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Schuller

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[54] **VEHICLE HOPPER DOOR OPERATING MECHANISM**

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[21] Appl. No.: **89**

[52] **U.S. Cl.** **105/240,** 105/291, 105/310

[51] **Int. Cl.** **B61d 7/28**

[58] **Field of Search**.....105/240, 286, 287, 288, 291, 105/310, 304, 305; 92/14; 292/119, 127, 201, 135, DIG. 62

[56] **References Cited**

UNITED STATES PATENTS

3,166,024	1/1965	Hamilton	105/240
3,435,558	4/1969	Kruse	49/200
2,893,327	7/1959	Lunde	105/240

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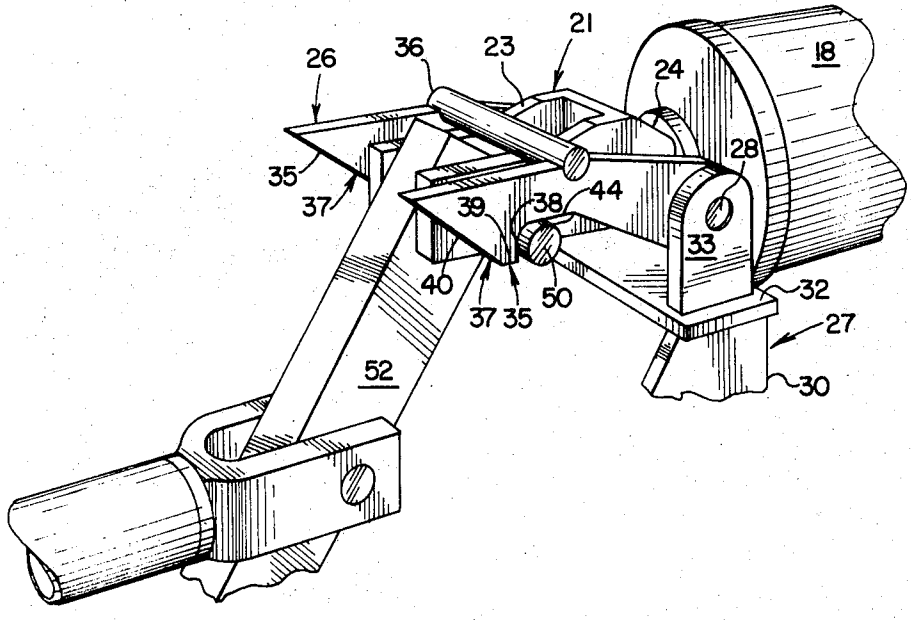
[57] **ABSTRACT**

An automatic device for locking and unlocking a hopper car door operating lever mechanism. This device, which prevents unintentional opening of hopper doors and includes pivoted and connected spaced locking members connected by an operating bar, is locked onto the door operating drive lever and is removed automatically from the levers on actuation of the door opening air cylinder when a cammed portion of the air cylinder ram contacts and lifts the operating bar thus allowing operation of the door operating mechanism.

