackets by pins insertable in bearings formed in the brackets from the outside of said brackets, the pins being maintained against accidental loss by the actuating member of the lift mechanism which is engaged with an end of a pin projecting beyond a bracket.

A further object is to provide a lift mechanism for sliding doors embodying rollers formed of inner and outer portions mounted by pins journaled in the doors having non-circular portions extending eccentrically through the inner portions of the rollers so that the pins are capable of rotation during the lifting of the door to-

gether with the inner portions of the rollers and remain substantially stationary during the sliding movement of the doors upon the outer portions of the rollers.

Other objects of the invention will become clear as the description of the instant invention proceeds.

In the drawings forming part of this specification,

Figure 1 is a partial elevation of a sliding lift car door embodying the invention, the door being shown in lowered position.

Figure 2 is a view similar to Figure 1, the door being shown in elevated position.

Figure 3 is a vertical section taken on line 3—3 of Figure 1.

Figure 4 is an enlarged detail of the left-hand bracket and the lift mechanism, the cover portion of the bracket being removed to more clearly illustrate the remainder of the construction.

Figure 5 is a horizontal section taken on line 5—5 of Figure 1.

Figure 6 is a horizontal section taken on line 6—6 of Figure 1.

Referring now to the drawings, the numeral 10 designates a sliding car door illustrated for the purpose of describing the instant invention in detail. The door selected for this purpose is a metallic door and embodies a sheet metal panel 11 formed with horizontally extending corrugations 12 which may merge at their ends into vertical corrugations 13 and 14, as indicated at 15. Obviously the invention is not limited to the illustrated door but is applicable, as well, to any type of sliding door.

The vertical and upper margins of the door 10 may be reinforced in any desired manner and by any suitable means. At its lower margin the door is preferably reinforced by means of an angle member 16, the vertical leg 17 of which is secured to the door and the horizontal leg 18 of which extends horizontally outwardly. The horizontal leg 18 is adapted to frictionally engage the tread 19 of a track 20 in order to prevent or at least retard undesired sliding movement of the door relative to the track.

The track 20 may take the form of an angle member arranged with the leg 19 which serves as the tread of the track in a horizontal position and the leg 21 extending vertically downwardly therefrom. The track 20 is secured to the side sill 22 of a car underframe by means of brackets 23. The tread 19 of the track is secured to a horizontal outwardly extending leg 24 of each bracket by means of rivets 25. The brackets 23 are secured to the side sill by means of rivets 26 extending through a vertical leg 27 of the brackets and the side sill.

In order to slide the door upon the track 20 to expose the opening in the car controlled by the door and to effect sliding movement with ease, the lift mechanism of the instant invention is utilized. This lift mechanism comprises rollers 28, one of which is disposed preferably adjacent each lower corner of the door. Each roller 28 embodies an inner portion 29 and an outer portion 30 which engages the track 20. The inner and outer portions of the rollers are capable of rotation relative to each other and to permit easy relative rotation it is preferred to interpose antifriction means between the inner and outer portions. In the instant embodiment of the invention this antifriction means comprises a cage 31 within which balls 32 are disposed. The balls 32 are seated within grooved raceways provided in the cage and in the periphery of the inner portions of the rollers.

In order to mount each roller upon the door a bracket member, preferably in the form of an integral casting, is utilized. The bracket member 33 employed in connection with the roller disposed adjacent the forward lower corner of the door includes an attaching flange 34 provided on three sides of the bracket, an outer wall 35 and an inner wall 36. The outer wall 35 is disposed in spaced relationship to the inner wall 36, as clearly indicated in Figures 3 and 5 of the drawings, and in this space a roller is received. The inner wall 36, which is connected with the outer wall 35 by means of flanges 37 and 38, is of less depth than the outer wall, this depth being sufficient to provide a bearing 39. An aligned bearing 40 is provided in the outer wall 35. A pin 41 is journaled in these bearings, this pin extending eccentrically through the inner portion 29 of the roller in order to mount the roller in the bracket. The eccentric relationship between the pin 41 and the inner portion 29 of the roller is indicated at 42. For the purpose of confining the inner portion 29 of the roller for rotation with the pin, the intermediate portion 43 of the pin is non-circular in section, this portion of the pin being illustrated in Figures 3 and 5 of the drawings as substantially rectangular in section. The bore of the inner portion of the roller conforms to the section of the intermediate portion of the pin.

