United States Patent

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[54] **EXTERIOR COVER ENCLOSING HOPPER GATE AND ACTUATING MECHANISM**
7 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **105/253,** 105/239, 105/248, 105/280, 105/282, 105/284, 105/296, 105/299, 105/304, 105/308, 105/311, 105/358, 105/424, 302/52

[51] **Int. Cl.** **B61d 5/04,** B61d 5/08, B61d 7/22

[50] **Field of Search** ..... 105/247, 250, 251, 282 (RP), 282 (R); 302/52; 105/239, 248, 253, 280, 282, 284, 296, 299, 304, 308, 311, 358, 424

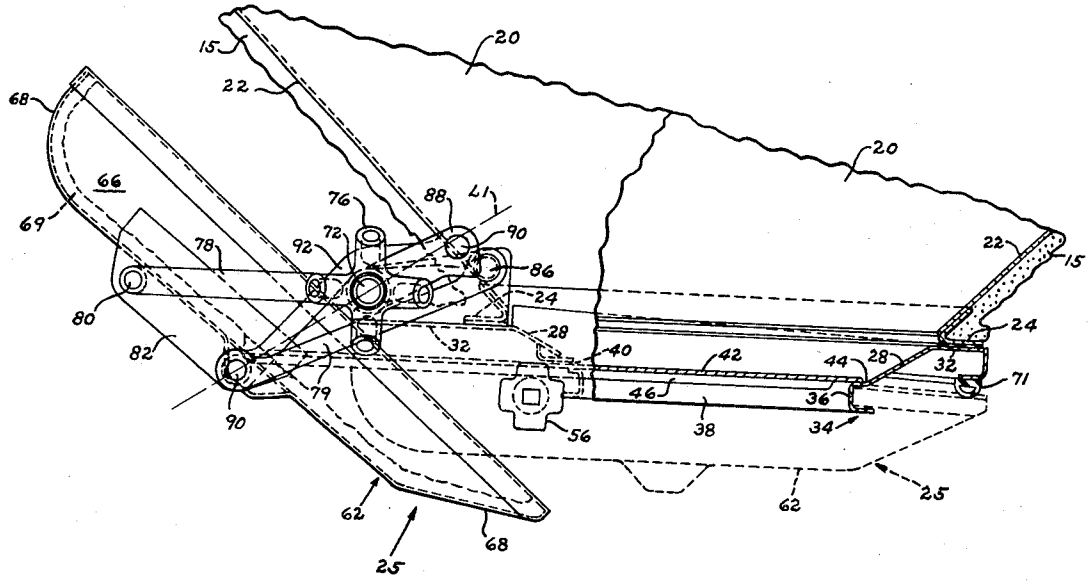
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ABSTRACT: A lower generally pan-shaped cover for fitting around the entire bottom discharge structure of a railway hopper car, such as a discharge structure having a gravity gate and a combination rack-and-pinion drive for the gravity gate. The cover seals the entire bottom outlet structure against the entrance of foreign matter including the drive means. Means mount the cover for movement between a covering position with respect to the bottom outlet and a position removed from beneath the bottom discharge outlet to permit the discharge of lading. The cover is formed of fiber glass and resin binder to insulate the bottom discharge structure for minimizing heat losses from an insulated car. The capstans for rotating the pinion shaft are mounted for folding to an inoperative position in order for the cover to cover the drive means while remaining within clearance limits and without being of an unduly long length.



