

Sept. 30, 1969

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3,469,539

RAILWAY HOPPER CAR DOOR ACTUATING AND LOCKING MECHANISM

Filed Oct. 30, 1967

3 Sheets-Sheet 1

fig. 1.

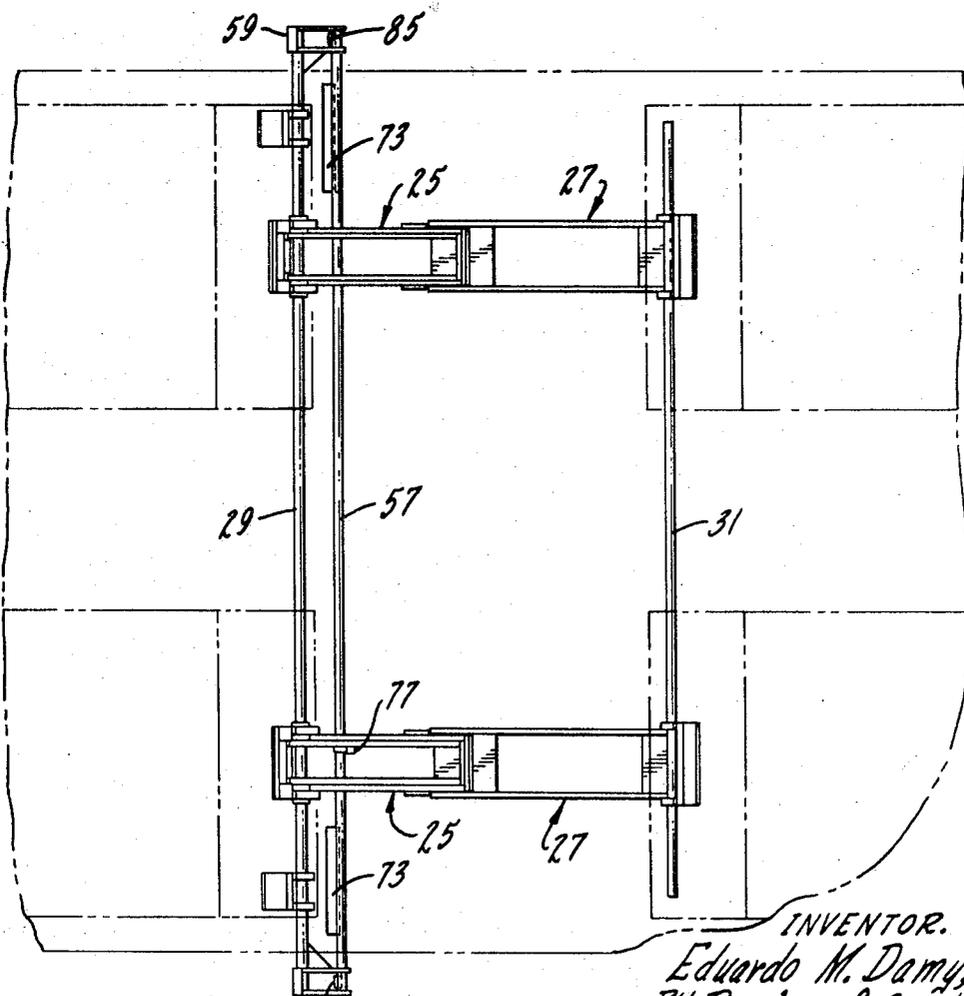
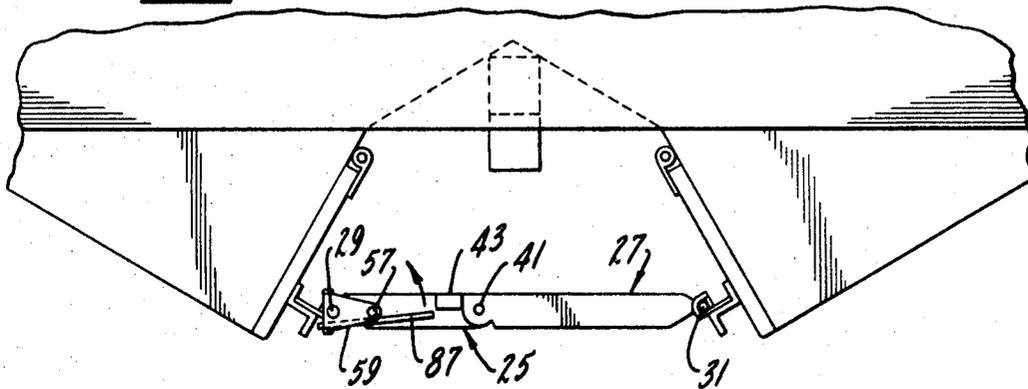