6 Claims, 6 Drawing Figures



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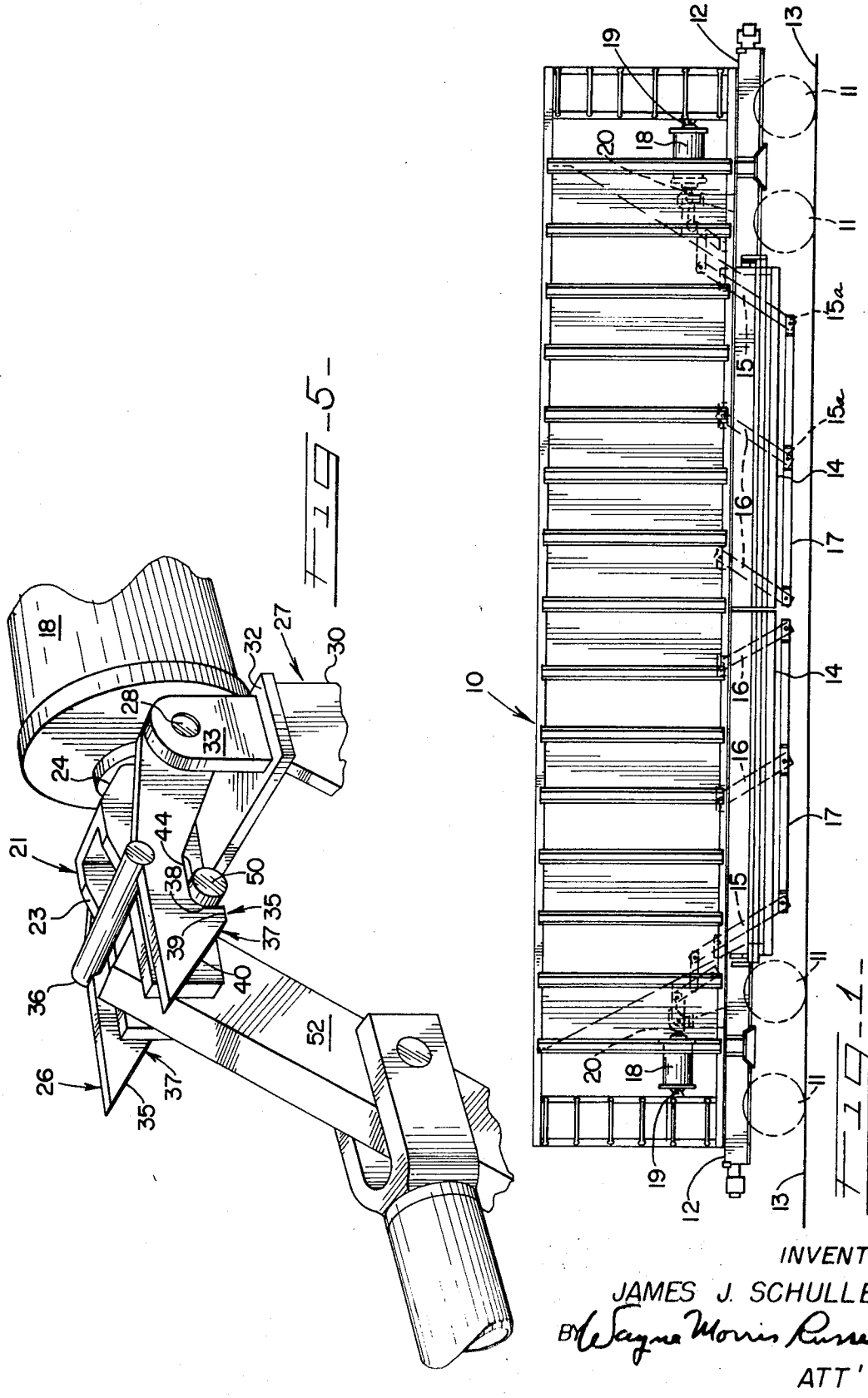

