Dec. 3, 1968 R. H. KRESS ETAL 3,413,894

BOTTOM DUMP DOOR ACTUATING MECHANISM FOR VEHICLES

Original Filed Oct. 23, 1965 3 Sheets-Sheet 1

Fig. 1

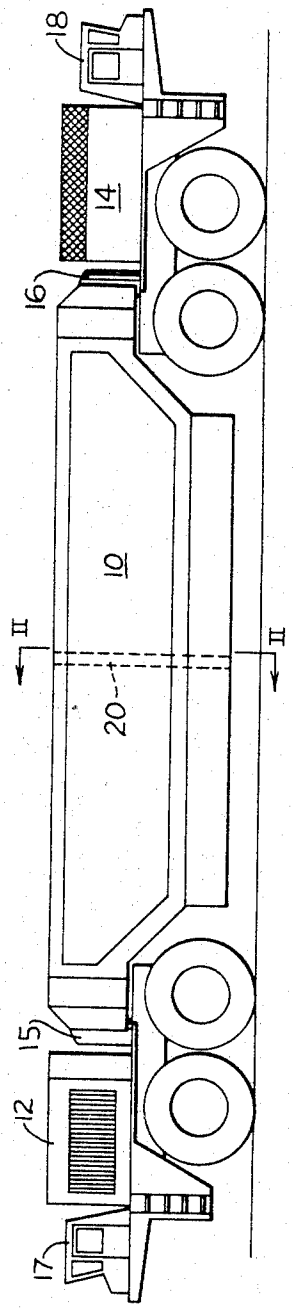
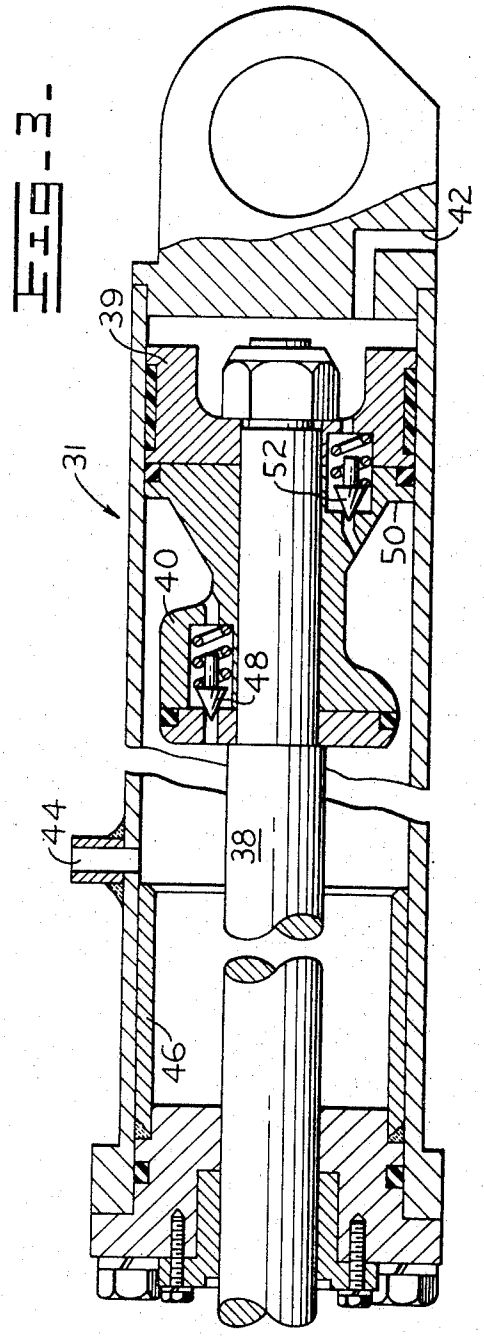


