Feb. 19, 1963 T. T. LUNDE 3,077,841

AUTOMATIC PIVOTED LATCHING HOOK FOR SWINGING LEVER DUAL SWINGING DOOR OPERATING MECHANISM

Filed Jan. 26, 1956 3 Sheets-Sheet 1

FIG_1

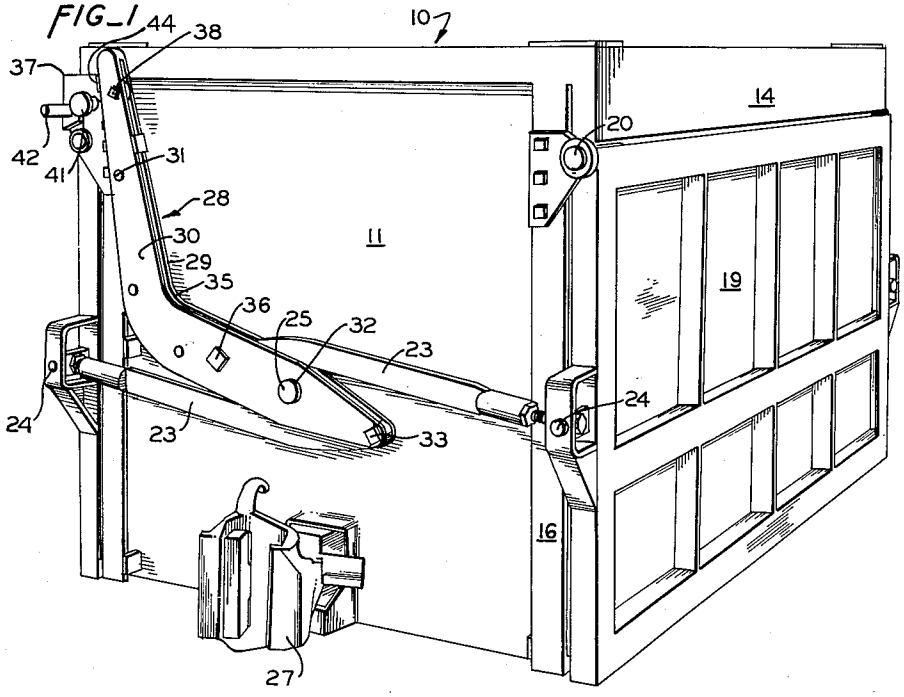
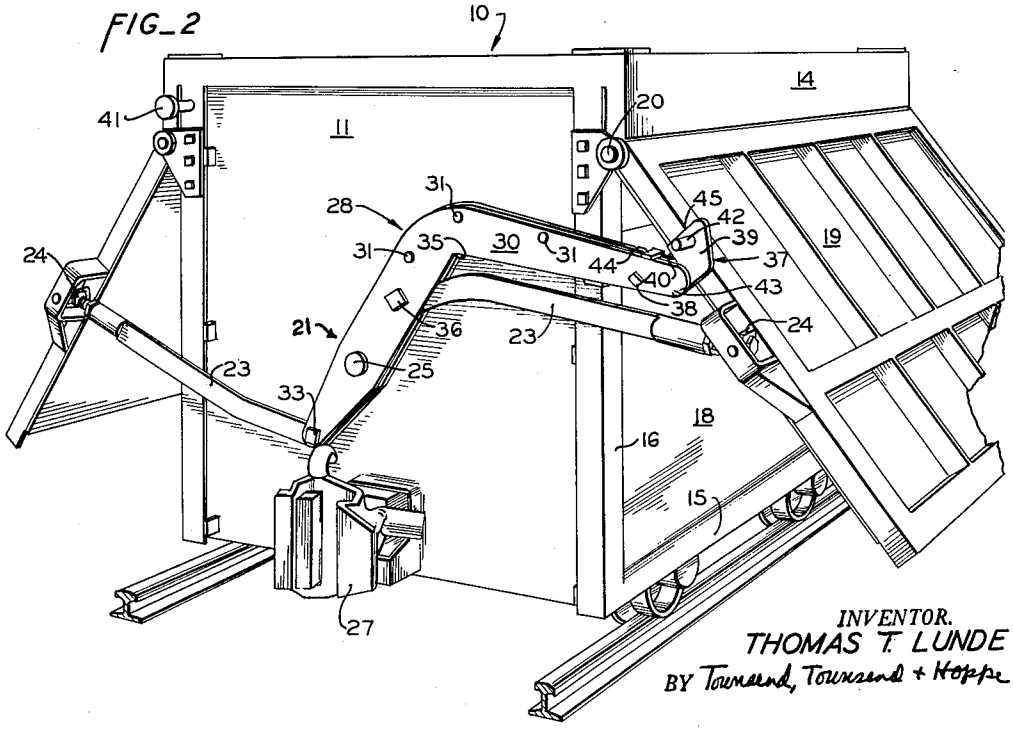