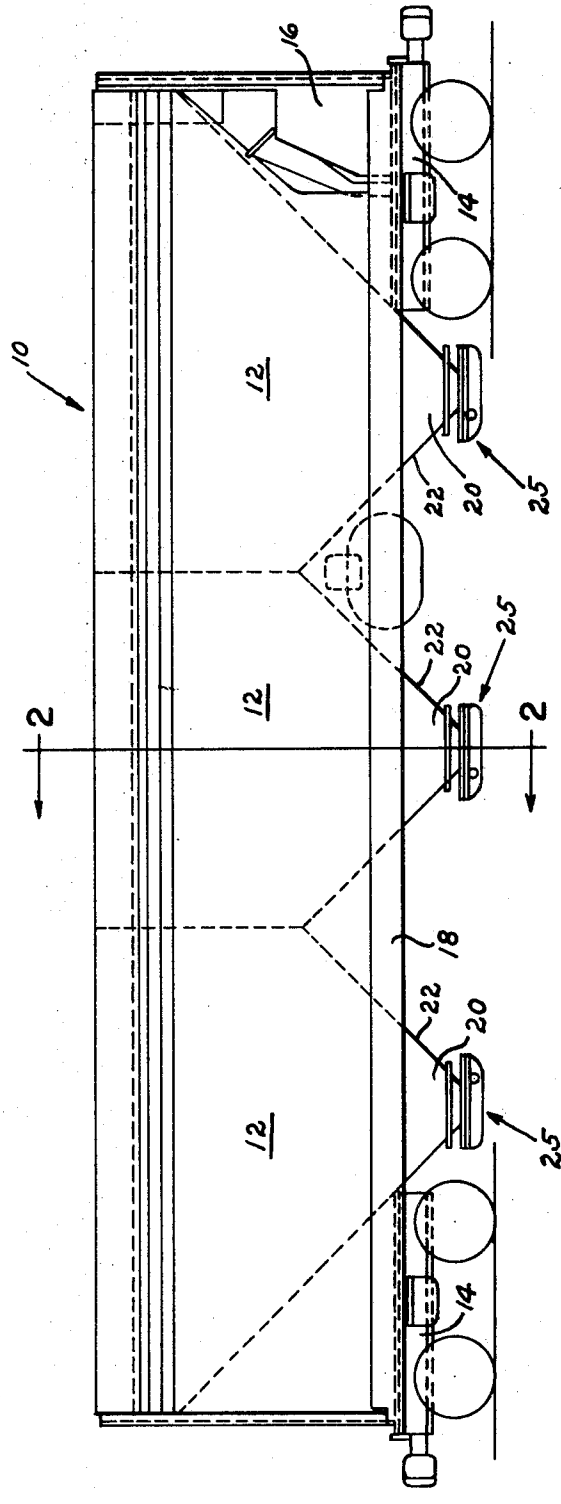


FIG. 1.

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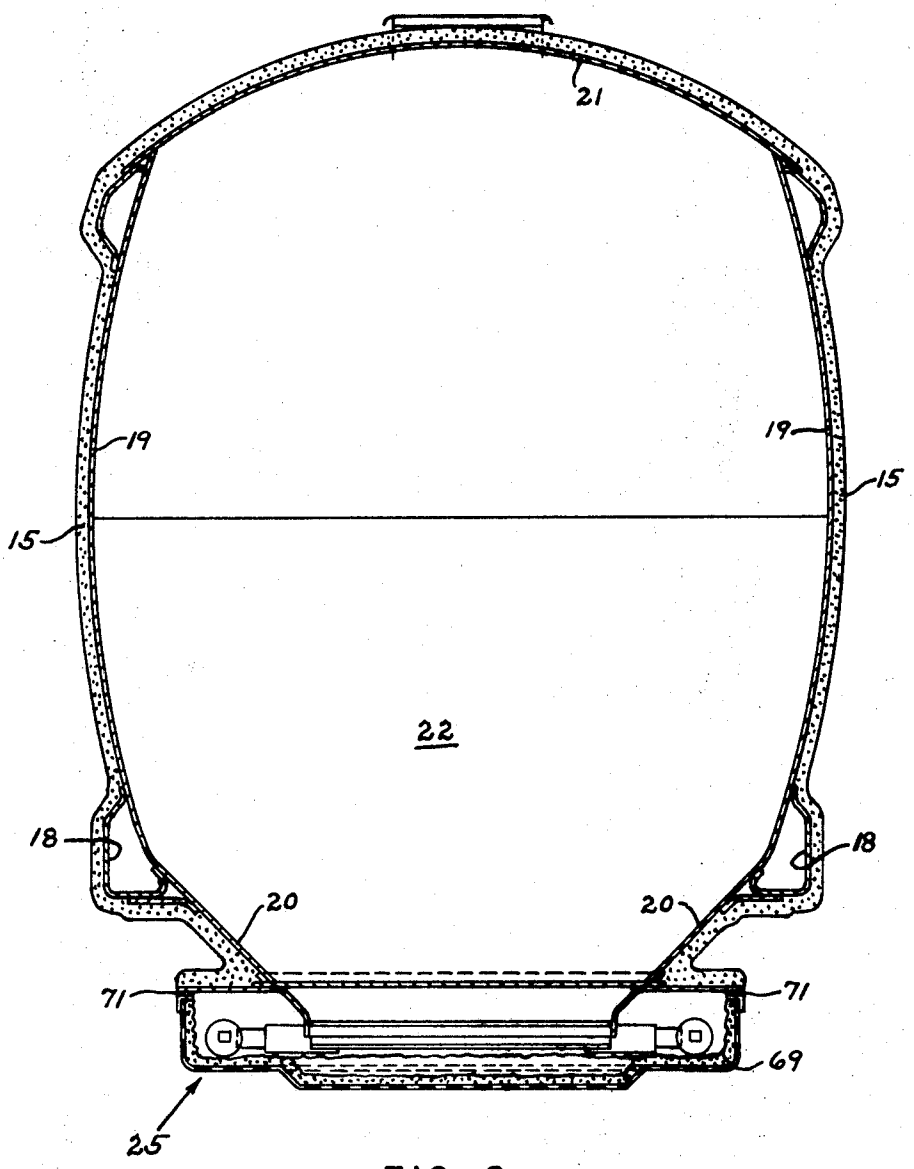


FIG. 2.