Fig. 3



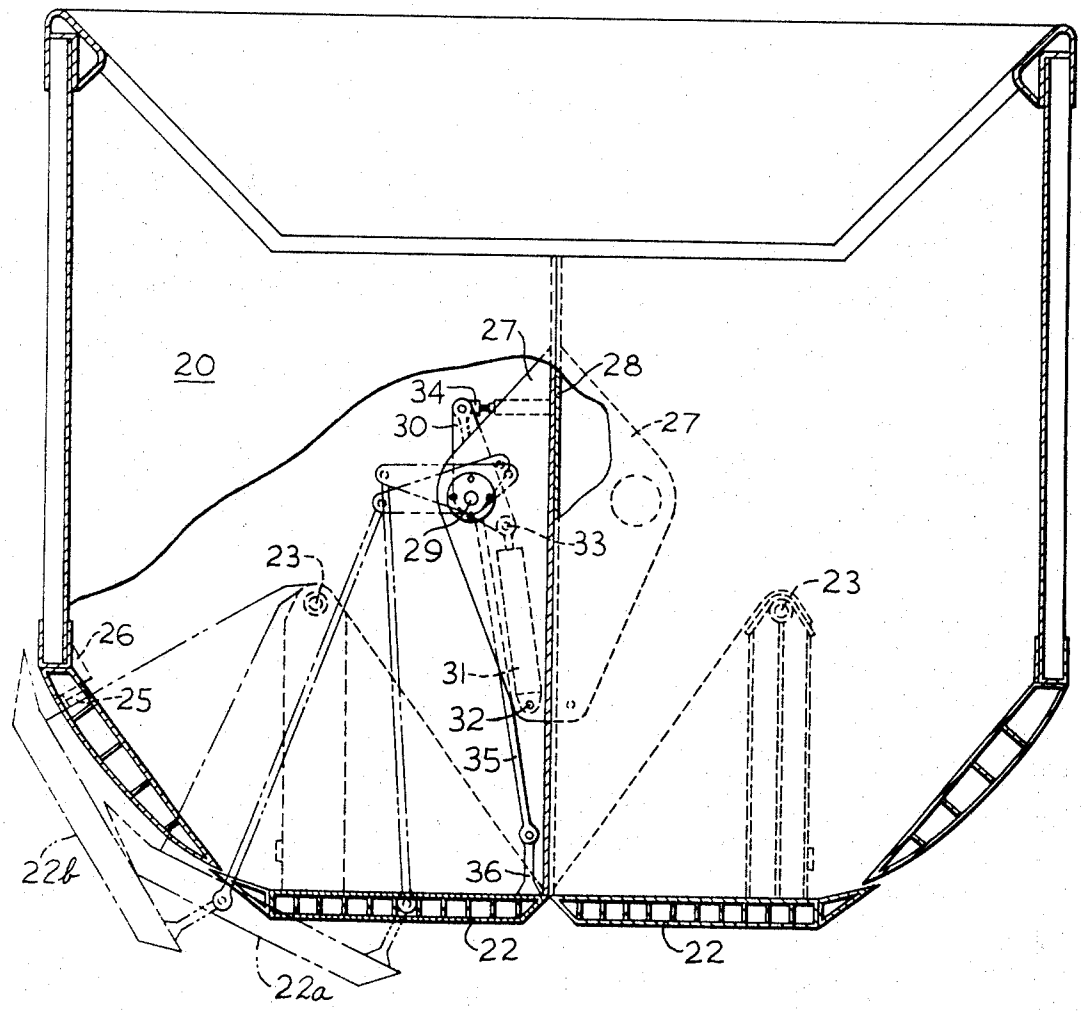
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BOTTOM DUMP DOOR ACTUATING MECHANISM FOR VEHICLES

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Fig. 2.



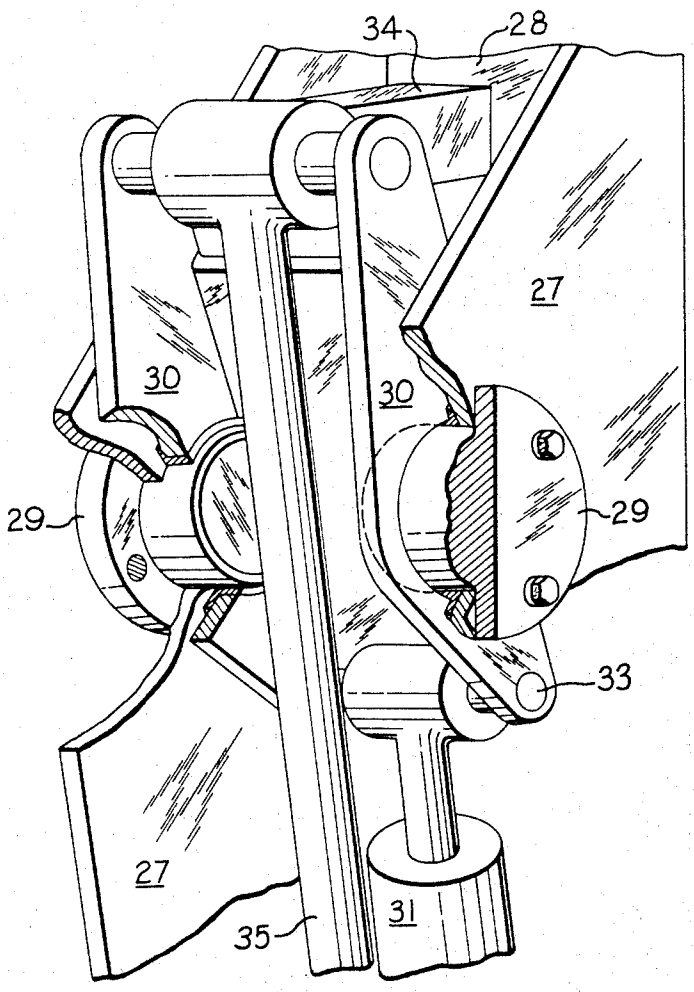
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BOTTOM DUMP DOOR ACTUATING MECHANISM FOR VEHICLES

