United States Patent [19]

Fuller

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[54] **HOPPER GATE TOGGLE OPERATING MECHANISM**

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[52] **U.S. Cl.**..... **105/253,** 105/282 R, 105/304, 105/308 R

[51] **Int. Cl.**..... **B61d 7/02,** B61d 7/20, B61d 7/26

[58] **Field of Search**..... 105/282 R, 304, 253, 105/308 R

[56] **References Cited**

UNITED STATES PATENTS

3,183,852	5/1965	Fritz	105/282 R
3,343,887	9/1967	McNamara	302/52
3,509,828	5/1970	Fritz	105/282 R
3,581,673	6/1971	Danielson	105/282 R
568,775	10/1896	Lane	105/282 R X
472,003	3/1892	Snyder et al.	105/282 R
2,640,440	6/1953	Dorey	105/304

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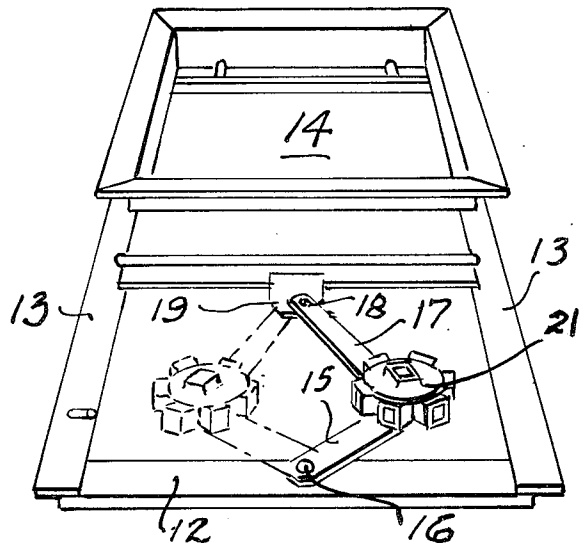
[57] **ABSTRACT**

Mechansim for moving the gate of a material discharge chute which includes a toggle device actuated by applying a force at the joint between the toggle links. Such application may involve a manually operated lever readily applicable to and removable from the toggle device, but other means for exerting a thrust on the device are contemplated. Preferably the mechanism includes connections tending to lift the gate from its support on the chute.