FIG-1-

FIG-5-

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FIG-3

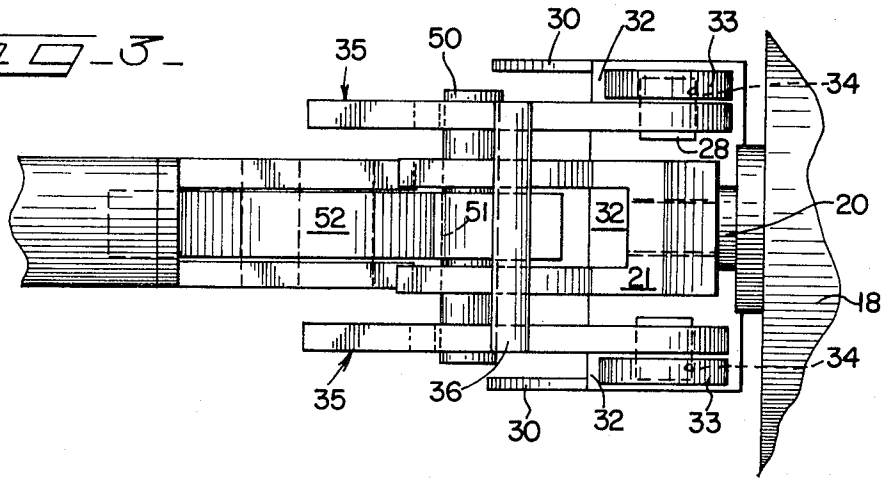

FIG-2

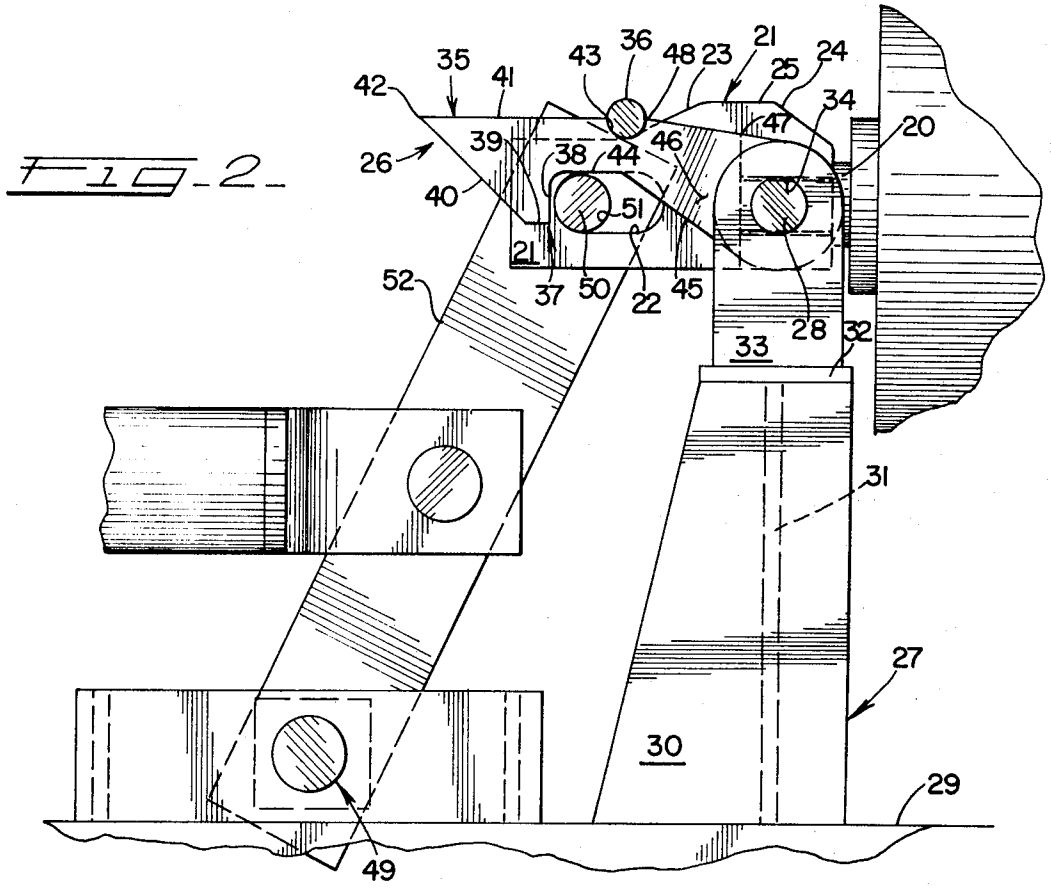

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FIG. 6