Original Filed Oct. 23, 1965 3 Sheets-Sheet 3

Fig. 4



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United States Patent Office

3,413,894

Patented Dec. 3, 1968

3,413,894

BOTTOM DUMP DOOR ACTUATING MECHANISM FOR VEHICLES

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Original application Oct. 23, 1965, Ser. No. 503,037, now Patent No. 3,356,416, dated Dec. 5, 1967. Divided and this application Apr. 3, 1967, Ser. No. 649,379

2 Claims. (Cl. 91—28)

ABSTRACT OF THE DISCLOSURE

A hydraulic jack including a cylinder having large and small diameter sections and a piston having corresponding large and small diameter sections located in the cylinder. The cylinder has a discharge opening in its large diameter section adjacent the small diameter section, and the piston has a check valve in both its large and small diameter sections to effect either partial or full extension of the jack.

Cross-reference to related applications

This is a division of application Ser. No. 503,037, filed Oct. 23, 1965, now U.S. Patent 3,356,416, issued Dec. 5, 1967.

Background of the invention

This invention relates to power actuated mechanism for opening and closing the doors on bottom dump trucks or the like.

The invention is designed particularly for very large material hauling vehicles such as the 240 ton capacity vehicle disclosed in our assignees' co-pending application of Ralph H. Kress and Jackson C. Medley entitled "Suspension System for Heavy Vehicles," filed Sept. 21, 1965, Ser. No. 488,985, now U.S. Patent 3,330,578, issued July 11, 1967.

Vehicles of the kind disclosed herein are often used in mining operations and their contents dumped through bottom opening doors into bins or the like where it is desired that the doors be only partially opened to avoid spilling the material on the sides of the bins and in the path of travel of the vehicle wheels. It is also desirable sometimes to dump material in windrows and in this case the doors should be fully open.

It is an object of the invention to provide actuating mechanism to open and close bottom dump doors in which the doors may be selectively partially or fully opened. It is a further object of the invention to provide hydraulic actuating means for doors of the kind described comprising a hydraulic motor and means to prevent the weight of the doors when they are closed and the weight of the load on the doors from being transmitted to the hydraulic motors.

It is a still further object of the present invention to provide a special hydraulic jack which is operable, selectively through a short stroke or a long stroke for causing partial and full opening of doors or the like.

Still further objects and advantages of the invention are made apparent in the following specification wherein reference is made to the accompanying drawings for a detailed disclosure.

In the drawings:

FIG. 1 is a view in side elevation of a large truck embodying the present invention;

FIG. 2 is a sectional view with parts broken away and taken on the line II—II of FIG. 1; and

FIG. 3 is a central longitudinal section view through a hydraulic jack used for actuating the bottom dump doors to which the invention pertains.

The truck shown in FIG. 1 has a large body **10** for carrying material which may be discharged from bottom dump doors to be described. Two large tractor units **12** and **14** support the body **10** through king pins **15** and **16**. Each tractor unit has its own operator's cab **17** and **18** equipped with dual controls so that all operations can be controlled from either cab. A partition shown in dotted lines at **20** extends transversely of the truck body midway between its ends for strengthening the body and to provide a space for door actuating mechanism where it is protected from damage by contact with materials being hauled.

The arrangement of door actuating mechanism within the space provided by the partition **20** is shown in FIG. 2 wherein the near wall of the partition is partially broken away. In this figure, bottom dump doors are shown at **22** as pivotally suspended from pivots **23** arranged at opposite ends of the body. This enables the doors to be swung through the broken line positions illustrated in connection with the door at the left side of the body, the position **22*a*** being a partially open position and the position **22*b*** being a fully opened position in which the further opening movement is limited by engagement of pads **25** on the doors and stops **26** on the body. The mechanism for opening and closing one door is illustrated, it being understood that the mechanism for the other door is identical.