fig. 2.

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fig. 3.

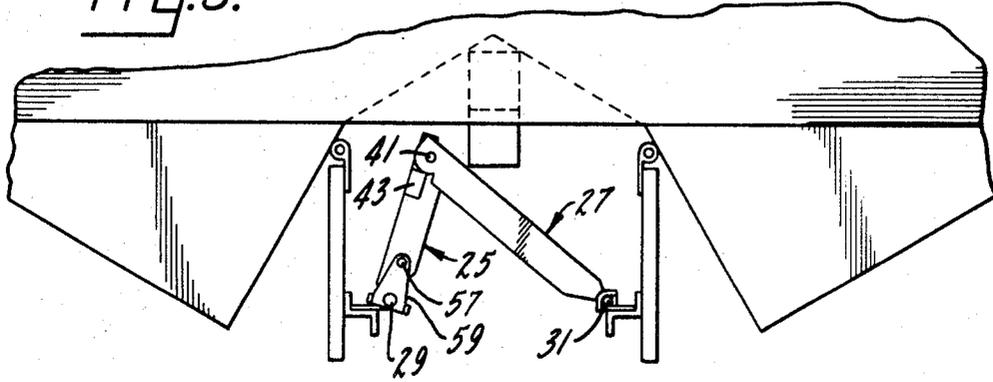


fig. 4.

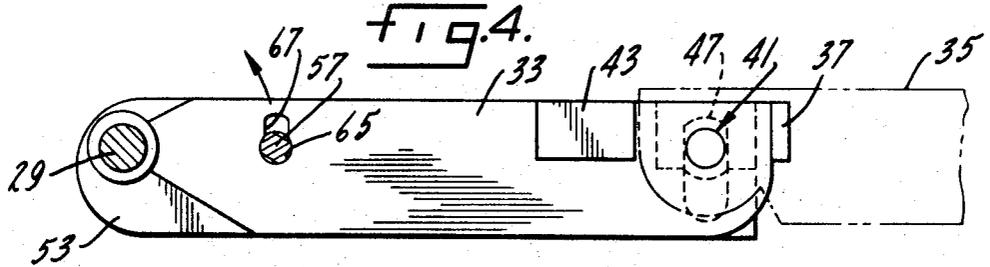


fig. 5.

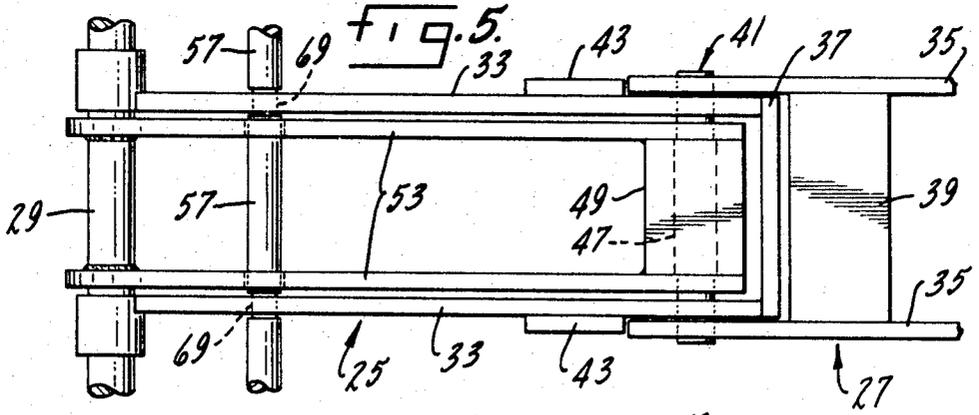
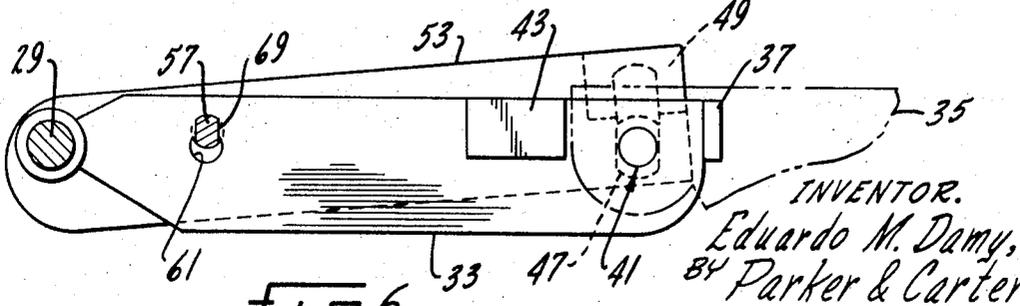