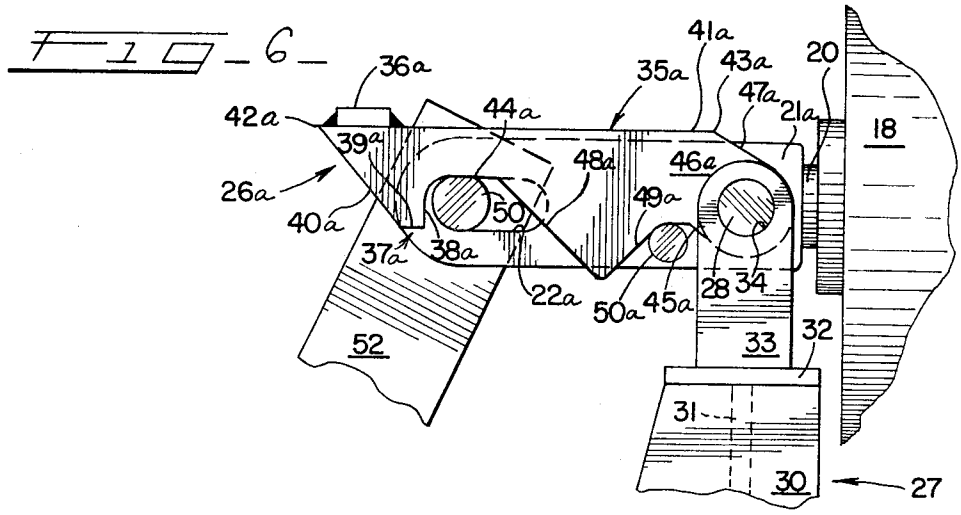
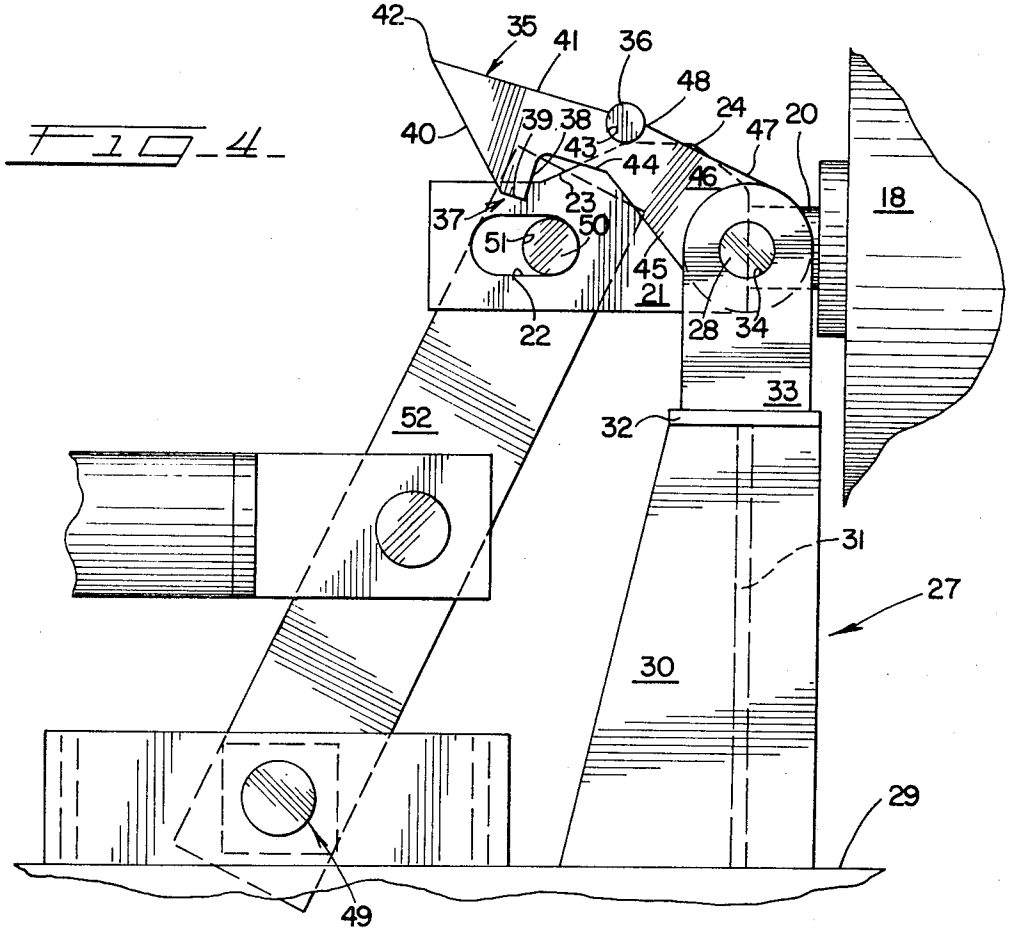


FIG. 4



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VEHICLE HOPPER DOOR OPERATING MECHANISM