FIG_2



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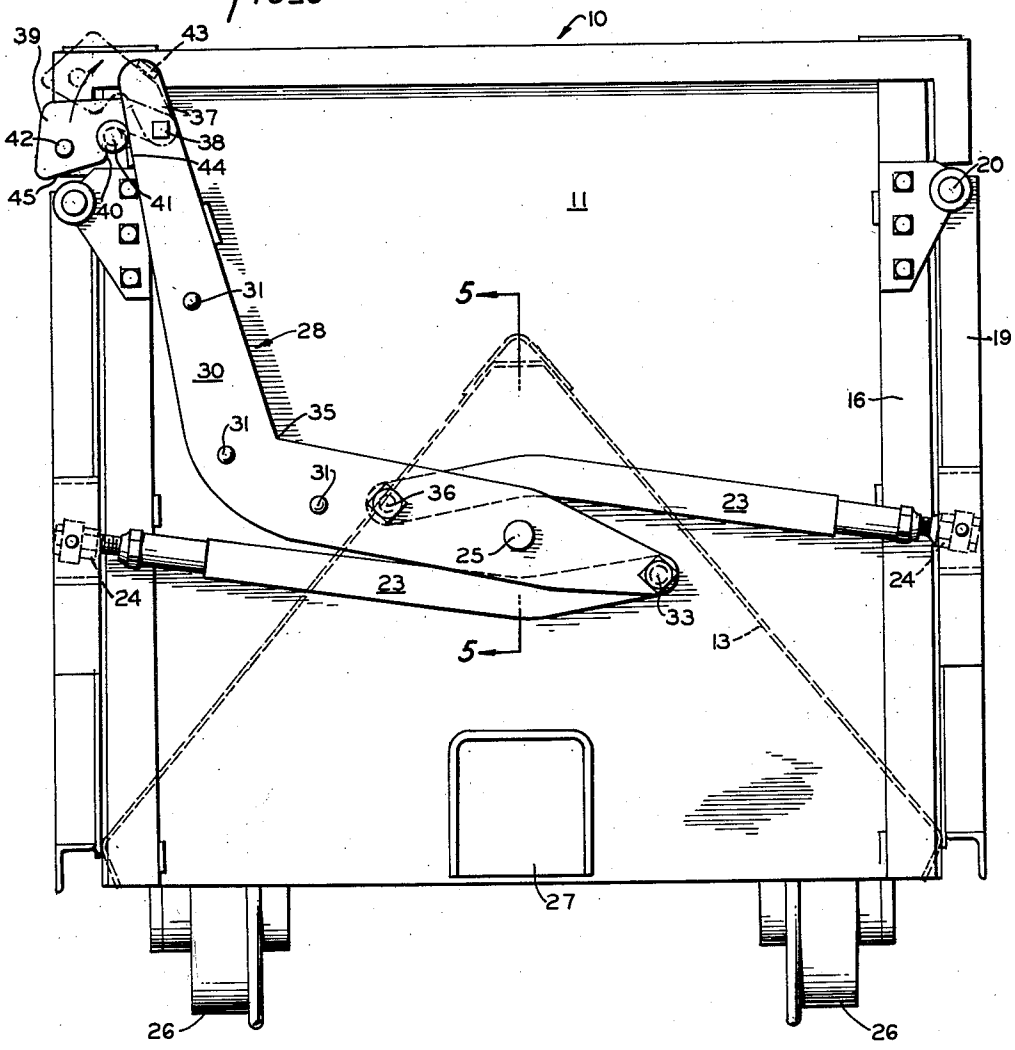
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FIG_3



