

Oct. 15, 1968

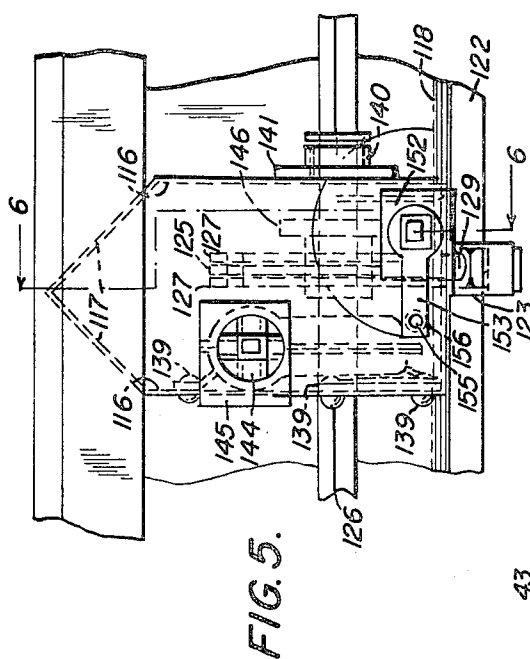
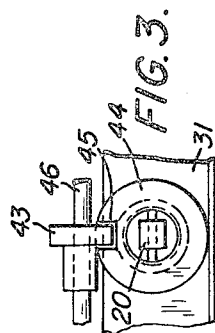
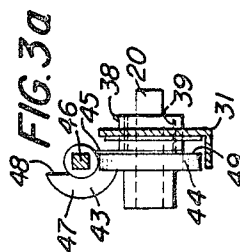
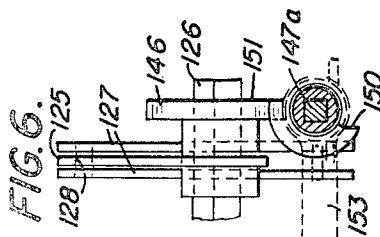
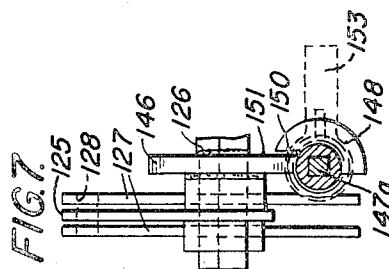
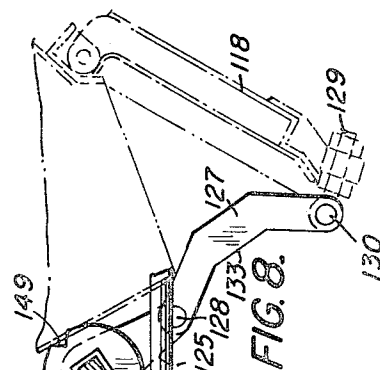
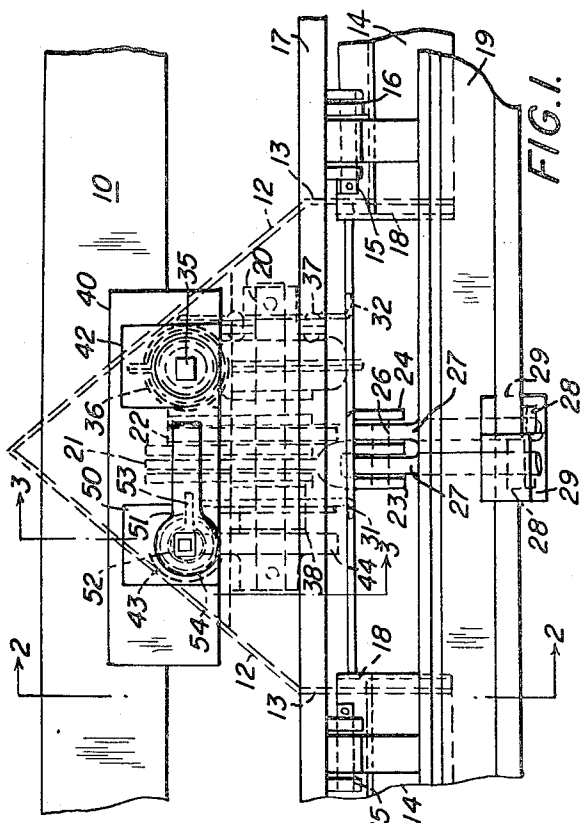
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3,405,655