The roller disposed adjacent the rear lower corner of the door is mounted upon the door by means of a bracket 44 preferably in the form of an integral casting. The bracket 44 comprises an attaching flange 45 extending from three sides of the casting. The bracket is provided with an outer wall 46 and an inner wall 47 spaced from the outer wall by means of flanges 48 and 49, thereby providing a space for the reception of the roller 28. The relative proportion between the outer and inner walls 46 and 47 is preferably the same as indicated for the outer and inner walls 35 and 36 of the bracket 33. Aligned bearings 50 and 51 are formed in the walls of the casting and in these bearings a pin 52 is journaled. The pin 52 is inserted into the bearings 50 and 51 from the outside of the inner wall 47 and is retained in the bracket by the door when said bracket is secured to the door. The intermediate portion 53 of the pin is substantially rectangular in section and conforms to the bore provided in the inner portion 29 of the roller through which the pin extends eccentrically, as indicated at 54. The inner portion 29 of the roller is thus confined to rotate with the pin.

It will be apparent from the foregoing description that upon rotation of the inner portions of the rollers a lifting force will be exerted upon the brackets, which force will be transmitted to the door inasmuch as the brackets are fastened thereto. In order to impart rotation to the inner portions of the rollers and consequent elevating force to the door, the pin 41 extends outwardly beyond the outer wall 35 of the bracket 33 a sufficient distance to permit an operating member 55 to be mounted upon the pin. The operating member 55 is provided with a handle portion 56 at its upper end and at its lower end with a substantially cylindrical portion 57 having an inwardly extending recess 58 defined by means of parallel sides 59 and 60. The operating member 55 is adapted to be slid upon the outer end of the pin 41 and to insure rotation of the pin when the member 55 is

operated the pin is provided with flat faces 61 and 62.

It is desirable that the door be elevated above the track uniformly. The elevating movement occasioned by the rotation of the pin 41 is, consequently, transmitted to the roller at the rear of the door. This transmission is effected by means of a bar 63 provided with an opening conforming to and through which the intermediate portion 43 of the pin extends. Similarly, a bar 64 is mounted upon the non-circular intermediate portion of the pin 52. These bars are connected by means of a rod 65 having openings in the ends thereof through which studs 66 and 67, formed on the bars 63 and 64, extend. It will be apparent, therefore, that as pin 41 and the corresponding inner portion of a roller is rotated by means of the operating member 55, this rotation will simultaneously be imparted to the pin 52 and the corresponding inner portion of the roller mounted thereon.

It will be observed from Figures 3 and 5 of the drawings that the pin 41 includes an outer cylindrical portion, an intermediate portion non-circular in section having the same diameter as the outer cylindrical portion and an inner cylindrical portion which may be of less diameter than the remaining portions of the pin. The pin 41 is assembled with the bracket 33 by insertion into the bearing portions 39 and 40 formed in the outer and inner walls 35 and 36 of the bracket from the outside of the outer wall. After assembly of the pin with the bracket means is provided whereby accidental loss of the pin is prevented. For the attainment of this end the operating member 55 is utilized. The cylindrical portion 57 of the operating member is provided with flanges 68 and 69 disposed on opposite sides of the recess 58 provided in said cylindrical portion. The operating member 55, when it is slid upon the outer cylindrical portion of the pin 41, is disposed in abutting engagement with a shoulder 70 formed on said cylindrical portion. The flanges 68 and 69 of the operating member 55 are received behind flanges 71 and 72 directed toward each other and provided on the outer wall 35 of the bracket 33 and disposed in spaced relationship to said outer wall. In view of this construction it will be apparent that after initial assembly of the pin, the bracket and the operating member, accidental loss of the pin is obviated. The pin cannot move outwardly relative to the operating member by reason of the engagement of the shoulder 70 formed thereon and the cylindrical portion 57 of the operating member. The operating member 55 is maintained against outward displacement relative to the outer wall of the casting by reason of the interlocking engagement between the flanges provided thereon and the flanges formed on said outer wall. Consequently, it is impossible for the pin to slide outwardly through the bearing formed in the outer wall.

It has been stated hereinbefore that the outer portion 30 of each of the rollers 28 is disposed in engagement with the track 20. To obtain this engagement the horizontal leg 18 of the reinforcing angle 16 is coped, as indicated at 73 and 74.