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FIG_4

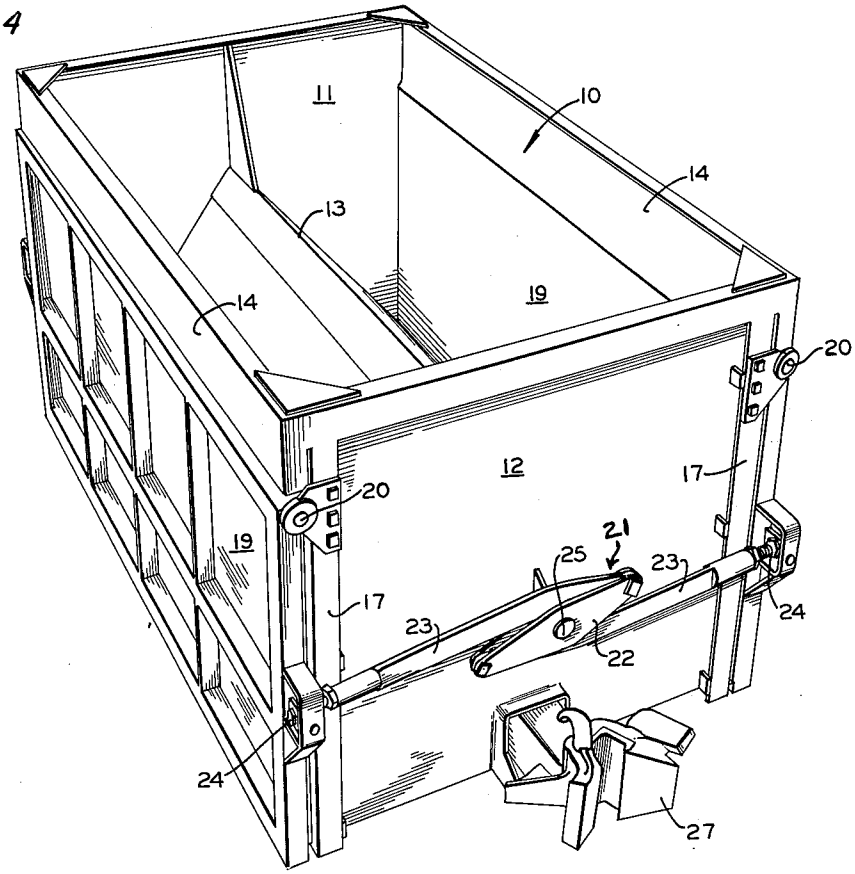
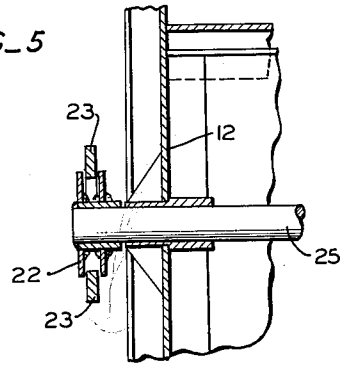


FIG_5



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AUTOMATIC PIVOTED LATCHING HOOK FOR SWINGING LEVER DUAL SWINGING DOOR OPERATING MECHANISM

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4 Claims. (Cl. 105—255)

This invention relates to door latches for hopper cars. The invention is disclosed in particular relationship with a gable bottom car.

One of the objects of this invention is to provide a door latch of simple construction arranged to maintain the car doors closed, irrespective of the load transmitted to the latch by pressure on the car doors.

Another object of the invention is to provide latch means of the character described which are opened easily by application of direct force applied angularly to the direction of the force applied to said latch by the pressure on the car doors.

Still another object of the invention is to provide latch means of the character described which close and engage automatically after the load carried by the car has been emptied.

The foregoing and other objects of the invention will become apparent upon an understanding of the following written description of the invention taken in connection with the accompanying drawings and appended claims.

In the drawings:

FIG. 1 is a perspective view of a gable bottom car utilizing the present invention illustrating the car doors and the latch means in closed position;

FIG. 2 is a view of the car illustrated in FIG. 1 showing the car doors in open position;

FIG. 3 is an end elevational view of the car illustrated in FIG. 1 looking at the end facing forwardly in FIG. 1 and illustrating the latch both in engaged and unengaged positions;

FIG. 4 is a perspective view of the car illustrated in FIG. 1 viewing the end away from the viewer in FIG. 1; and

FIG. 5 is a partial cross-sectional view on the line 5—5 of FIG. 3.