10 Claims, 5 Drawing Figures



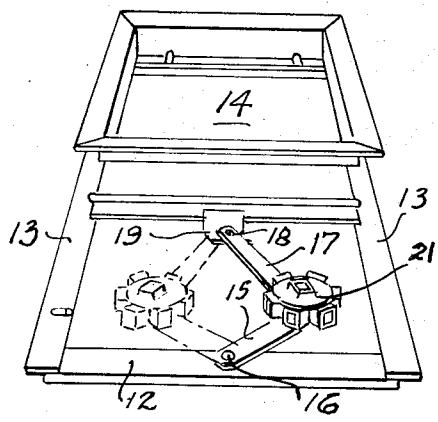


FIG. 1

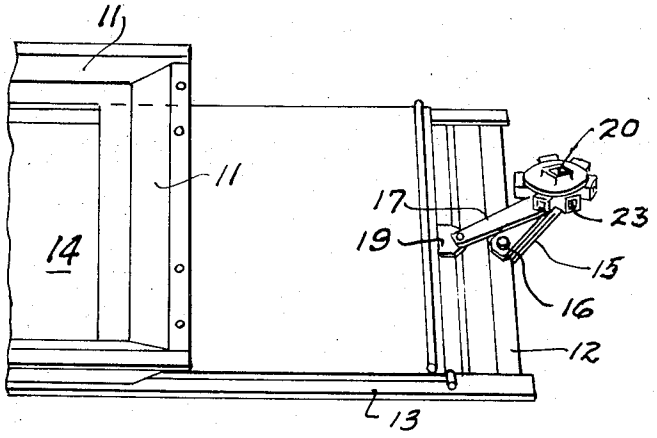


FIG. 2

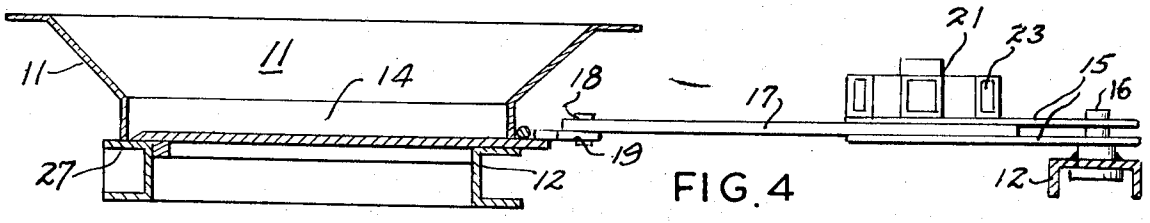


FIG. 4

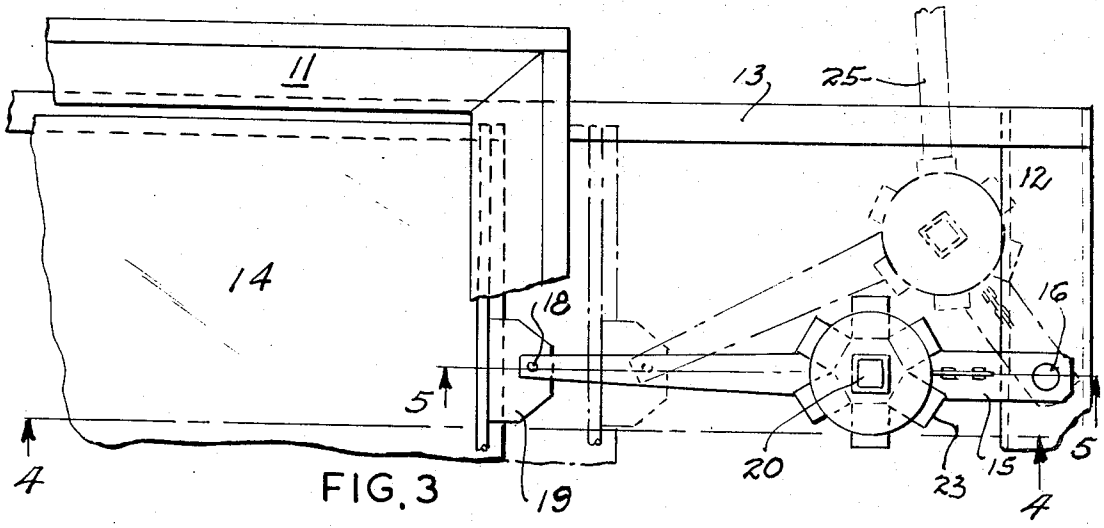


FIG. 3

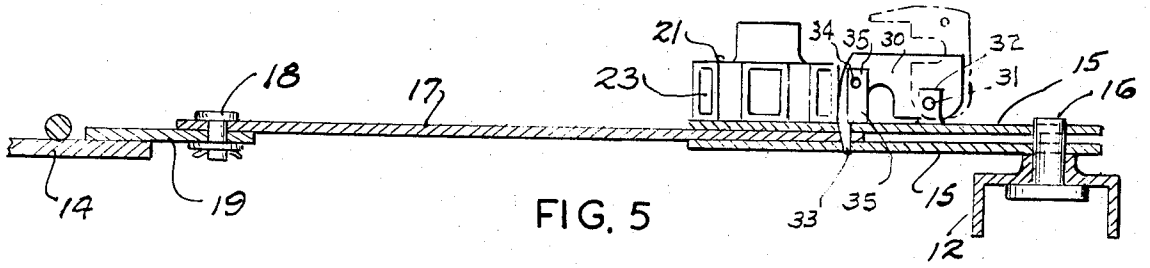


FIG. 5

HOPPER GATE TOGGLE OPERATING MECHANISM

BACKGROUND OF THE INVENTION

The invention relates to hoppers and hopper gate combinations and is here illustrated and described as embodied in a railway car, although the invention may be utilized in other hopper structures.

One feature of the invention is the use of a toggle link mechanism for shifting the hopper gate to open or closed position in which the operating force is applied directly to the toggle knee joint, as distinguished from applying the gate shifting force to the pivoted end of toggle links which acts as a crank-like member connected at its other end to the gate and in which effective force applied to the gate is reduced by the length of the toggle link.

Another feature is the providing of a component of the operating force exerted vertically of the gate in an upward direction to reduce friction between the gate and its support.

Another feature is the provision of means enabling a workman at either side of the hopper to exert effective pull or push effort to rotate the toggle knee joint to shift the gate irrespective of the position of the gate in the hopper.

Another feature is to facilitate the application of the shifting force through an elongated lever extending in a direction nearly at a right angle to the length of the toggle links.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 are perspective top views of a hopper discharge chute and gate and toggle mechanism for moving the gate, FIG. 1 showing the position of the parts as the toggle joint in first broken, and FIG. 2 showing the position of the parts when the gate is fully opened.

FIG. 3 is a top view of the structure when the gate is fully closed, with the toggle links aligned.

FIG. 4 is a vertical longitudinal section on line 4—4 of FIG. 3.

FIG. 5 is a detail vertical section on line 5—5 of FIG. 3 and drawn to a larger scale.

DETAILED DESCRIPTION

The hopper chute 11 is supported on car framing elements 12, 13 which may include ways 24 guiding hopper gate 14 as it slides to positions closing or opening the chute. The toggle mechanism comprises a double anchor link 15, pivoted at 16 to a car framing element 12, and a single gate-connected link 17 pivoted at 18 to a tab 19 on the gate, the inner ends of links 15 and 17 being pivoted to each other by an upright pin 20 to form the knee joint of the toggle. When the gate is closed (FIG. 3) the links are aligned end to end along the longitudinal center line of the gate. This arrangement tends to avoid lateral thrust of the gate against the longitudinal ways at the beginning of an opening movement and at the end of a closing movement.