fig. 6.



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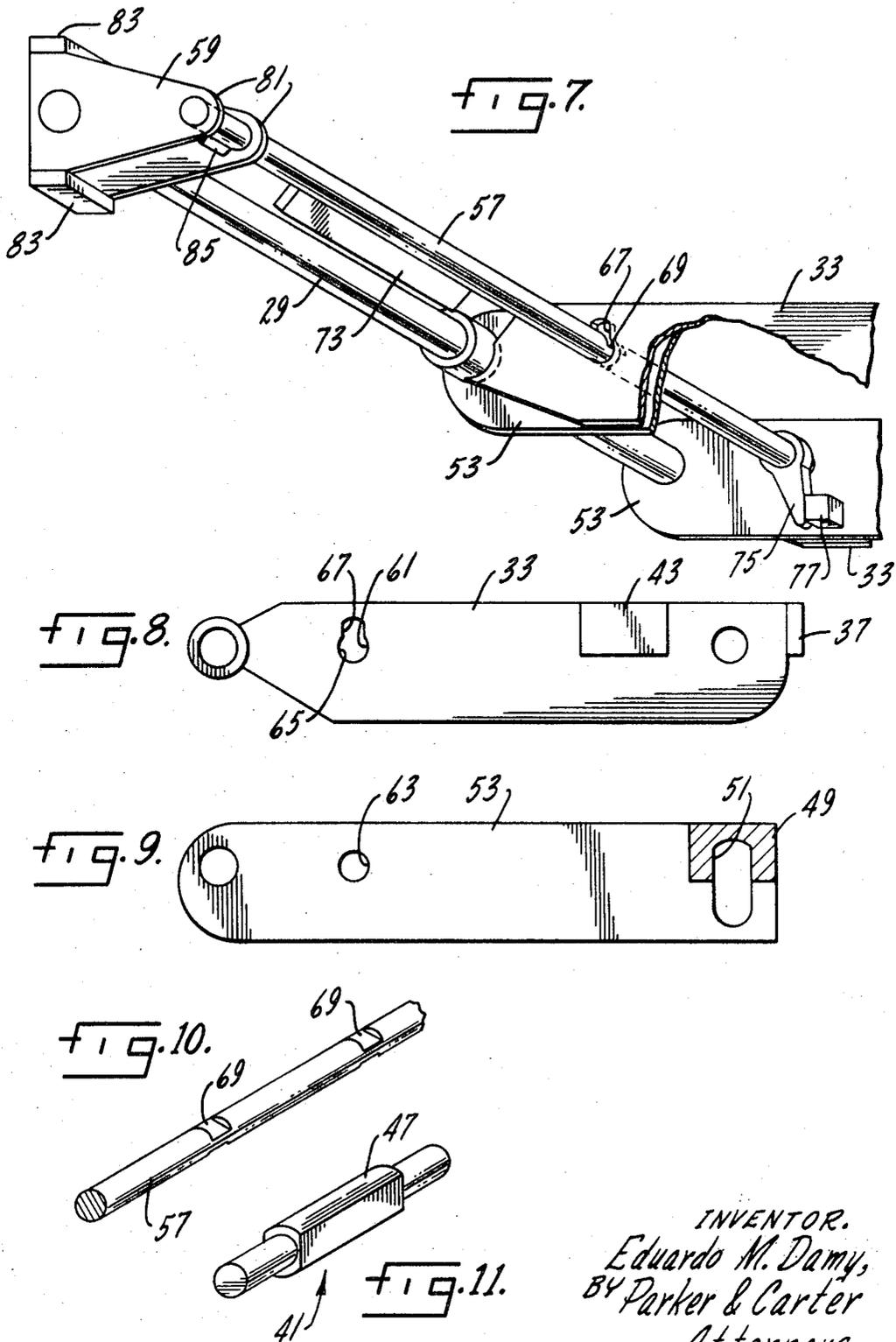
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1