RAILWAY HOPPER CAR DOOR OPERATING MECHANISM LOCK

Filed Nov. 22, 1966

3 Sheets-Sheet 1



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RAILWAY HOPPER CAR DOOR OPERATING MECHANISM LOCK

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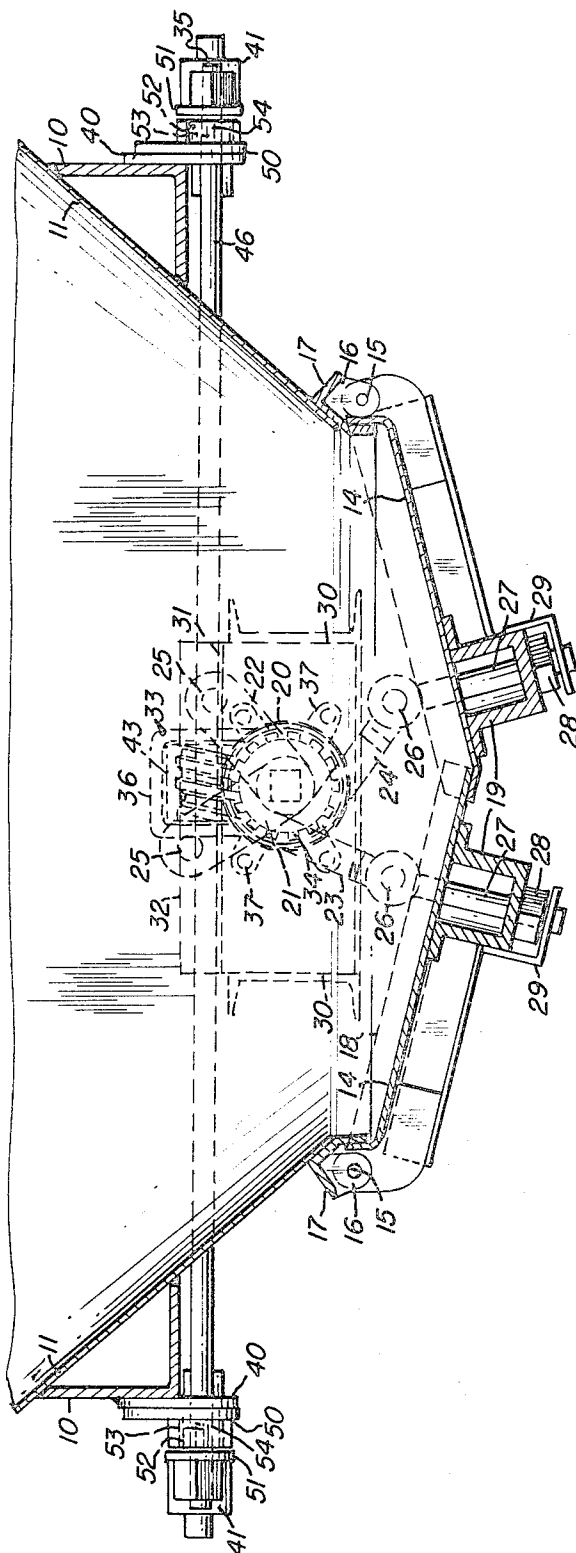


FIG. 2.

