ABSTRACT OF THE DISCLOSURE

A mechanism for opening and closing the covers of side discharge hatches of a railway car in which a linkage opens and closes the covers in response to rotation of a double-rim toothed segment, which is caused by a cylindrical body of uniform diameter, wherein a toothed segment is driven through a coupling constituted by a segment rigidly mounted on the shaft and having integral, spaced, rim portions with teeth engaged by gear teeth on spaced integral rim portions of a driven segment which is pivotally mounted on the frame of the car.

The present invention relates to self-discharge railway hopper cars adapted to carry bulk cargo and, more particularly, to a mechanism for closing and opening the covers of side discharge hatches thereof.

Known in the art are mechanisms for closing and opening covers of side discharge hatches of railway hopper cars for bulk cargo, which mechanisms incorporate a longitudinally extending actuating shaft disposed under the hopper and connected through a linkage to at least one drive. Mounted on each end of said longitudinally extending actuating shaft is a double-arm lever connected by means of links to the respective covers.

A disadvantage of the known mechanisms for closing and opening covers of side discharge hatches is a limited (not more than 180°) pivoting angle of the linkage and, consequently, a limited angle of rotation of the longitudinal shaft, this leading to inadequate opening of the covers opposing a free outflow of the cargo being discharged by gravity, with the direction of the discharge flow changed and the discharge time increased.

It is an object of the present invention to develop a mechanism for closing and opening discharge hatches, which mechanism insures rapid discharge of bulk cargo from the car by gravity means of increasing the angle of rotation of the longitudinal actuating shaft, and, consequently, of increasing the pivoting angle of the covers. Accordingly, the discharge time of hopper cars is reduced, as well as the time during which the operating personnel have to remain in a dusty atmosphere.

The present invention comprises a mechanism for closing and opening covers of side discharge hatches of railway hopper cars for bulk cargo wherein a longitudinally extending actuating shaft disposed under the hopper is connected to at least one drive and to the covers via a linkage, according to the present invention, each drive, being essentially a pneumatic or hydraulic cylinder, is mounted on the car frame and connected to said longitudinally extending actuating shaft through a toothed coupling comprising a double-rim gear secured to said longitudinal shaft and a double-rim toothed segment mounted to the car frame with a possibility of rotation under the action of said pneumatic cylinder. The rod of said pneumatic cylinder can be actuated between the rims of said toothed segment.

The mechanism can be provided with an adjustable member mounted on the car frame and adapted to limit the angle of rotation of said double-rim toothed segment, due to which member, the covers may be retained in an open position with the drive disconnected.

Other objects and advantages of the present invention will be more clearly apparent from the following detailed description of an embodiment thereof, with due reference being made to the accompanying drawings, in which:

FIGURE 1 is a cross-sectional view of a mechanism embodying the present invention;
FIGURE 2 diagrammatically shows the mechanism embodying the present invention;
FIGURE 3 is a perspective view of a toothed coupling of the mechanism embodying the present invention;
FIGURE 4 is a side elevation view of the toothed coupling of the mechanism embodying the present invention; and
FIGURE 5 is a side elevation view of the mechanism embodying the present invention, with the covers opened.

Referring to the drawings, the mechanism for closing and opening covers 1, 1' (FIG. 1) of discharge hatches comprises a longitudinally extending actuating shaft 2 disposed under a hopper 3, each end of said shaft 2 carrying a double-arm lever 4, 4' (FIGS. 1, 2) connected by links 5, 5' to covers 1, 1'. Longitudinally extending shaft 2 is coupled with each one of two pneumatic cylinders 6, 6' by means of a respective toothed coupling comprising gears 7, 7' and corresponding toothed segments 8, 8'. Gears 7, 7' are rigidly secured to actuating shaft 2, while toothed segments 8, 8' are mounted on respective pivots 9, 9' secured to a frame 10 of the car. The toothed segments 8, 8' are respectively coupled with pneumatic cylinders 6, 6'. Both gears 7, 7' and toothed segments 8, 8' are provided with two toothed rims each (FIG. 3). A rod 11 of pneumatic cylinder 6 extends between two rims 13, 13' of segment 8 and is connected therewith by means of a pivot 12. The provision of pivot 12 precludes warpage of rod 11, when segment 8 is rotated.

FIG. 4 shows a toothed coupling on an enlarged scale. The mechanism is provided with an adjustable stop 14 mounted on frame 10 of the car, said stop 14 carrying removably attached plates 13 made of elastic material. By mounting removable plates 13 of different thickness, the angle of rotation of toothed segment 8 may be adjusted.