When it is desired to move the door 10 from its lowered and closed position, illustrated in Figure 1 of the drawings, to an open position, the handle 56 of the operating member 55 is grasped and pulled downwardly. The downward movement of the operating member imparts rotation to the pin 41 and by virtue of the connection between this pin and pin 52 simultaneous rotation is imparted to the latter pin. The rotation of the pins 41 and 52, by reason of their association with the inner portions of the rollers 28, imparts rotation to these inner portions. By reason of the relationship of the pins to the inner portions, these inner portions constitute eccentrics operating within the outer portions of the rollers and, hence, the rotation of the inner portions of the rollers effects lifting of the door so as to break the frictional engagement of the angle member 16 with the track and support the door upon the rollers. The door may then be slid in the direction of opening movement and during this sliding movement the pins and the inner portions of the rollers will remain substantially fixed, the outer portions of the rollers rotating about the inner portions. Ease of this sliding movement is obtained by the antifriction bearings interposed between the inner and outer portions of the rollers. Upon release of the operating member 55 the door will at once gravitate into frictional engagement with the track. During the sliding movement of the door relative to the track the door is guided and maintained against outward displacement from the track by means of hook members 75 and 76 which are formed preferably as integral parts of the outer walls 35 and 46 and overlap the depending leg 21 of the track.

The rollers 28 have been described as having inner and outer portions between which is disposed a cage provided with antifriction bearings. The instant invention, however, is not limited to this structure of roller inasmuch as it is obvious that the cage itself may serve as the outer portion of the roller, or the outer portion of the roller may be formed so as to provide an integral cage.

It will, thus, be seen that the objects hereinbefore enumerated are attained by the instant invention. Roller housings heretofore utilized in lift mechanism have been completely obviated whereby the lift mechanism of the invention is greatly simplified. The construction of the invention, moreover, is such that the pins and rollers may be accurately assembled in their brackets which may subsequently be applied as units to the door. In this way proper disposition of the rollers relative to the door is insured and an easy moving door is obtained.

It will be apparent that numerous changes and modifications of the details of the instant invention may be resorted to by those skilled in the art. It is, therefore, intended to comprehend all such changes and modifications within the purview of the invention, which is to be limited only by the appended claims.

I claim:

1. In lift mechanism for a slidable car door, brackets secured adjacent the vertical margins of said door, each bracket being integrally formed and comprising a front wall and a spaced rear wall, a roller for each bracket received between said walls, a pin for each roller journaled in said walls and extending eccentrically through each roller, each pin having an intermediate non-circular portion, each roller having an inner portion provided with a bore conforming to said intermediate portion of the pin and an outer portion rotatable relative to said inner portion, antifriction means disposed between said portions of each roller, means engaging one of said pins for imparting rotation thereto and to an inner

roller portion and means mounted upon said intermediate portions of said pins and connected together for imparting simultaneous rotation to said other pin and inner roller portion to lift said door.

2. A unit structure for lift mechanism for a sliding car door comprising a bracket member having spaced front and rear walls, a roller disposed between said walls, said roller comprising inner and outer portions rotatable relative to each other, said inner portion having an eccentric non-circular bore and a pin journaled in said walls having an intermediate portion conforming to and extending through said bore.

3. A unit structure for lift mechanism for a sliding car door comprising a bracket member having integrally formed spaced front and rear walls, a roller disposed between said walls, said roller comprising inner and outer portions rotatable relative to each other, said inner portion having an eccentric non-circular bore and a pin journaled in said walls having an intermediate portion conforming to and extending through said bore.

4. A unit structure for lift mechanism for a sliding car door comprising a bracket member having spaced front and rear walls, a roller disposed between said walls, said roller comprising inner and outer vertically aligned portions rotatable relative to each other, a pin journaled in said walls extending eccentrically through said inner portion, said inner portion being mounted upon said pin for rotation therewith.

5. A unit structure for lift mechanism for a sliding car door comprising a bracket member having spaced front and rear walls, a roller disposed between said walls, said roller comprising inner and outer vertically aligned portions rotatable relative to each other, antifriction means disposed between said portions, said inner portion having an eccentric non-circular bore and a pin journaled in said walls having an intermediate portion conforming to and extending through said bore.

6. A unit structure for lift mechanism for a sliding car door comprising a bracket member having integrally formed spaced front and rear walls, a roller disposed between said walls, said roller comprising inner and outer vertically aligned cylindrical portions, said outer portion being rotatable about said inner portion, antifriction means positioned between said portions, a pin journaled in said bracket walls extending eccentrically through said inner portion, said latter portion being constrained to rotate with said pin.

7. Lift mechanism for a car door comprising a roller for elevating and supporting said door for sliding movement in elevated position, said roller embodying inner and outer rotatably related portions, said inner portion being disposed within said outer portion, and a pin journaled on said door extending eccentrically through said inner portion, said latter portion being constrained to rotate with said pin.