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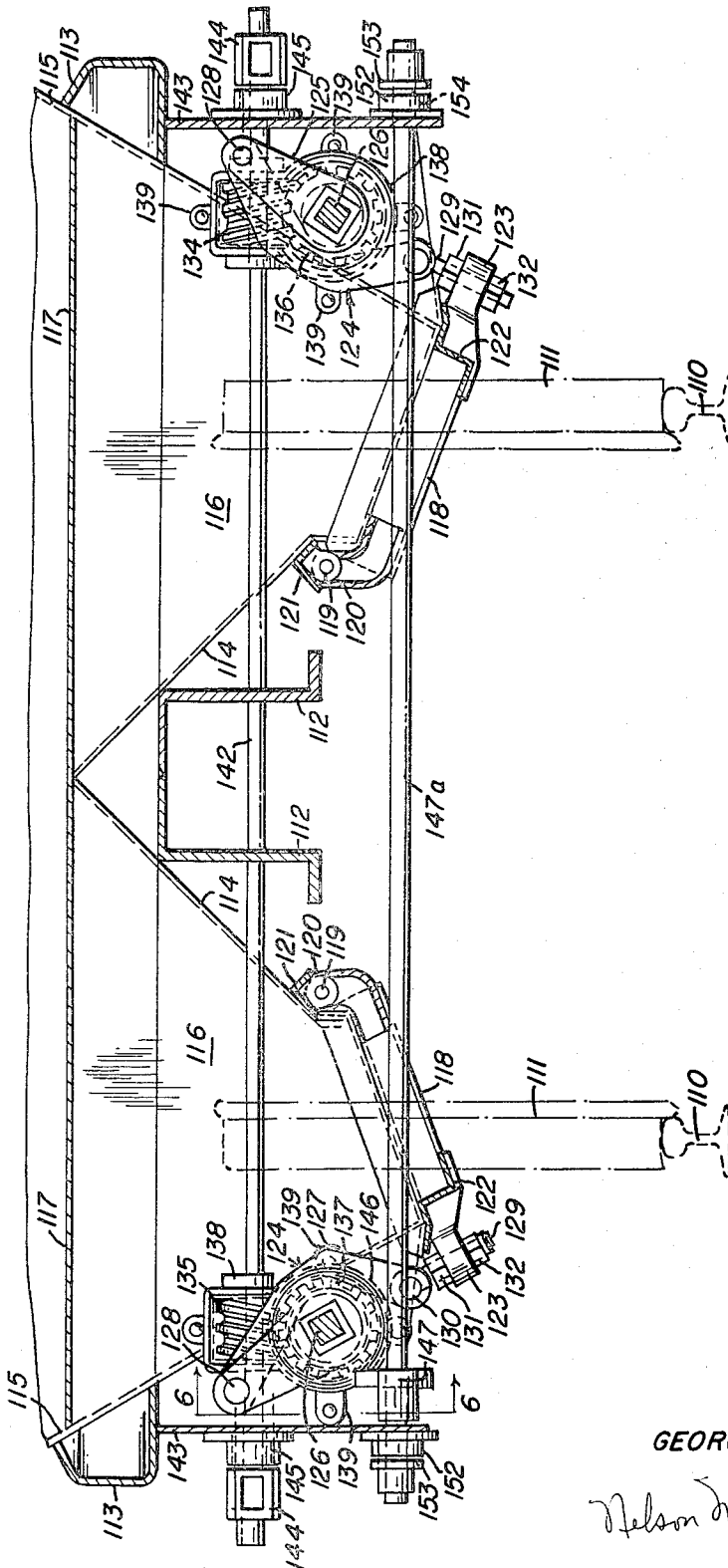


FIG. 4.

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RAILWAY HOPPER CAR DOOR OPERATING MECHANISM LOCK

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4 Claims. (Cl. 105—250)

ABSTRACT OF THE DISCLOSURE

An arrangement for locking the discharge door mechanisms of railway cars, in particular those having worm and gear operating means which can be actuated from either side of the car. More particularly the arrangement is applicable to cars having pivotally mounted, longitudinally extending doors. Essentially, the locking arrangement comprises a rotatable segmental detent on a transverse locking shaft which cooperates with a slotted disk on a longitudinal door-supporting shaft to lock the door operating mechanism when the doors are closed. Two modifications of the mode of applying the device are disclosed.

A particular object of the invention is to provide an arrangement of locking means acting directly on supporting shafts and operable from either side of the car and to further provide locking means which will give visual indication that all doors are positively closed and locked.

It is now becoming increasingly prevalent to employ pneumatically or electrically driven portable tools for raising and lowering discharge doors and to this end it is customary to employ cross-shafts operable from either side of car and in order to ensure complete closure of the doors of a train of cars it is necessary that there be some visual indication that all doors are positively closed prior to loading. To this end the present improvement contemplates the employment of a disk-like element non-rotatably on the door supporting shaft to coact with a detent non-rotatably on a transverse operating shaft and so arranged as to maintain the locking parts in a state of release during the full range of door movement.