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4 Claims

ABSTRACT OF THE DISCLOSURE

A hopper car having pairs of oppositely disposed discharge chutes with outlets inclined to the vertical and equipped with doors hinged along the upper edges thereof. The opposed doors are opened and closed in unison by a pair of arms which are pivotally connected to each other and to the doors. When the arms extend generally horizontally, the doors are held closed and when the arms are folded upwardly, the doors are held open. A first locking mechanism is provided to prevent rotation of the pivotal connection between the arms when the doors are closed and a second locking mechanism is provided to prevent accidental release of the first locking mechanism. A door opening arrangement is provided which sequentially releases the second and first locking mechanisms and then rotates the door operating arms from the horizontal to the upward folded position.

Summary of the invention

This invention relates to a hopper car discharge door opening mechanism and more specifically to such a mechanism having a double locking mechanism to prevent accidental opening of the doors.

An object of this invention is a hopper car door actuating mechanism having a double locking mechanism which is automatically disengaged upon opening of the doors.

Another object is a locking mechanism for hopper car doors which maintains the doors in a closed position by preventing rotation of the pivotal connection between the door arms.

Another object is a locking mechanism for hopper car doors having a first gravity actuated locking means and a second positive locking means which prevents unintentional disengagement of the gravity actuated locking means.

Another object is a door actuating and locking mechanism in which the door actuating mechanism also automatically releases the locking mechanisms.

Other objects will be found in the following specification, claims and drawings.

Brief description of the drawings

FIGURE 1 is a partial side elevational view of a hopper car equipped with the door actuating and locking mechanism of this invention;

FIGURE 2 is a top plan view of the hopper car of FIGURE 1 with some parts omitted and others shown in phantom for clarity of illustration;

FIGURE 3 is a partial side elevational view similar to the view of FIGURE 1, but showing the doors and the door operating mechanism in the open position;

FIGURE 4 is a partial side elevational view of the door actuating arms with some parts shown in phantom;

FIGURE 5 is a partial top plan view of the structure of FIGURE 4;

FIGURE 6 is a partial side elevational view similar

2

to FIGURE 4, but showing the locking mechanisms in their released positions;

FIGURE 7 is a partial perspective view, with parts removed, of the door actuating and secondary locking mechanism of this invention;

FIGURE 8 is a side elevational view of a door actuating arm of this invention;

FIGURE 9 is a side elevational view of one of the primary locking means supporting arms of this invention with parts shown in cross-section;

FIGURE 10 is a partial perspective view of the locking rod shown in FIGURE 7; and

FIGURE 11 is a perspective view of the pivot rod connecting the door actuating arms.

Description of the preferred embodiment

FIGURES 1 and 2 show a railway hopper car of the type with which the door actuating and locking mechanism of this invention may be utilized. Such a hopper car is equipped with discharge chutes which are oppositely disposed. These chutes may be arranged side by side in pairs as shown in FIGURE 2. The discharge openings of these chutes are inclined to the vertical and are closed by doors hinged to the discharge chutes along the top edges of the chutes.