8. Lift mechanism for a car doom comprising spaced rollers, each of said rollers having inner and outer rotatably related portions, said inner portion being received within said outer portion, a pin journaled on said door extending eccentrically through said inner portion, said pins and their corresponding inner roller portions being constrained to rotate together, actuating means engaging one of said pins, said inner portions of said rollers being associated for simultaneous movement, said means being actuated to rotate said inner portions to elevate said door, said outer portions rotating about said inner portions to permit sliding movement of said door.

9. Lift mechanism for a car door comprising spaced rollers, each of said rollers having inner and outer rotatably related portions, a bracket for each roller secured to said door, a pin journaled in each bracket and extending eccentrically through the inner portion of each roller, each inner portion being constrained for rotation with its pin, actuating means engaging one of said pins to rotate said inner portion to elevate said door, said one pin being insertable through the corresponding inner portion of a roller from the outside of the bracket for said roller, said inner portions being associated for simultaneous movement, said actuating means preventing disengagement of said one pin from the inner portion of said roller, said outer portions of the rollers rotating about said inner portions to permit sliding movement of said door.

10. Lift mechanism for a car door comprising spaced rollers, each of said rollers having inner and outer rotatably related portions, a bracket for each roller secured to said door, a pin journaled in each bracket and extending eccentrically through the inner portion of each roller, each inner portion being constrained for rotation with its pin, actuating means engaging one of said pins to rotate said inner portion to elevate said door, said one pin being insertable through the corresponding inner portion of a roller from the outside of the bracket for said roller, a shoulder on said one pin adjacent its outer end, said means abutting said shoulder, a flange provided on said bracket disposed in overlapping relationship to said means, said inner portions being associated for simultaneous movement, said outer portions of said rollers rotating about said inner portion to permit sliding movement of said door.

11. In lift mechanism for a slidable car door, brackets secured adjacent to the vertical margins of said door, each bracket being integrally formed and comprising a front wall and a spaced rear wall, spaced flanges carried by said front wall in substantially parallel relationship thereto, bearings in said walls, a roller for each bracket received between said walls, each roller comprising inner and outer rotatably related portions, a pin for each roller extending eccentrically through and rotatable with said inner portion, said pins being journaled in said wall bearings, one of said pins being inserted in said bearings through the front wall of a bracket, a member engaging said one pin which extends outwardly of said front wall for imparting rotation to said pin, a shoulder provided on said pin, said member abutting said shoulder, said wall flanges overlapping said member to prevent loss of said pin and means constraining said inner portions of said rollers to simultaneous rotation.

12. Lift mechanism for a car door comprising spaced rollers, each of said rollers having inner and outer rotatably related portions, said inner portions being received within said outer portions, a pin for each roller journaled on said door and extending eccentrically through an inner portion, said pins and their corresponding inner roller portions being constrained to rotate together, means for imparting simultaneous movement of rotation to said inner roller portions, said outer portions rotating about said inner portions to permit sliding movement of said door.

13. Lift mechanism for a slidable car door com-

prising spaced rolling means, each of said means embodying an inner member and an annular outer member surrounding said inner member and being concentric with the circumference of said inner member, said annular member being rotatable about said inner member, a pin journaled on said door and extending eccentrically through said inner member, said pin and said inner member being constrained to rotate together and means for imparting rotation to said inner members.

14. In a railway house car having a sliding door and a door track, spaced pins journaled upon said door, a member eccentrically mounted upon each pin for rotation therewith, a collar rotatably surrounding each member, said collars engaging said track and means for imparting simultaneous rotation to said members to elevate said door, said collars rotating around said members and upon said track to permit sliding movement of said door.

15. In a railway house car having a sliding door and a door track, spaced shafts carried by said door, members eccentrically mounted upon said shafts for rotation therewith, the periphery of said members being circular, collars rotatably surrounding said members and being concentric with the periphery thereof, said collars engaging said track, means fixed upon said shafts, a bar connecting said means and a lever mounted upon one of said shafts.

16. In a railway house car having a sliding door and a door track, said door being frictionally seated upon said track, eccentrics carried by said door in engagement with said track, means for simultaneously actuating said eccentrics to elevate said door above said track, said eccentrics supporting said door upon said track during opening and closing movements of said door, a part of each of said eccentrics rolling upon said track during said opening and closing movements.

17. In a railway house car having a sliding door and a door track, said door being frictionally seated upon said track, eccentrics carried by said door in engagement with said track, each of said eccentrics comprising an inner disc, an outer collar and anti-friction bearing members disposed between said disc and said collar, means for simultaneously actuating said eccentrics to elevate said door above said track, said eccentrics supporting said door upon said track during opening and closing movements of said door.

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