The improvement is especially desirable in connection with a structure having the mechanisms concealed from the view of the train crew and where the only indication of complete closure of the doors is determined by resistance of the operating tool to continued rotation.

The invention further resides in certain details of construction and in the combination of parts such as will be described and claimed. For further comprehension of the invention reference may be had to the accompanying drawings wherein embodiments of the improvement are shown as applied to railway cars having longitudinally extending doors and showing one embodiment with doors arranged for discharge between the rails and another embodiment with doors arranged for sideways discharge outwardly of the rails.

In said drawings FIGURE 1 shows a vertical side view of the lower portion of a railway hopper car having doors arranged for center discharge, said view being taken midway of the length of the car and showing the transversely extending ridge structure and the connected end portions of a pair of doors. FIGURE 2 is a transverse vertical sectional view taken through the car on a line 2—2 of FIGURE 1. FIGURE 3 is a fractional vertical sectional view as taken on a line 3—3 of FIGURE 1. FIGURE 3a is a vertical side view of FIGURE 3 as viewed from right to left of said FIGURE 1. FIGURE 4 is a vertical transverse sectional view taken through the lower portion of a hopper car having doors arranged for side discharge, said sectional view being taken at a location midway of

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the length of the car. FIGURE 5 is a vertical elevational side view of a portion of the side of the car as viewed in FIGURE 4 from left to right. FIGURE 6 is a vertical fractional sectional view taken on a line 6—6 of FIGURE 5 showing the disk element and detent in engaging relation. FIGURE 7 is a view similar to FIGURE 6 except that the detent has been rotated to release position. FIGURE 8 is a fractional vertical sectional view corresponding to the left-hand portion of FIGURE 4 showing the mechanism in released position in relation to open doors as indicated by conventional dot and dash lines.

Referring first to the structure shown in FIGURES 1 to 3 inclusive, the framing structure of the car is indicated by longitudinally extending side members 10—10 and inwardly downwardly sloping floors 11—11 which meet transversely extending sloping walls 12—12 leading to vertically depending sections 13—13. The said end walls 12 and 13 define one end of hopper sections, it being understood that similar walls (not shown) are provided to complete the opposite ends of four-sided hopper sections. The said longitudinal and transverse walls lead to openings for discharge of lading by gravity and oppositely swinging doors 14—14 are provided for closing the discharge openings. The doors are pivotally mounted at 15 on brackets 16 integrally formed with a hood shaped longitudinally extending member 17 which in turn is carried by the inwardly sloping side floor plates 11. The doors at the ends are formed with upwardly extending flanges 18 and adjacent their swinging ends are reinforced by beam members 19 which extend continuously to unite the longitudinally spaced door sections. The doors 14 in closed position are adapted to meet in overlapping relation.

The swinging end of the doors are supported by a longitudinally extending rotatable shaft 20 which is fitted with non-rotatably mounted arms 21 and 22 respectively disposed in spaced angular relation.

The connection between the arms 21 and 22 and the doors is effected by links 23 and 24 which are pivotally connected at their upper end with the arms at 25 and the pivotal connection with the doors is effected at 26 through the medium of screwthreaded eyebolts 27. The eyebolts 27 extend through door beams 19 and are held in place by screwthreaded nuts 28 which in turn are preferably held in place by angle shaped brackets 29.

The shaft 20 is supported by a frame assembly consisting of a pair of longitudinally extending channel shaped members 30—30 transversely united by angle shaped members 31 and 32 which also function as supporting members for the shaft 20 as will be described.

Rotation of the shaft 20 is effected by a worm and gear drive, the worm being indicated at 33 and the gear at 34. The worm is non-rotatably associated with a transversely extending operating shaft 35 and the said worm and gear are carried by a housing 36 which is bolted or otherwise secured at 37 with member 32 and constitutes one of two supporting bearings for the shaft 20. The other bearing member for shaft 20 is in the form of a bracket 38 carried by member 31, there being a sleeve 39 on the non-circular shaft 20 to provide an annular bearing surface. The shaft 20 is thus well supported on opposite sides of the linkage mechanisms.