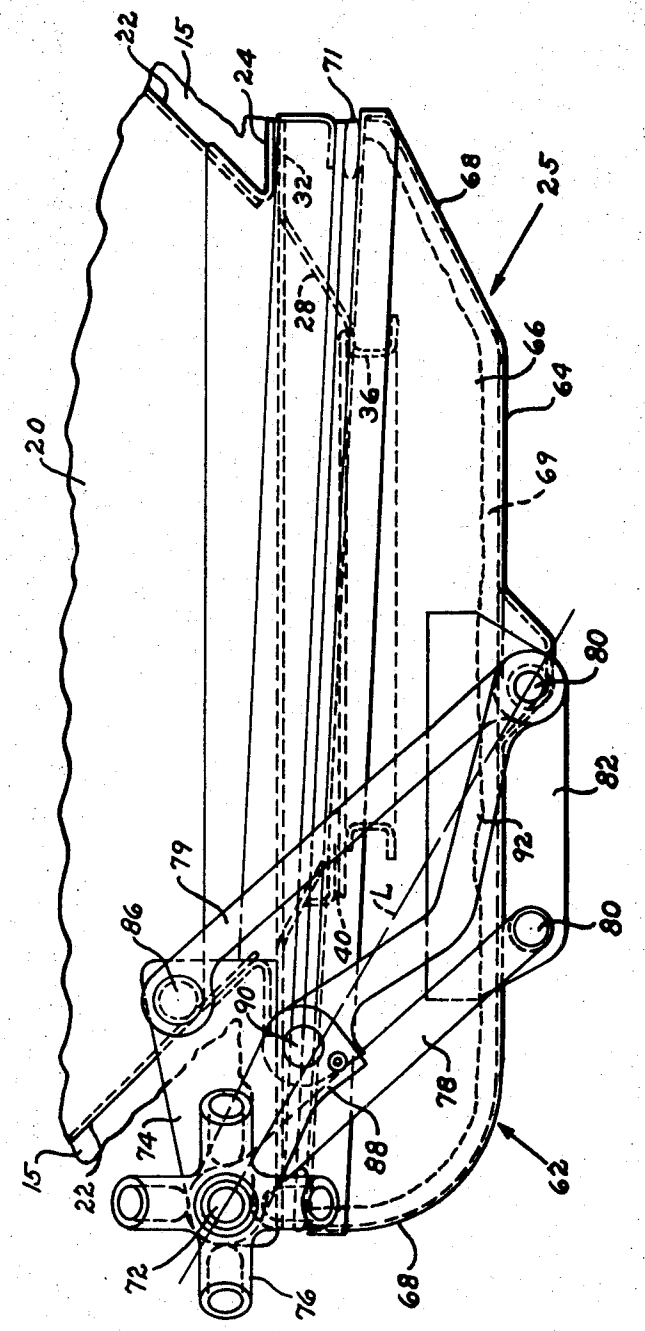

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FIG. 3.