The selected embodiment of this invention is disclosed, as pointed out above, in connection with a gable bottom car of conventional design. Such a car is provided with a hopper 10 having front and rear ends 11 and 12 and a gable shaped bottom 13. The sides of the car are formed of a framework comprising a top member 14, a bottom member 15 and end members 16 and 17 defining an opening 18. Opening 18 on each side of the car is closed by a door 19 hingedly supported at each of its upper ends by hinge means 20.

Cars provided with side-opening doors are conventionally provided with means to coordinate the motion of the two doors with respect to one another. These means, best illustrated in FIG. 4, include a pair of crank mechanisms 21 at each end of the car. In conventional cars these crank mechanisms 21 include a crank 22 having two throws disposed 180° with respect to each other, a pair of connecting rods 23 interconnecting each throw of the crank to an opposite door of the car and pivoted trunnions 24 interconnecting each door to the connecting rod. In order to synchronize the front and rear ends of the doors, cranks 22 arranged at each end of the car are mounted upon a common shaft 25.

As is conventional, the car is provided with wheels 26 and draft gears 27.

All of the foregoing is well-known to persons ski"ed in the car manufacturing art and illustrates the general embodiment in which the present invention is found.

In the selected embodiment of the invention, door crank 22 arranged at the operating end of the car is replaced with a generally V-shaped door opening arm 28. As illustrated, this door opening arm 28 is placed at the front end of the car and it comprises two parallel members 29 and 30 which embrace opposite sides of the connecting rods 23. Plates 29 and 30 are secured together in spaced relationship by pipe spacers 31 welded between the two plates.

One of the legs of V-shaped arm 28 is secured to shaft 25 as at 32 and one end of arm 28 is pivotally secured to one of connecting rods 23 as at 33. The other connecting rod 23 is secured to door arm 28 at a point intermediate the end of the door arm and the vertex 35 of the V, as at 36.

The other end of the V-shaped door arm is provided with a latch 37 which is pivoted to door arm 28 as at 38. This latch is formed in a shape resembling in elevation the general shape of a chair, with the back of the chair being tilted forwardly from the vertical (see FIG. 3), viewing the drawing with the right side of the sheet pointed upwardly). This provides a weighted portion 39 for the latch at a point remote from pivot 38, as well as a detent 40 intermediate weighted end 39 and pivot 38. This detent 40 mates with a fixed pin 41 mounted on the forward end of the car.

A handle 42 is provided so that the operator may urge or strike it upwardly to release the latch. Further, a back stop 43 is provided on door arm 28 to control the out of engagement angular position of latch 37.

It will become apparent from an examination of the geometry of latch 37 and the location of its center of gravity that car doors 19 will remain closed in transit, irrespective of the load transmitted to them by pressure on the car doors. This, because the torque produced upon the latch by door arm 28 is necessarily less than the downward torque produced upon that same latch by the force of gravity upon weighted end 39. In addition, the pressure surface of detent 40 abutting fixed pin 41 when latch 37 and pin 41 are engaged is substantially normal to the direction of the force applied by the lever arm 28. This creates a maximum useful coefficient of friction between detent 40 at pin 41.

In order to dump the gable bottom car, handle 42 is lifted by the operator, or it may be struck with an upward blow by a hammer. This lifts the detent 40 of the latch out of engagement with fixed mating pin 41 and releases the door mechanism. The weight of the material within the car forces both doors open and the material flowing out on both sides of the car urges the doors outwardly and rotates the door latching arm clockwise, viewing the operating end (FIGS. 1–3).

After the load is discharged, gravity closes the doors. It is apparent from a study of the illustrative embodiment of the latching mechanism described above that the acceleration of the door arm varies from zero at the start of the closing motion to an extremely high value toward the end of the closing motion. This counterclockwise rotation throws the latch in a clockwise direction up against its back stop 43 by centrifugal force. The latch remains against the back stop until the end of the closing cycle. Latch 37 is thus carried toward mating pin 41, but out of the path in which it would prematurely strike the mating pin. When the closing cycle suddenly ceases, the kinetic energy stored in the latch itself causes the latch to rotate counterclockwise on its pivot 38 into closing engagement with fixed pin 41, thereby latching the car.