The transverse operating shaft 35 extends through and beyond carrier plates 40 depending from each side sill member 10. The said projecting portions of shaft 35 are fitted with operating socket handles 41 which in turn are journaled in bearing brackets 42 mounted on the carrier plates. The supporting shaft 20 is arranged to be locked in holding position by interengaging means between a rotatable detent 43 of segmental shape and a disk element 44 having a notched aperture 45 for the entrance of

the detent 43 therein. The disk element 44 is non-rotatably mounted on the shaft 20 and the detent 43 is likewise non-rotatably mounted on a transversely extending locking shaft 46. The detent 43 includes a blocking section in the form of a sector 47 adapted to enter the notched aperture 45 in the disk element 44 for locking the shaft 20 against rotation. The segmental portion 47 is adapted to be rotated to clear the notched opening 45 and permit rotational movement of the supporting shaft 20. A rotary movement of half a revolution of the detent effects complete release of the blocking action and when so released the end face 48 of the segment lies adjacent to and outwardly of the proximate side face 49 of the disk element and is thus held in this state of release throughout the range of rotary movement of the shaft 20.

The locking shaft 46 on which the detent 43 is non-rotatably mounted is extended to project beyond the carrier plates 40 and through bearing brackets 50 also carried by said carrier plates 40. The projecting ends of shaft 46 are each fitted with a handle portion 51 having a hub-like circular portion 52 extending within the brackets 50 to provide an annular bearing hub.

The handles 51 are preferably adapted to rotate through a half revolution in the transition from locked to unlocked positions and therefore serve to visually indicate when doors are fully closed and locked. The handles upon release of the blocking function gravitate to an overbalanced horizontal position and said handles and bearing brackets are respectively provided with interengaging abutments as indicated at 53 and 54 respectively to limit rotation of the locking shaft in either direction.

Referring now to the structure shown in FIGURES 4 to 8 inclusive wherein the doors are arranged for side discharge of lading, the rails on which the car is mounted are indicated conventionally by dot and dash lines at 110 and the wheels of the truck at 111 respectively. The car proper is indicated by center sills 112 and side sill members 113 and the body of the car is shown as including hoppers on opposite sides of the center sills formed in part by inner and outer transversely sloping floor walls as indicated at 114 and 115 respectively meeting with transversely extending walls 116 of a transverse hollow ridge 117 disposed midway of the length of the car and forming an end of hopper openings. It will be understood that similar transverse walls (not shown) will be located at the opposite end of the doors to complete the hopper structures.

The lower margins of the sloping floor walls 114, 115 116 and its opposite end wall (not shown) define the boundaries of discharge openings which are adapted to be closed by swinging doors 118. The doors 118 extend longitudinally of the car and are pivotally mounted at 119 on hinge brackets 120 integrally formed with hinge beams 121 carried by the sloping floors 114. The doors are reinforced along their swinging ends by beam members 122 which extend continuously to span the space between a pair of longitudinally separated doors and each said beam is provided with forwardly projecting brackets 123 for connection with supporting linkage mechanisms generally indicated at 124. It will be understood that similar mechanisms (not shown) are incorporated at the opposite ends of the beam members 122 thereby providing for supporting the longitudinally spaced and united doors at each end thereof and at an intermediate location.

The mechanisms 124 include a radially extending arm 125 non-rotatably mounted on door supporting shafts 126 and each pivotally connected at its distal end with a pair of spaced link members 127—127 as indicated at 128, said arms 125 being sandwiched between said link members 127—127. The link members 127—127 at their lower distal end straddle a screw threaded eyebolt 129 and pivotally connect therewith at 130. The eyebolts 129 extend through the forwardly projecting brackets 123 and are retained thereon by screw threaded nuts 131 and 132. The link members 127 are indented at 133 to allow over center

toggle knuckling of the links and arms for efficient retention of the doors in closed position.