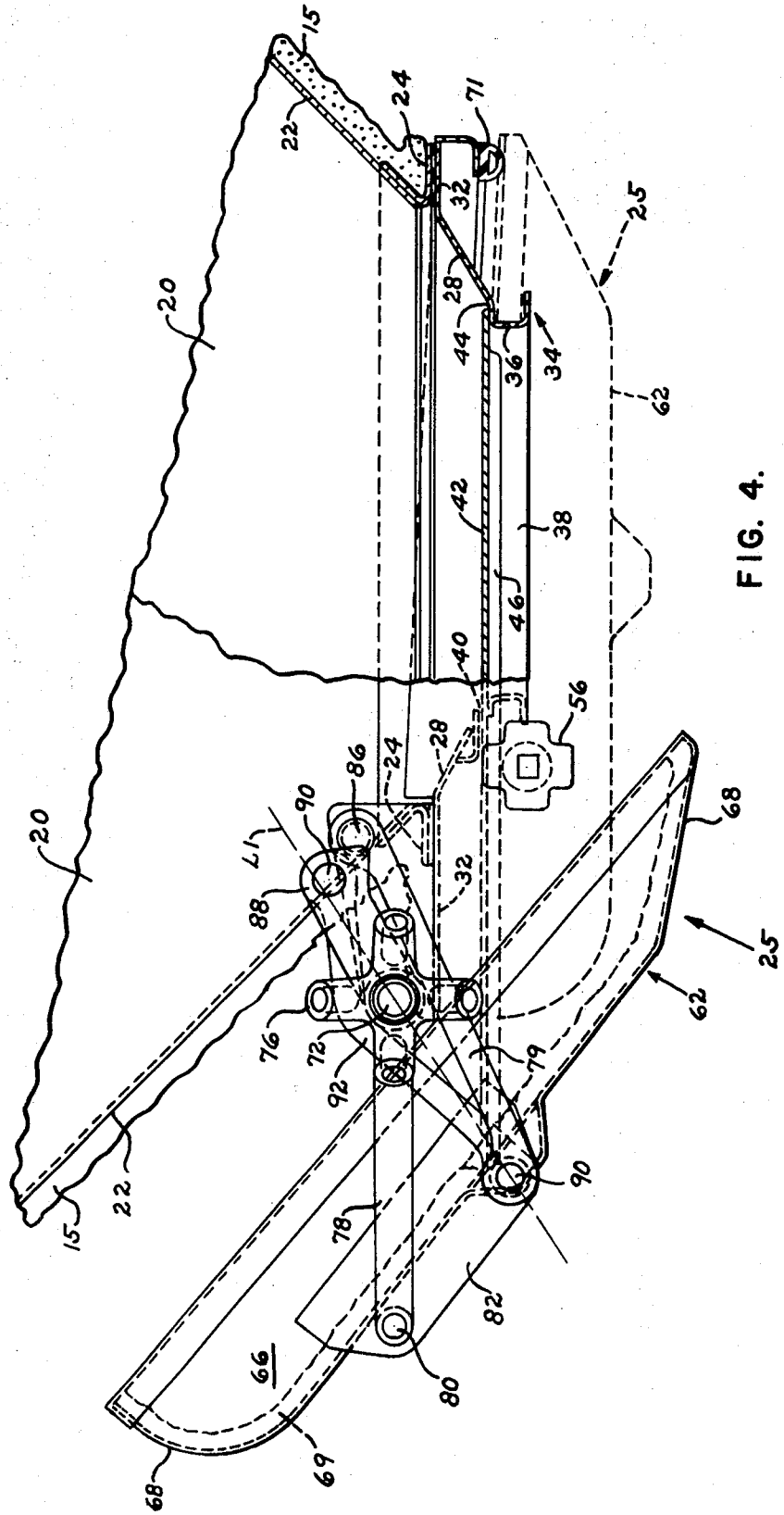

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FIG. 4.

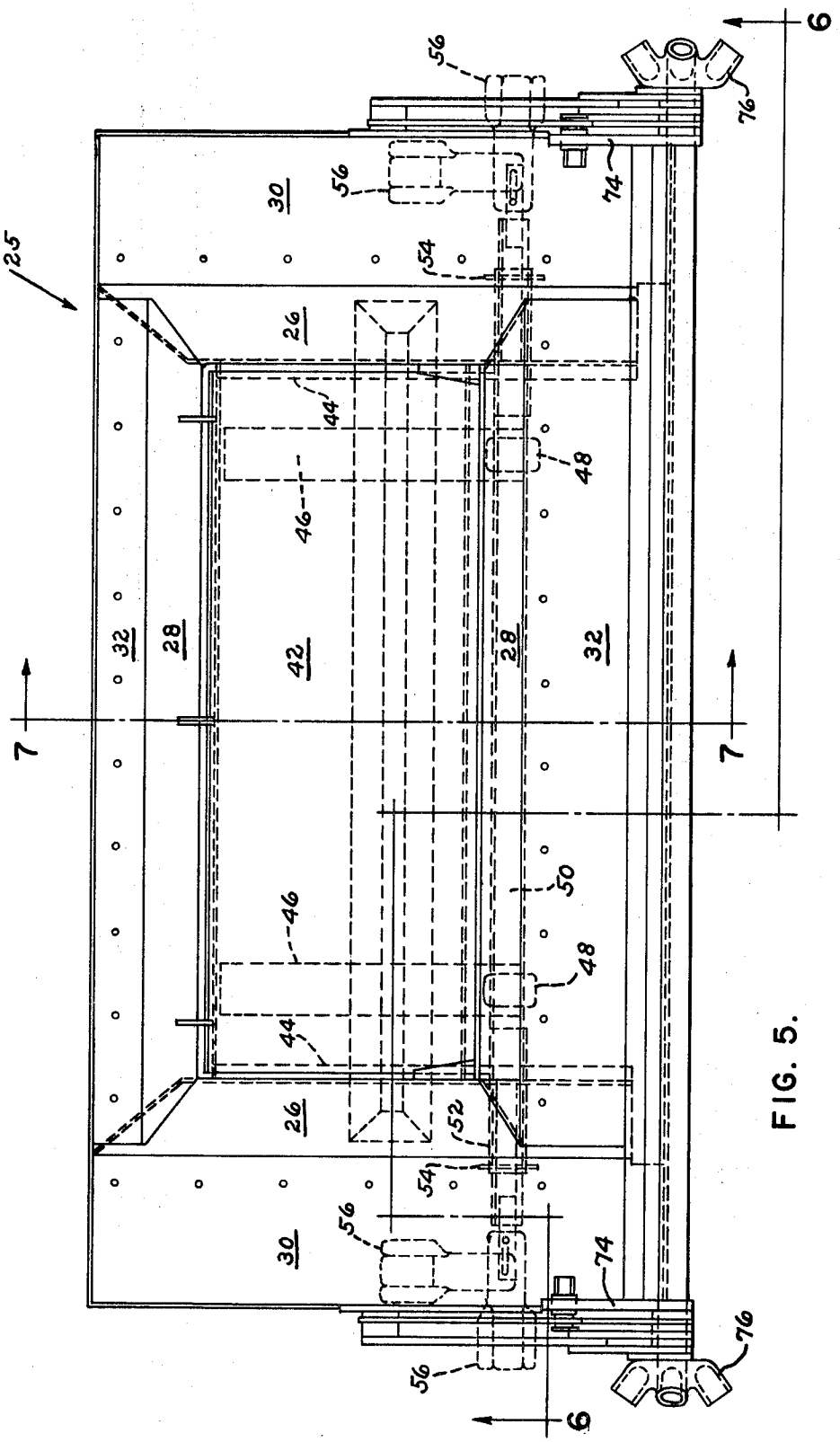

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FIG. 5.