SUMMARY

With the entrance into the area of larger cars having greater capacities, higher lading and other forces are encountered requiring stronger, more massive force transmitting and structural members than those used in the past. In utilizing these larger force transmission members higher inertial forces are encountered which on impact could supply sufficient forces to a mechanism to open the hopper doors. It was with this in mind that the present design evolved in order to prevent unintentional and undesirable opening of hopper car doors due to inertial forces on impact or other forces which were sufficient to operate door operating mechanism and produce unintentional door opening. The present invention embodies a pivotally located locking device engaging the door operating drive lever near the air cylinder which upon actuating of the air cylinder disengages from a locked position to allow movement of the lever. A means is employed between the air cylinder ram and the locking device which upon actuating of the air cylinder allows a pretravel of the ram and in this pretravel, the locking device is removed from the drive lever. When the pretravel has terminated the ram engages the door operating lever and in turn actuates the door operating mechanism which opens the doors.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a railway hopper car which employs the locking device at both ends;

FIG. 2 is an enlarged view of the locking device utilized at the right end of the hopper car illustrated in FIG. 1 in the self locked position;

FIG. 3 is a top plan view of the device illustrated in FIG. 2;

FIG. 4 is an elevation view of the invention showing the position of the locking device in the unlocked position;

FIG. 5 is a perspective view of the locking device; and

FIG. 6 is another embodiment of a locking device with cammed surfaces.

DETAILED DESCRIPTION

With reference now to the drawings, and in particular to FIG. 1 there is shown a railway hopper car **10** having wheels **11** center sill **12** and riding on rails **13**. Hopper doors **14** are pivoted on a longitudinal axis and open downward to discharge lading. The doors **14** operate in pairs and each pair is interconnected allowing the inner door of each pair to overlap and support the outer door of the pair. The doors open and close sequentially in response to forces transmitted through the levers **15** and **16** which are connected by the connecting link **17**. This arrangement of the door operating mechanism is shown in my co-pending Pat. application Ser. No. 884,424 filed on Dec. 12, 1969 and titled Door Operating Mechanism, now U.S. Pat. No. 3,633,511 issued Jan. 11, 1972 and being herein incorporated by reference. A pneumatic cylinder **18** located at each end of the hopper car **10** is pivotally connected at **19** having a piston rod **20** extending through its non-pivoted end. The piston rod **20** has a ram **21** fixedly attached to it. The ram **21** illustrated in FIGS. **2** and **3** is substantially U-shaped having opposed slots **22** with first and second cammed portions **23** and **24** connected by an intermediate dwell portion **25**. The auxiliary lock **26** is pivotally connected to the lock supporting means **27** and pivots about the pivot pin **28**. The lock supporting means **27** is fixedly attached to the top **29** of the center sill **12** and includes spaced side plates **30** connected by means of a connecting plate **31** and topped with a top plate **32** to which is fixedly attached spaced lugs **33** having openings **34**.

The auxiliary lock **26** comprises spaced locking members **35** connected so as to move in unison by means of the connecting bar **36** and pivotally connected about the pivot pins **28**. Each locking member **35** includes a nose portion **37** having a vertical wall **38**, a connection section **39**, and a cammed or angled portion **40**. The top portion **41** extends from the tip **42** to the radiused cutout **43** which accommodates the connecting bar **36**. Below the radiused cutout **43** is a wall **44** which connects the wall **38** with the bottom side **45** of the lug portion **46**. The top **47** of the lug **46** is terminated at **48**.

An auxiliary drive lever **52** is positioned as illustrated in FIGS. **2–6** to transmit and multiply forces supplied by the pneumatic cylinder **18**. The drive lever **52** pivots about the pivot means **49** and includes a pin **50** which extends through an opening **51** and is fixedly attached thereto and also extends through slots **22** in the ram **21** and terminates just outside the bottom of the wall **44** of the locking members **35**, best illustrated in FIGS. **2** and **3**.

A second embodiment of an automatic unlocking auxiliary lock is illustrated in FIG. **6**. Parts used in this embodiment which are the same as those parts used on the previously described lock are designated by the same reference numerals. The auxiliary lock **26*a*** includes spaced locking members **35*a*** pivoted about the pivot pins **28** and connected by a connecting bar **36*a***. The locking members **35*a*** include a nose portion **37*a*** comprising a wall **38*a***, section **39*a***, and an angled or cammed portion **40*a***. The top portion **41*a*** extends from the tip **42*a*** horizontally until it meets the top portion **47*a*** of the lug portion **46*a*** at **43*a***. Diagonal cammed surfaces **48*a*** and **49*a*** are located opposite and extending downward of the top portion **44*a***. Upon initial movement of the ram pin **50*a*** which is fixedly attached to the ram **21*a***, the ram pin **50*a*** will contact the cam surface **49*a*** to raise the auxiliary lock **26*a***.