Safety means are provided to prevent latch 37 from jamming against mating pin 41 if for any reason the latch is not thrown or maintained against the back stop 43 during the closing cycle. These means comprise a stop 44 and a cam surface 45. Stop 44 is secured between the

two plates 29, 30 making up the V-shaped arm 28 at a point immediately below the normally closed position of the latch, as appears in FIG. 3. The cam surface 45 is located along the lower edge of the latch 37 and is spaced outwardly from the pivot 38 beyond the detent 40, as also appears in FIG. 3. This cam face is proportioned as illustrated so that it will strike the mating pin 41 in the event that the latch should fail to lie against back stop 43 during the closing cycle. As the doors close under this circumstance, the cam surface 45 rides up over the mating pin 41 until the doors are fully closed, at which time the weight of the latch closes the latch with the detent 40 embracing mating pin 41.

It will be perceived that the foregoing mechanism is simple to construct, easy to operate and practically foolproof in the field.

Having thus described a selected embodiment of the invention, it is to be understood that the invention comprehends such reasonable modifications as fall within the clear language of the appended claims.

I claim:

1. In a hopper car having pivoted doors, a rock-shaft, crank means connected to said rock-shaft, connecting rods interconnecting said crank means with said doors of said car and a lever arm connected to said rock-shaft, the improvement which comprises: a pin fixedly mounted on said car and spaced radially from said rock-shaft; a one-piece latch; pivot means connecting said latch to said lever arm at a point spaced radially from said rock-shaft at a distance approximately equal to the distance which said pin is spaced from said rock-shaft; a detent formed in the lower face of said latch, positioned to mate with said fixed pin and provided with one side located remote from said pivot means and extending substantially normal to the direction of force applied by said lever arm to the juncture of said side of said detent and said pin; a cam surface formed along the lower face of said latch and spaced outwardly from said pivot means and beyond said detent; stop means on said lever arm positioned to engage with said latch and located so as to present said cam surface of said latch to said pin when said latch is in engagement with said stop; and stop means on said lever arm positioned to restrain said latch means against backward movement occasioned by rapid movement of said lever arm toward latching position.

2. In a hopper car having pivoted doors, a rock-shaft, crank means connected to said rock-shaft, connecting rods interconnecting said crank means with said doors of said car and a lever arm connected to said rock-shaft, the improvement which comprises: a pin fixedly mounted on said car and spaced radially from said rock-shaft; a one-piece latch; pivot means connecting said latch to said lever arm at a point spaced radially from said rock-shaft at a distance approximately equal to the distance which said pin is spaced from said rock-shaft; a detent formed in the lower face of said latch, positioned to mate with said fixed pin and provided with one side located remote from said pivot means and extending substantially normal to the direction of force applied by said lever arm to the juncture of said side of said detent and said pin; and stop means on said lever arm positioned to restrain said latch means against backward movement occasioned by rapid movement of said lever arm toward latching position.

3. In a hopper car having pivoted doors, a rock-shaft, crank means connected to said rock-shaft, connecting rods interconnecting said crank means with said doors of said car and a lever arm connected to said rock-shaft, the improvement which comprises: a pin fixedly mounted on said car and spaced radially from said rock-shaft; a one-piece latch; pivot means connecting said latch to said lever arm at a point spaced radially from said rock-shaft at a distance approximately equal to the distance which said pin is spaced from said rock-shaft; a detent formed in the lower face of said latch, positioned to mate with said fixed pin and provided with one side located remote from said pivot means and extending substantially normal to the direction of force applied by said lever arm to the juncture of said side of said detent and said pin; a cam surface formed along the lower face of said latch and spaced outwardly from said pivot means and beyond said detent, and stop means on said lever arm positioned to engage with said latch and located so as to present said cam surface of said latch to said pin when said latch is in engagement with said stop.

4. In a hopper car having pivoted doors, a rock-shaft, crank means connected to said rock-shaft, connecting rods interconnecting said crank means with said doors of said car and a lever arm connected to said rock-shaft, the improvement which comprises: a pin fixedly mounted on said car and spaced radially from said rock-shaft; a one-piece latch; pivot means connecting said latch to said lever arm at a point spaced radially from said rock-shaft at a distance approximately equal to the distance which said pin is spaced from said rock-shaft; and a detent formed in the lower face of said latch, positioned to mate with said fixed pin and provided with one side located remote from said pivot means and extending substantially normal to the direction of force applied by said lever arm to the juncture of said side of said detent and said pin.

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