The sets of opposed doors are operating in unison by means of arms 25 and 27 which are pivotally connected to the doors and to each other. In this example, the arms 25 are shorter than the arms 27. If pairs of opposed discharge chutes are arranged side by side in the manner shown in FIGURE 2, a separate set of arms 25 and 27 will be provided for each pair of doors. In such a case, a common pivot rod will be provided for each pair of similar arms. For example, pivot rod 29 will be provided for arms 25 and pivot rod 31 for arms 27.

Each arm includes a pair of spaced plates which are affixed at one end to a respective pivot rod and pivotally connected at the opposite end to the plates of the other arm. In this embodiment, as can be most clearly seen in FIGURE 5, arm 25 is made up of spaced plates 33 and arm 27 is made of spaced plates 35. Cross spacers to tie the plates together are shown at 37 in arm 25 and at 39 in arm 27. The arms 25 and 27 are pivotally connected together by means of a pivot rod 41 which is shown in FIGURE 11. As seen in FIGURE 5, the pivot rod 41 is affixed to the plates 35 and is journaled in the plates 33. Stops 43 are attached to the outside of the plates 33 to be engaged by the ends of the plates 35 to prevent rotation of the arms below a generally horizontally disposed position as is shown most clearly in FIGURE 1.

Referring to FIGURE 11, the pivot rod 41 is formed with a non-circular center portion 47. A block 49 (FIGURE 4, 5, 6 and 9) having an opening 51 complementary in shape to the non-circular portion 47 of the pivot rod 41 is mounted between spaced plates 53 which are journaled on the pivot rod 29. When the non-circular portion 47 of the pivot rod 41 is received in the opening 51 of the block 49 as seen in FIGURE 4, the pivot rod 41 cannot rotate and, consequently, the arms 25 and 27 cannot be pivoted relative to one another. This is the first or gravity actuated locking mechanism.

A lifting and pivoting means for the arms 25 and 27 is shown in FIGURE 7. It includes a rod 57 which is journaled as opposite ends in stirrups 59 which in turn are journaled on the door pivot rod 29. The rod 57 extends through openings 61 and 63 located respectively in the plates 33 and 53. Opening 61 (FIGURE 8) is

keyhole shaped with an enlarged circular portion 65 and a smaller generally rectangular portion 67. Opening 63 (FIGURE 9) is circular in cross-section. The shaft 57 (FIGURE 10) has flattened portions 69 of generally rectangular cross-section which are spaced to align with the plates 33 as seen in FIGURE 5 and 7. When the rod 57 is rotated to the position shown in FIGURE 4 and 7, the rectangular cross-section portions 69 of the rod are not in angular registration with the rectangular portion 67 of the keyhole shaped opening 65. In this position of rotation of the rod 57, it cannot be lifted relative to the plates 33. This is generally referred to as the second or positive lock. As seen in FIGURE 7, the rod 57 is held in this position of rotation by means of the weights 73 which are attached to the rod 57. Rotation of the rod 57 beyond this angular position in a clockwise direction as viewed in FIGURE 4 and 7 is prevented by engagement of a lug 75, which is also fastened to the shaft 57, with a stop member 77 which is secured to the inside of plate 53.

Each stirrup 59 is constructed of spaced generally triangular side plates 81 which are held together by cross members 83. A tab 85 is attached to the rod 57 between the side plates 81 of the stirrups 59. This tab extends from the rod at an angle such that when a rod 87 is inserted in a stirrup in the manner shown in FIGURE 1 in which it contacts the bottom cross member 83 and the rod 57, the tab 85 is contacted and is rotated sufficiently in a clockwise direction, as viewed in the drawings, to rotate the rectangular portion 69 of the rod 57 into registry with the rectangular portion 67 of the keyhole slot 65. As the rod 87 is rotated in a counterclockwise direction, the portion 69 of rectangular cross-section of the rod will move into the rectangular portion 67 of the openings 61 as shown in FIGURE 6. Lifting of the rod 57 relative to the side plates 33 raises the plates 53 and the locking weight 49 free of the shaft 41. After the locking weight 49 is raised to the position shown in FIGURE 6, continued counterclockwise rotation of the operating rod 87 will lift the arms 25 and 27 of the position shown in FIGURE 3 in which the doors are open since the pivotal rod 41 is now free to rotate relative to the arm 25.