The ram **21*a*** is fixedly attached to the piston rod **20** and is essentially U-shaped having slots **22*a*** in each leg of the U for movement about and the constraining of the pin **50** of the auxiliary drive lever **52**.

OPERATION

Referring now to the drawings and in particular FIGS. **1** through **6**, the operation of the preferred auxiliary lock will be understood. Upon operation of the power source **18** the piston rod **20**, as best illustrated in FIG. **2**, will begin to move to the left and in doing so the first cammed portion **23** of the ram **21** will contact the connecting bar **36**, and as movement of the ram continues the camming action of surface **23** will lift the bar and lift the attached locking members **35** which the bar

connects, the locking members 35 moving pivotally about the pivot pins 28. Also, as the ram 21 moves towards the left, there is relative movement between the pin 50 of the drive lever 52 and the cutout 22 of the ram 21. This relative movement continues until the right side of the slot 22 comes in contact with the pin 50. When this has occurred the auxiliary lock 26 will have rotated to the position illustrated in FIG. 4, thus in effect unlocking the pin 50 and allowing it to be moved by the ram 21. The lever 52 will remain in position until moved by the ram 21 because of an over center self-locking feature of the door operating levers 15, 16 and their door operating struts or arms 15*a*.

The auxiliary lock 26 will remain in approximately the position illustrated in FIG. 4 until the ram 24 has completely passed under the auxiliary lock 26. Generally, the bar 26 will not contact surface 24 because the inertia given to the lock 26 during its initial clockwise rotation into the position illustrated in FIG. 4 maintains the lock 26 in a position above surface 24 until the rapidly moving ram 21 has passed.

After counter clockwise rotation of the lock has begun a stop not shown in the illustration prevents further counter clockwise rotation of the auxiliary lock 26 past a predetermined position, thus, preventing the bar 36 from contacting the piston rod 20 during the remainder of movement of the ram 21 which rotates the lever 52 to open the hopper doors 14.

On the return stroke of the pneumatic cylinder 18 the cutout 22 of the ram 21 will move across the pin 50 of the drive lever 52 in a lost motion movement until the pin 50 is constrained by the left rounded end of the cutout 22 at which time the pin 50 will move in unison with the ram 21. On this return stroke the pin 50 may be positioned to contact the cammed portion 40 of the nose 37 or the cammed surface 24 may be utilized in conjunction with the connecting bar 36 to rotate the locking members 35 about the pivot 28 until the pin 50 has passed under the flat section 39 thus allowing the locking members 35 to move in a counterclockwise direction and to return to a position which will restrain movement of the drive lever 52 and the pin 50. This position is illustrated in FIG. 2 and depicts the position of the auxiliary lock 26 when the hopper doors 14 are in a locked, overlapping, and supportive position.

In the operation of the embodiment illustrated in FIG. 6 movement of the ram 21*a* to the left on operation of the pneumatic cylinder 18 releases the locking members 35*a* from constraining the pin 50 and allows the drive lever 52 to rotate when the right end of slot 22*a* contacts the pivot pin 50. Upon initial movement of the ram 21*a* the ram pin 50*a* makes contact with the first cammed portion 49*a* of the locking members 35*a*. Upon linear longitudinal movement of the ram 21*a* the pin 50*a* will cause the locking members 35*a* to rotate in a clockwise direction until contact between the ram pin 50*a* and the first cammed surface is terminated. When this termination occurs the inertia of the lock 26*a* will cause it to continue to rotate in a clockwise direction, during which time the ram 21*a* will pass under the locking members 35*a* allowing the lock 26*a* to rotate in a return, counterclockwise direction, until the lock 26*a* strikes a stop (not shown) which is positioned to prevent the bar 36*a* from contacting the piston rod 20. When contact between the pin 50*a* and cam surface 49*a* ends, the right side of the slot 22*a* is in contact with the pin 50 and rotation of the drive lever 52 begins.