The doors 118 on the respective sides of the centersill 112 are arranged for conjoint operation from either side of the car and to this end the respective supporting shafts 126 are respectively fitted with right and left worms as indicated at 134 and 135 respectively for engagement with complementary toothed gear wheels as indicated at 136 and 137 respectively. The said worms and gears are assembled in housings 138 and the said housings are provided with attaching lugs 139 for attachment to one of the walls 116 of the ridge 117 whereby said housings constitute one of a pair of supporting bearings for the shaft 126, the other bearing support 140 being in the form of a bearing bracket 141 carried by the opposite wall 116 of the ridge 117.

Rotation of the worm and gear mechanism is effected by means of a transversely extending operating shaft 142 which is extended through and beyond walls 143 lying at the respective ends of the transverse ridge 117 and which serve as ties for maintaining the vertical walls 116 in spaced relation. The projecting ends of the operating shaft 142 are provided with operating socket handles 144 rotatably mounted in bearing brackets 145 which in turn are secured to end walls 143.

The supporting shafts 126 are arranged to be locked in closed position by locking means acting on one of the said shafts and to this end a disk like element 146 is non-rotatably mounted on one of the shafts and a segmental shaped detent 147 is adapted to have a blocking face 148 for contact with an edge portion 149 of said disk to block rotational movement thereof as seen in FIGURE 6. The detent 147 is non-rotatably mounted on a transversely extending shaft 147A.

The blocking face 148 is adapted to move beyond the edge surface 149 and thereby permit free rotational movement of the disk and when so released the terminal end face 150 of the segmental portion lies adjacent the proximate side face 151 of the disk element thereby holding the detent in a state of release throughout the range of unwinding movement of the linkage. In view of the conjoint operation of the two supporting shafts it will be evident that the locking of one shaft will also operate to lock the companion shaft. The projecting ends of the locking shaft 147A are rotatably mounted in bearings 152 carried by the end wall 143 and are there fitted with handles 153 which incorporate a hub portion 154 adapted to seat in the bearings. The handles 153 and end wall 143 are formed with apertures 155 adapted to register with similar apertures 156, formed in the end walls 143 when the detent is in blocking position, for admitting a sealing ribbon.

What is claimed as new is:

1. In a railway car having an opening for gravity discharge of lading therethrough and doors for closing the opening pivotally mounted on axes extending longitudinally of the car, in combination:

- (a) rotatable door supporting shaft means extending longitudinally of the car in juxtaposition to the pivotal axes of the doors,
- (b) linkage means connecting the supporting shaft means and the doors,
- (c) a transversely extending operating shaft,
- (d) worm and gear means connecting the supporting shaft means and the operating shaft for actuating said supporting shaft means by rotation of said operating shaft,
- (e) locking means acting on the supporting shaft means and indicating complete closure of the doors including:

- (1) a transversely extending rotatable locking shaft juxtaposed to the operating shaft,
- (2) a disk-like element having an edge portion presenting a locking face, said element being

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non-rotatably mounted on the supporting shaft means,

- (3) a segmental shaped detent non-rotatably mounted on the locking shaft and presenting a blocking face adapted in one position of rotation of the shaft to lie in the path of movement of and to abut the edge face portion of the disk-like element, and

- (4) said detent being rotatable with the locking shaft to dispose its blocking face to one side of said edge face portion in non-abutting relation whereby to permit rotation of the supporting shaft means.

2. The invention set forth in claim 1 wherein the end of the segmental section distal from the locking end when in released position lies outwardly of and adjacent to the proximate side face of the disk element throughout the extent of rotary movement of the supporting shaft thereby precluding rotary movement of the locking shaft except with fully closed doors.

3. The invention set forth in claim 1 wherein the respective ends of the locking shaft each include:

- (a) a bearing member for rotatably supporting the shaft,
(b) a handle non-rotatably carried by the shaft, and
(c) interengaging limiting abutments carried by the bearing member and handle respectively for limiting rotation of the locking shaft.

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4. The invention set forth in claim 1 wherein:

- (a) the doors are arranged for outward side discharge of lading,
(b) the supporting shaft means comprise a longitudinally extending rotatable supporting shaft for each door,
(c) worm and gear means connect each supporting shaft with the operating shaft for conjoint operation, and
(d) the disk element and cooperating detent are provided for only one of the supporting shafts and the locking shaft, whereby locking of the other supporting shaft occurs through the self-locking function of the worm and gear means.

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