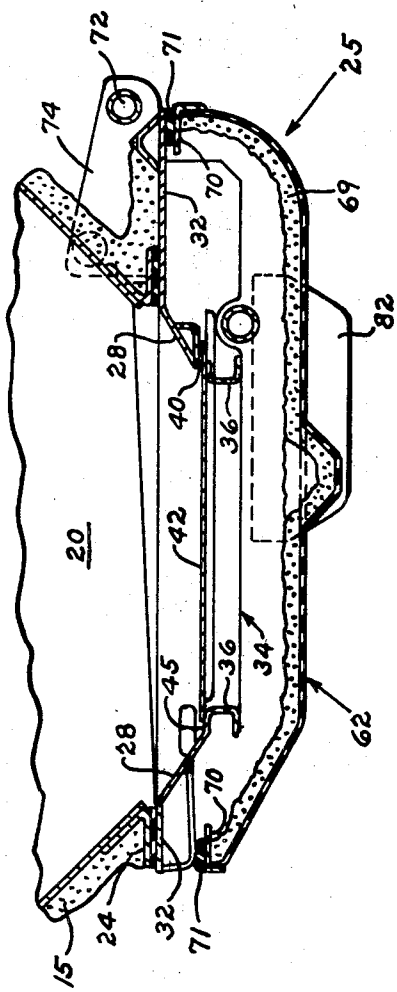

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FIG. 7.

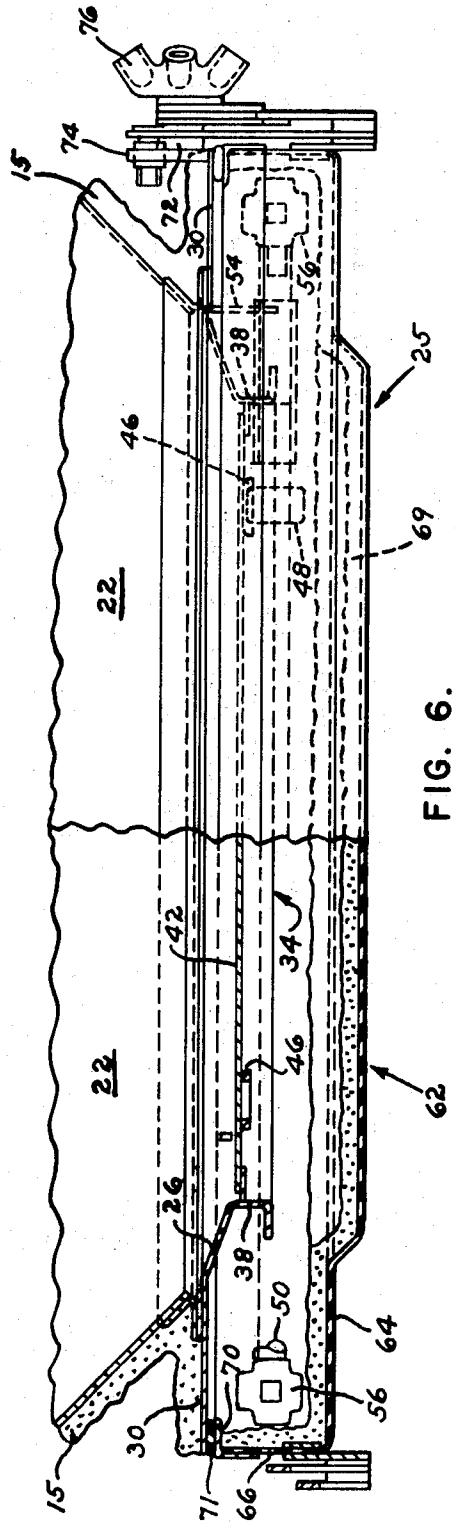
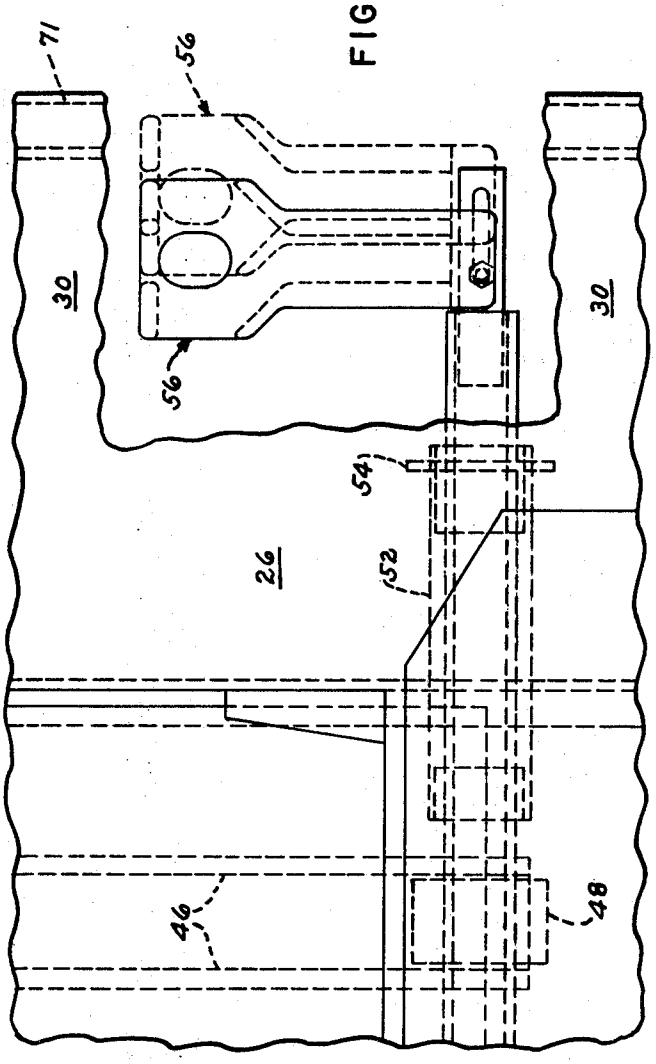