On the return stroke of power cylinder 18 the slot 22*a* in the ram 21*a* will move across pivot pin 50 until contact occurs between the pivot pin 50 and the left side of the slot 22*a*. At this point clockwise rotation of the drive lever 52 begins, and after a predetermined rotation, the pin 50 of the drive lever 52 will contact the cammed portion 40*a* of the nose 37*a* producing a momentary clockwise rotation of the locking members 35*a*. However, spacial relationships between pins 50, 50*a* and surfaces 40*a*, 48*a* could be arranged to allow pin 50*a* to combine with surface 48*a* in lifting the auxiliary lock 26*a* during the return stroke of the ram 21*a*. This momentary rotation allows the auxiliary lock 26*a* to override the pin 50 until the pin 50 is under the wall 44*a* and constrained by the nose 37*a*.

The foregoing description and drawings merely explain and illustrate the invention and the invention is not limited thereto, except insofar as the appended claims are so limited, as those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

What is claimed is:

1. A railway hopper car having pneumatic cylinder means operative upon a door opening lever mechanism for opening and closing of pivoted discharge doors, said hopper car also including:

pivoted locking means adjacent said pneumatic cylinder means for preventing operative movement of said lever mechanism,

said pneumatic cylinder means having a connection with said lever mechanism for opening and closing said discharge doors, and thereby defining at their connecting extremities a lost motion connection means translating motion from the pneumatic cylinder means to the lever mechanism in the same plane and in a linear path,

said pneumatic cylinder means including a linearly reciprocal drive member having a locking means engaging surface and said lost motion connection means having a lost motion connection surface on said reciprocal drive member being spaced vertically from said locking means engaging surface attendant to releasing of the locking means from the lever mechanism during coacting movement of both surfaces as the reciprocal drive member moves linearly.

2. A railroad hopper car having pivoted discharge doors and pneumatic cylinder operating means, and said car including:

linearly reciprocable ram drive means being connected with said pneumatic cylinder means,

discharge door operating pivoted lockable lever means connecting with said ram drive means,

first cam means on said ram drive means,

a lost motion connection means coupling said ram drive means and the lockable lever means and including a lost motion surface on said ram drive means,

lock means mounted adjacent said ram drive means,

said lost motion connection surface being spaced from said first cam means attendant to releasing of the lock means from the ram drive means during

coacting movement of the lost motion surface and the first cam means in a linear direction,

said lock means including a lever restraining means engageable with and containing the pivoted lockable lever means against movement, and

second cam means carried by said lock means and engageable with the first cam means and movable thereby to release the locking means from the discharge door operating pivoted lockable lever means during initial linear movement of said ram drive means.

3. The invention according to claim 2, wherein

said lost motion connection means comprising a slotted portion in the ram drive means surrounding a portion of said lockable lever means,

said first cam means of the ram drive means comprising a pair of inclined and spaced cammed surfaces operatively associated with said lock means;

said second cam means comprising a follower member extending from said lock means and engageable with said inclined cammed surfaces to thereby actuate the lock means during reciprocating linear movement of said ram drive means.

4. The invention according to claim 2, and

said lost motion connection means comprising a slotted portion extending longitudinally and horizontally through the ram drive means; means;

said lockable lever means having a lock pin extending through said slotted portion of the ram drive means thereby forming said lost motion connection means coupling the ram drive means and the lockable lever means;

said first cam means of the ram drive means including a follower member operatively attached to and protruding from said ram drive means;

said second cam means including a pair of spaced inclined cammed surfaces extending from said lock means and operatively associated with said follower member of the ram drive means to thereby release the lock means from engagement with the lock pin of the lockable lever means during linear reciprocal movement of the ram drive means.

5. The invention according to claim 3, and

said slotted portion of the ram drive means including a longitudinally and horizontally extending opening in the ram drive means;

said lockable lever means including a lock pin means fixedly attached thereto and positioned within a portion of said opening of the ram drive means to thereby form said lost motion connection coupling the ram drive means and the lockable lever means.

6. The invention according to claim 5, and

said lock means including a pivotally mounted means having a locking nose portion engageable with the lock pin means of the lockable lever to prevent an operative movement of said lever when the pneumatic cylinder is inoperative.

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