The use, operation and function of this invention are as follows:

The hopper car door actuating and locking mechanism of this invention provides a lock that is positive to prevent the doors from accidentally opening, yet provides a simple and reliable mechanism for opening the doors. This locking means includes the block 49 which meshes with and prevents rotation of the pivotal shaft 41 connecting the opposed door arms. Since the shaft 41 is rigidly secured to the arms 27 and is journaled in the arms 25, these arms cannot rotate relative to each other about this pivot rod unless the pivot rod is free to rotate. Release of the first lock is obtained by lifting the block 41 but normally this is prevented by engagement of the rod 57 with the plates 33 of the arms 25. Unless the flattened or generally rectangular portions 69 of this rod are rotated to the proper angle relative to the keyhole portion 67 of the opening 61, the rod cannot be lifted relative to the plates 33. Thus, the doors cannot accidentally open due to unusual operating conditions such as poor track as long as the rod 57 is rotated to its non-lifting position. The rod is maintained in this position by the weights 73 and the engagement of the lug 75 and the stop 77.

In spite of the positive locking features of this mechanism, the arms and doors are easily opened through the use of the operating rod 87. When the operating rod 87 is inserted in a stirrup 59 in contact with the plate 83 and the rod 57, the rod 57 is automatically rotated a sufficient degree to unlock the plates 53 for rotation relative to the plates 33. As the rod 87 is rotated upwardly against the rod 57, the rod 57 and stirrups 59 rotate about

the pivot rod 29 and lift the plates 53 which in turn lift the weight 49 out of locking engagement with the non-circular portion 47 of the shaft 51. Continued rotation of the rod 87 will bring the rod 57 into engagement with the plates 33 to therefore also lift the plates 33 and thereby raise the pivot rod 41 and allow the doors to open.

While a preferred form of this invention has been shown and described herein, it should be understood that many modifications and alterations will become obvious to one skilled in the art. Therefore, this invention should be limited only by the appended claims.

I claim:

1. In a railway hopper car, in combination with a car body, a hopper, a pair of oppositely disposed discharge chutes at the bottom of the hopper, each discharge chute having an opening inclined to the vertical, a door for closing each discharge chute opening, each door being hinged to its discharge chute along the upper edge thereof to swing towards the other door upon opening, and means for opening, closing and locking said doors in the closed position, including:

a pair of arms,

each arm having one end pivotally connected to a respective one of said doors, and an opposite end pivotally connected to the other arm, with said arms being generally horizontally disposed in their extended positions relative to each other when the doors are closed,

said pivotal connection between said arms including a shaft secured to one arm and journaled in the other arm,

said shaft having a portion of non-circular cross section,

a third arm attached to the door pivotal connection of one of said pair of arms,

a shaft locking means attached to the free end of said third arm and adapted to engage the non-circular portion of said shaft in locking engagement, and

a lifting rod extending through said third arm and said one of said pair of arms and having a lost motion connection with said one arm to permit lifting of said third arm relative to said one arm at least far enough to move said shaft locking means out of locking engagement with said shaft.

2. The structure of claim 1 further characterized in that said shaft locking means includes a member having an opening complementary in shape to the non-circular portion of said shaft with said opening adapted to receive said portion of said shaft in close fitting contact.

3. The structure of claim 1 further characterized in that said lost motion connection between said lifting rod and said one of said pair of arms includes an opening in said arm having an upper portion of non-uniform cross section and a lower portion of circular cross section with said lifting rod having a similar portion of non-circular cross section aligned with said arm.

4. The structure of claim 3 further characterized in that said lifting rod is mounted to rotate about its own axis,

means are provided to retain said lifting rod in a position of rotation relative to said portion of non-uniform cross section of said opening in said one of said pair of arms to prevent said portion of non-circular cross section of the rod from entering the portion of non-uniform cross section of said opening in said rod, and

means are provided to rotate said lifting rod to permit said portion of non-uniform cross section of said lifting rod to enter said similar portion of said opening in said one of said arms so that lifting of said rod can lift said third arm to unlock the pivotal connection between said pair of arms.

3,469,539

5

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6

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