A capstan 21 is affixed to, or is integral with, the inner portion of upper link 15 and includes a plurality of laterally opening sockets 23 each adapted to receive the end of an actuating lever 25 readily insertible into and removable from a selected socket by a workman on either side of the car. Sockets 23 are speced sixty degrees apart about the capstan axis.

At the beginning of an opening movement of the gate, the thrust by operating lever 25 will be applied to both toggle links directly at the toggle knee joint 20 and the workman thereby exerts maximum leverage to swing the links about their respective pivots 16 and 18 on the frame and gate. Similarly, near the end of closing movement of the gate when its forward edge is over a shelf 27 on the frame, the thrust on the toggle link may be applied at right angles to the length of the links and more effectively shift the toggle links to their extreme positions, as distinguished from the decrease in the leverage by the length of toggle link 15 as would occur if the operating lever engaged toggle link 15 as a crank adjacent its pivot on the frame.

In any position of the capstan there are lever-receiving sockets in the capstan opening transversely of the hopper approximately at right angle to the longitudinal center line of the hopper or at acute angles to that line. This enables a workman at either side of the hopper to insert a lever at the most convenient angle for applying a pull or push effort effectively. The capstan sockets are above the level of the toggle links and hence the horizontally disposed lever at the same level as the sockets may move over the pivot pin 20 at the knee joint of the toggle if such movement will facilitate the workman's operation of the lever bar.

An upright latch plate 30 (FIG. 5) is pivoted at 31 to a bracket 32 on upper link 15. In the lower position of the latch, a lower finger 33 on its swinging end enters a notch in the inner end of link 17 to hold the link against rotation and thereby locks the gate. When latch 30 swings to an upright position, it frees the links for operation by the lever. when latch 30 is in upright position, a sudden movement of the car is likely to jar the latch so that it drops down and locks the gate against shifting. An ordinary car seal may be inserted through openings 34 in the latch and in an upstanding lug 35 on upper link 15 to avoid careless or unauthorized release of the lock.

Link 17 and its connection 18, 19 to the gate are above the level of the upper face of the gate, hence there is an upward resultant from the pulling force which tends to lift the gate as it is being opened. This decreases friction between the gate and its supporting ways and is particularly desirable if there is ice and snow between the gate and the ways.

The gate shifting mechanism may involve means other than an elongated lever, and the exclusive use of the combination of elements specified in the appended claims is contemplated.

I claim:

1. In combination with support structure, a hopper having a discharge chute and a gate carried thereby, and toggle mechanism for sliding said gate to closed and open positions, said mechanism including a pair of toggle links disposed end to end and pivotally interconnected at their adjacent ends and pivotally connected at their outer ends to said structure and gate respectively, there being a knee joint member rigid with the inner end of one of said links and having a pivot connection to the adjacent end of the other of said links, and means for rotating said member about said pivot connection to swing said links into substantial end to end alignment, to close said gate, or to rotate said links in the opposite direction, to fold said links and thereby open said gate.

2. A combination as described in claim 1 in which the outer ends of the toggle links are attached to the gate and to the support structure respectively by pivots in substantial alignment with the longitudinal center line of the gate.

3. A combination as described in claim 1 in which the toggle links are disposed lengthwise of the gate when the gate is closed and the toggle knee joint member pivot connection may swing toward either side of the hopper as the gate is opened.

4. A combination as described in claim 3 in which the knee joint member has sockets facing toward both sides of the hopper and the member is rotatable by an elongated lever inserted into the knee joint member from either side of the hopper irrespective of previous operation.

5. A combination as described in claim 1 in which the knee joint member has a socket opening transversely of the length of the toggle link and adapted to receive the end of an elongated lever.

6. A combination as described in claim 5 in which the knee joint member has a plurality of sockets opening in different angular directions transversely of the axis of the knee joint.

7. A combination as described in claim 5 in which the knee joint member has a plurality of sockets opening transversely of the axis of the knee joint at acute angles to each other.

8. A combination as described in claim 5 in which the knee joint member has a plurality of sockets opening outwardly of the knee joint member in directions approximately sixty degrees apart about the knee joint axis.

9. A combination as described in claim 1 in which the discharge chute is provided with elongated ways disposed substantially horizontally and the link connected to the gate is disposed horizontally and above the level of said ways so that the pull of the toggle link connected to the gate is above the level of the supporting contact of the gate on said ways.

10. In combination with a railway hopper car discharge chute, a gate therefor, and mechanism for closing and opening said gate comprising toggle links connected at their outer ends to said chute and gate respectively and having a pivotal knee joint connection to each other at their inner ends, and means at said knee joint connection including lever receiving sockets facing respectively toward opposite sides of the car and at different angles to the longitudinal center line of the hopper gate.

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