The mechanism operates in the following manner.

A signal is directed from a remote control panel (not shown in the drawings) into spaces 16, 16' of pneumatic cylinders 6, 6' for the covers to be opened. Rod 11 of the pneumatic cylinder is moved out and rotates toothed segment 8 to a position indicated in FIG. 5. When toothed segment 8 rotates, rod 11 of cylinder 6 connected thereto pivots which, in turn, causes pivoting of the body of cylinder 6 about a pivot 17 (FIG. 3) on which cylinder 6 is mounted. Such an arrangement provides for the centering of pneumatic cylinder 6 in relation to toothed segment 8, whereby rod bending or cylinder breakage at the moment of rotation of the toothed segment is prevented.

Double-rim gear 7 being in mesh with toothed segment 8 turns, thus producing rotation of longitudinal actuating shaft 2 together with double-arm levers 4, 4' mounted thereon. The latter turn covers 1, 1' about pivots 18, 18' via links 5, 5' (FIG. 1), thus opening discharge hatches 19, 19' (FIG. 3). The covers 1, 1' are moved so wide as to insure free pouring out of the cargo.

In order that covers 1, 1' stay open, when the air pressure in spaces 16, 16' of cylinders 6, 6' is released, the angle of rotation of toothed segment 8 is so adjusted by means of adjustable stop 14 that the linkage consisting of double-arm levers 4 and links 5 passes beyond its dead center, when covers 1, 1' are being opened. Then the linkage will not return into its initial position upon the disconnection of pneumatic cylinders 6, 6', and the covers will stay open.
To close covers 1, 1', compressed air is directed from the remote control panel into chambers 20, 20' of cylinders 6, 6', rods 11 move, returning toothed segments 8, 8' into their initial positions. Gears 7, 7' engaged by segments 8, 8' rotate and turn double-arm levers 4, 4' via actuating shaft 2, said levers closing covers 1, 1' via links 5, 5'.

The mechanism of the invention for closing and opening covers of discharge hatches used in hopper cars for transporting bulk cargo makes it possible to double the width of opening of the covers as compared to the known designs, and also to retain the covers in open position substantially parallel to the car bottom, which fact insures unobstructed outflow of the cargo.

What we claim is:

1. A mechanism for closing and opening the covers of side discharge hatches of self-discharge railway hopper cars intended for carrying bulk cargo, said mechanism comprising a longitudinally extending actuating shaft disposed under a hopper of the car; at least one drive means for rotating said longitudinally extending actuating shaft, said drive means being pivotally mounted on the frame of the car; a linkage connecting said longitudinally extending actuating shaft and said covers of the discharge hatches; a toothed coupling connecting said longitudinally extending actuating shaft to said drive means for rotating said shaft, said toothed coupling comprising a gear rigidly mounted on said actuating shaft and including two spaced integral rim portions with gear teeth thereon, and a segment pivotally mounted on said frame of the car and including two spaced integral rim portions with gear teeth thereon which are respectively in mesh with the gear teeth on the rim portions of said gear which is mounted on the actuating shaft, said drive means being pivotally coupled to said segment between the rim portions thereof.

2. A mechanism as claimed in claim 1, comprising an adjustable stop located on said frame of the car to limit the rotation of said segment, whereby said covers of the discharge hatches are retained in their open position when said drive means is disconnected from said shaft.

3. A mechanism as claimed in claim 1, wherein said drive means comprises a pneumatic cylinder including a rod which is disposed between the rim portions of said segment and connected to said segment.

4. A mechanism as claimed in claim 3, comprising an adjustable stop located on said frame of the car to limit the rotation of said segment, whereby said covers of the discharge hatches are retained in their open position when said drive means is disconnected from said shaft.

5. A mechanism as claimed in claim 4, wherein said toothed segment is pivotally mounted on the frame about an axis extending parallel to the axis of rotation of said shaft.

6. A mechanism as claimed in claim 5 wherein said linkage comprises a double arm lever connected to said shaft and links connecting said double arm lever and said covers, said linkage having a dead center position between the open and closed position of the covers so that the covers will remain open when the linkage passes the dead center position in a cover opening operation.

7. A mechanism as claimed in claim 5, wherein said rod extends perpendicularly to said actuating shaft and is connected to said segment at a radially spaced location relative to the axis of pivotable mounting of the segment on the frame.

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