A supporting bracket of U-shaped cross-section illustrated at **27** is provided on each side of a central partition **28** which divides the partition **20** into two compartments. Each bracket provides a pivot **29** for a bell crank lever **30** which is actuated by a hydraulic jack **31** disclosed in greater detail in FIG. 3. The jack cylinder is pivoted as at **32** in the bracket **27** and the rod is pivotally connected at **33** to one end of the lever **30**. The full line position of the lever **30** is the position occupied with the door **22** closed and the upper end of the lever contacts an adjustable stop **34**. A rod **35** is pivotally connected with a bracket **36** on the door and at its opposite end to the lever **30**. In the closed position shown the upper connection of the rod **35** is over center with respect to the pivotal support of the lever so that weight of the door or any portion of the load resting on the door will tend to close the door rather than to open it and will therefore not be imposed on the hydraulic cylinder and other components of the hydraulic circuit.

Hydraulic jack **31** may be partially extended to swing the door to the position shown at **22*a*** or may be fully extended to swing the door into the position illustrated at **22*b***. This is accomplished through structure shown in FIG. 3 wherein the jack is shown as having a rod **38** with a piston head **39** at one end thereof and a smaller or auxiliary head **40** associated therewith. The hydraulic circuitry and controls are not disclosed herein as they are not considered necessary to an understanding of the present invention. It will suffice to know, however, that the door jacks may be actuated from controls in either tractor cab and that they may be supplied selectively with hydraulic fluid at a nominal pressure of say 1,000 pounds or a higher pressure of 1,600 to 2,000 pounds. The jack of FIG. 3 is illustrated in its retracted position as with the doors closed. To open the doors to a partially open position, fluid is supplied at the lower pressure at the head end of the jack as through a passage **42**. Fluid from the rod end of the jack is discharged and returned to the source through passage **44**. When the auxiliary head **40** of the piston enters a reduced diameter in the cylinder **31** provided by a sleeve **46** exit of fluid through passage **44** is prohibited and the piston comes to rest against the body of fluid within the sleeve. This is the partially extended position which moves the door to the position shown at **22*a*** in FIG. 2.

To impart further or full opening to the door the higher pressure is directed to the cylinder through the port **42** and so increases the pressure within the sleeve **46** until it opens a spring-closed check valve shown at **48** permitting fluid to escape from the sleeve through the auxiliary piston **40** and out through the passage **44**. Closing of the doors is effected by directing pressure inwardly of the cylinder through passage **44** which will first be effective against a surface **50** in back of the piston **39** and later also against the face of the auxiliary piston **40**.

During opening of the doors, the great weight of the load within the body tends to open the doors more rapidly than fluid can be expelled from the rod end of the jack through the passage **44**. In order to prevent undesirable delay in the opening of the doors excessive pressure in the rod end of the jack is relieved through a spring-closed check valve **52** communicating pressure from the rod end through the piston to the opposite end of the jack or in effect bypassing fluid to permit increased speed of the door opening operation.

We claim:

1. A hydraulic jack for opening a door to either of two positions comprising a cylinder with an area of small diameter adjacent one end and an area of larger diameter toward the opposite end, an extensible rod having a piston with a portion fitting said small diameter and a portion fitting the larger diameter, a discharge passage in the large diameter part of the cylinder adjacent the small diameter part whereby fluid in the small diameter part will prevent extension and prevent discharge of fluid through the passage when the piston enters the small diameter part, and check valve means opening communication between the small diameter part of the cylinder and the discharge passage when the small diameter portion of the piston is in the small diameter portion of the cylinder and when a predetermined pressure is attained.

2. The combination of claim **1** with a second check valve means in the piston for admitting fluid from the discharge portion of the cylinder to a supply side of the cylinder when pressure in the discharge portion exceeds a predetermined value.

References Cited

UNITED STATES PATENTS

2,408,338	9/1946	Parsons	91—392
2,558,810	7/1951	Bent	91—392
2,786,452	3/1957	Tucker	91—395
2,807,081	9/1957	Black	91—399
2,986,123	5/1961	Augustin	91—422
3,106,870	10/1963	Abrams	91—395
3,259,026	7/1966	Madland	91—436

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