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FIG. 6.

FIG. 9.


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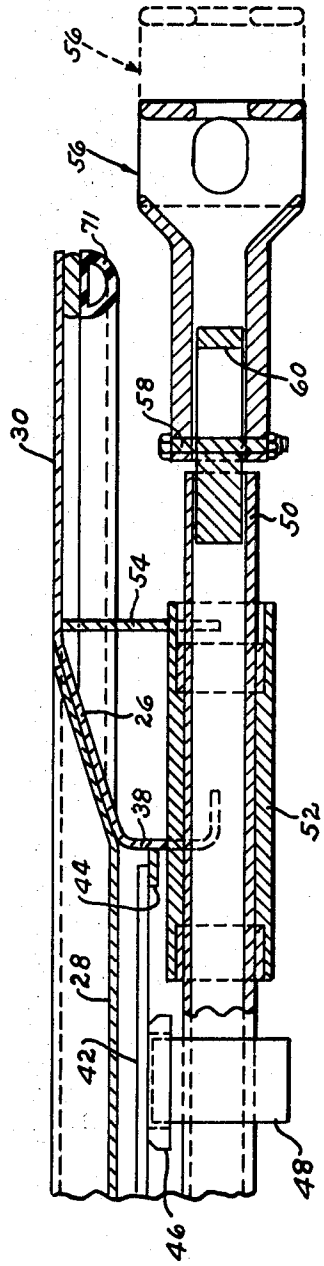

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FIG. 8.

EXTERIOR COVER ENCLOSING HOPPER GATE AND ACTUATING MECHANISM

BACKGROUND OF THE INVENTION

Heretofore, lower covers, such as shown in U.S. Pat. No. 3,343,886 dated Sept. 26, 1967 have been mounted beneath gravity gates of railway hopper cars to minimize the entrance of foreign matter as is desirable when foodstuffs and certain chemicals are being transported. However, the associated portions of the gravity gate, such as the rack-and-pinion drive means, have not been covered by such a cover and some foreign matter has been able to enter the bottom discharge outlet. Also, in the event such a hopper car has been insulated by a layer of polyurethane foam material or the like, heat losses have occurred at the bottom discharge outlets since portions of the discharge outlet have been necessarily exposed and not covered by the insulating foam material.

BRIEF DESCRIPTION OF THE INVENTION

The present cover is generally pan-shaped and covers the entire bottom discharge structure including the rack-and-pinion drive means. Then, the drive means are protected from foreign matter when the cover is closed. The cover is formed of a heat insulating material, such as a fiber glass material with a suitable resin binder, and insulates the entire discharge structure. When the hopper car is covered with a layer of insulating foam material, the foam material covers portions of the bottom discharge area not covered by the lower cover. In order to maintain the length of the cover within acceptable limits, the capstans of the pinion shaft are mounted for movement between an inward retracted position and an outward operable position. The capstans are moved to inward retracted position when the cover is moved to a covered position with respect to the bottom.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a side elevation of a covered hopper railway car having bottom outlet structures comprising the present invention thereon;

FIG. 2 is a transverse section taken generally along line 2–2 of FIG. 1 and indicating a layer of a polyurethane insulating foam material on the exterior of the railway car to provide insulation;

FIG. 3 is an enlarged end elevation of one of the bottom outlet structures shown in FIG. 1 and illustrating a lower cover in covering position beneath the bottom outlet structure;

FIG. 4 is an end elevation, certain parts broken away, showing the cover removed from beneath the discharge outlet to permit a discharge of lading when the gravity gate is opened;

FIG. 5 is a top plan of the bottom outlet structure removed from the railway car shown in FIG. 1 and showing the cover in a closed position covering the gate structure;

FIG. 6 is a section taken generally along line 6–6 of FIG. 5;

FIG. 7 is a section taken generally along line 7–7 of FIG. 5;

FIG. 8 is an enlarged longitudinal section of the pinion shaft and capstan thereon; and,

FIG. 9 is a plan of the pinion shaft and capstan shown in FIG. 8 illustrating the capstan being folded to a retracted position to permit the lower cover to easily cover the drive means for the gate.

Corresponding reference characters indicate corresponding parts throughout the drawings of this invention.

Referring now to the drawings for a better understanding of the invention, a covered hopper railway car is indicated generally **10** and includes a plurality of hoppers **12**. An end stub sill structure generally indicated **14** is provided adjacent each end of the railway car.

Railway car **10** is particularly adapted for ventilating the lading while in transit, to maintain a generally constant temperature therein. For this reason, a layer of insulation **15**, preferably a polyurethane foam material which may be sprayed on the exterior of the car, is shown particularly in FIG. **2**. Other types of insulating material, such as an interior foam material having an external fiber glass layer, would work in a satisfactory manner. Air-conditioning apparatus generally indicated **16** may be mounted adjacent an end of the car to provide air for the interior of the car and to provide a continuous recirculation of the air for aerating the interior of the car. Hollow side sills **18** may comprise air conduits for supplying air to the interior of the car. Curved hopper side sheets **19** extend between side sill **18** and a roof **21**. Hopper side slope sheets **20** and transverse slope sheets **22** funnel downwardly to the bottom discharge opening defined by a mounting flange **24** which extends about the circumference of the bottom discharge opening.

Mounted beneath the bottom discharge opening of each hopper **12** is a bottom outlet structure generally indicated **25** and comprising the present invention. Outlet structure **25** includes end slope sheets **26** connected to side slope sheets **28** to form an upper housing. Upper flanges **30** extend laterally outward from end outlet slope sheets **26** and upper flanges **32** extend outwardly from side outlet slope sheets **28**. Flanges **30** and **32** are secured, such as by a suitable bolt and nut combination or by welding, to superjacent flange **24**.

A lower housing generally indicated at **34** includes connected frame members **36** and **38**. Mounted within a slot **40** extending between an end slope sheet **28** and a lower frame member **36** is a gravity gate **42** as shown in FIG. **4**. Gate **42** rides along ledges **44** on frame members **38** and ledges **45** on the upper surface of frame members **36** to support gate **42** from movement between open and closed positions. Secured to the underside of gate **42** are racks **46**. Engaging racks **46** are pinions **48** mounted on a pinion shaft **50**. As shown particularly in FIG. **8** for supporting shaft **50** for rotation, a sleeve **52** is secured to extension **54** and adjacent frame member **30** adjacent each end of shaft **50**. Mounted on each end of shaft **50** is a capstan generally indicated **56** as shown in FIGS. **8** and **9**. Capstan **56** has a pin **58** received within a slot **60** in shaft **50** and is foldable to the position of FIG. **9** by movement of capstan **56** to the dotted line position of FIG. **8**. Capstan **56** may be engaged by a handspike or the like for rotation of shaft **50**.

Forming an important part of this invention is a lower cover generally indicated **62**. Lower cover **62** is generally pan-shaped having a bottom **64**, integral ends **66**, and sides **68**. An inwardly extending flange **70** extends about the entire upper surface of lower cover **62**. Cover **62** has an outer body preferably formed of a molded material, such as fiber glass and a suitable resin binder, and an inner layer **69** of an insulating material, such as a polyurethane foam. A rubber gasket **71** is secured in endless fashion about the entire circumference of bottom discharge outlet **25** and cover **62** is adapted to fit tightly against gasket **71** to seal cover **62** thereat.

Cover **62** is suspended for swinging movement between a closed position surrounding the gate **42** and the drive means therefor including capstans **56** and pinion shaft **50**. In this position, capstans **56** are folded to the position of FIG. **9** in order to accommodate lower cover **62** within limited space requirements. Cover **62** may be opened to the open position removed from beneath gate **42** to permit a gravity discharge of lading from the hopper **12** upon opening of gate **42**. To support cover **62** for swinging movement, a stub shaft **72** is mounted on a mounting plate **74** secured to the upper surface of flange **30** on opposed ends of outlet structure **25**. A capstan **76** is secured to the end of each stub shaft **72** and is adapted to be engaged by a suitable handspike or the like for rotating shaft **72**. Rotation of shaft **72** actuates a parallelogram linkage formed by links **78** and **79**. The lower ends of links **78** and **79** are mounted at pivots **80** on a support **82** secured to adjacent side **66** of lower cover **62**. The upper end of link **79** is pivoted at **86** to support plate **74** and the upper end of link **78** is pivotally mounted about shaft **72**. Secured to shaft **72** is an arm **88** pivotally connected at **90** to a locking link **92**. The lower end of locking link **92** is pivoted at **80** about the pivot of link **79** and the upper end of arm **92** is pivoted at **90** to arm **88**.

As shown in FIG. 3, with cover 62 in a closed position, pivot 90 is past a dead center position with respect to pivots 72 and 80 indicated by line L and the weight of cover 62 urges shaft 72 in a counterclockwise position thereby likewise urging cover 62 toward a closed position.

As shown in FIG. 4 when cover 62 is moved to a full open position, pivot 90 is moved past a dead center position indicated by line L1 with respect to pivots 72 and 80 thereby urging shaft 72 in a clockwise direction. Thus, weight of cover 62 holds cover 62 in such position until shaft 72 is rotated past dead center position, at which time the weight of the cover than causes cover 62 to swing downwardly to a position beneath gravity gate 42.

When cover 62 is in closed position, the entire lower housing 34 is covered as well as drive shaft 50, pinions 48, and capstans 56 which comprise the drive means for gravity gate 42. Thus, foreign matter and the like is not deposited on the drive means for gate 42 when cover 62 is closed. Since cover 62 has an inner layer 69 of an insulating material, bottom discharge structure 25 is effectively insulated to minimize any heat losses resulting when the remainder of the car is provided with exterior insulating material, such as a polyurethane foam material.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results obtained.

We claim:

1. In a railway hopper car having hopper sheets sloping downwardly to a bottom opening, a housing extending around the bottom opening and including a plurality of connected sides, a gate supported by said housing and mounted thereon for sliding movement between open and closed positions for the discharge of lading, drive means for said gate including a drive shaft having pinions thereon operatively connected to said gate for opening and closing said gate, a capstan adjacent each end of said drive shaft adapted to be engaged manually for rotation of said drive shaft, a bottom generally pan-shaped cover beneath the gate and fitting in a closed position against said housing about said gate and said drive means including said capstans thereby to seal said gate and drive means against the entrance of foreign matter and the like when said cover is closed, and means mounting the cover for movement between said closed position and a position removed from beneath the gate to permit the discharge of lading upon opening of the gate.

2. In a railway hopper car having hopper sheets sloping downwardly to a bottom opening, a housing extending around the bottom opening and including a plurality of connected sides, a closure carried by said housing and mounted thereon for movement between open and closed positions for the discharge of lading, manually operable means to move said closure between open and closed positions, a pan-shaped cover for fitting about said closure and manually operable means, said manually operable means to move said closure including a drive shaft having a capstan on each end thereof, said capstans being mounted for movement between retracted positions and extended positions whereby said cover fits about said drive means when the capstans are moved to the retracted positions, cover sealing means secured to said housing and extending generally about the circumference of the closure in outwardly spaced relation thereto, and linkage means supporting said cover for movement between a position beneath the closure and fitting tightly against said cover sealing means and about said drive shaft and associated capstans, and a position removed from beneath the bottom closure to permit the discharge of lading when the bottom closure is opened.

3. In a railway hopper car as set forth in claim 2, said hopper car having an exterior layer of polyurethane foam material thereon extending to a position adjacent said sealing means, said cover being formed of a heat insulating material to insulate said bottom outlet structure when in closed position about the closure.

4. In a railway hopper car having hopper sheets sloping downwardly to a bottom opening, a housing extending around the bottom opening and including a plurality of connected sides, a gate supported by said housing and mounted thereon for sliding movement between open and closed positions for the discharge of lading, drive means for said gate including a drive shaft having pinions thereon operatively connected to said gate for opening and closing said gate, a capstan on each end of said pinion drive shaft adapted to be engaged manually for rotation of said drive shaft, means mounting said capstans between inward retracted positions and extended positions, sealing means secured to said housing and extending generally about the gate in an outwardly spaced relation thereto, a bottom pan-shaped cover beneath the gate and fitting in a closed position against said sealing means about said gate and drive means including said capstans when said capstans are moved to inward retracted position thereby to seal said gate and drive means against the entrance of foreign matter and the like when said cover is closed, and means mounting the cover for movement between said closed position and a position removed from beneath the gate to permit the discharge of lading upon opening of the gate.

5. In a railway hopper car as set forth in claim 4, said means mounting the cover for movement comprising a parallelogram linkage mounting the cover for swinging movement in a generally vertical plane and means to releasably secure the linkage in an overcenter position at the open and closed positions of the cover.

6. In a hopper car as set forth in claim 4, said capstans being mounted on said drive shaft for pivotal movement and being folded inwardly when moved to retracted position for closing of the cover.

7. In a railway hopper car as set forth in claim 4, said hopper car having an exterior layer of polyurethane foam material thereon extending to a position adjacent said sealing means, and said cover having a fiber glass body and an inner layer of polyurethane foam material secured to the body.