July 27, 1937. C. E. COCHRAN 2,088,260

HYDRAULIC LOAD HANDLING SYSTEM FOR INDUSTRIAL TRUCKS

Filed Aug. 20, 1936 2 Sheets-Sheet 1

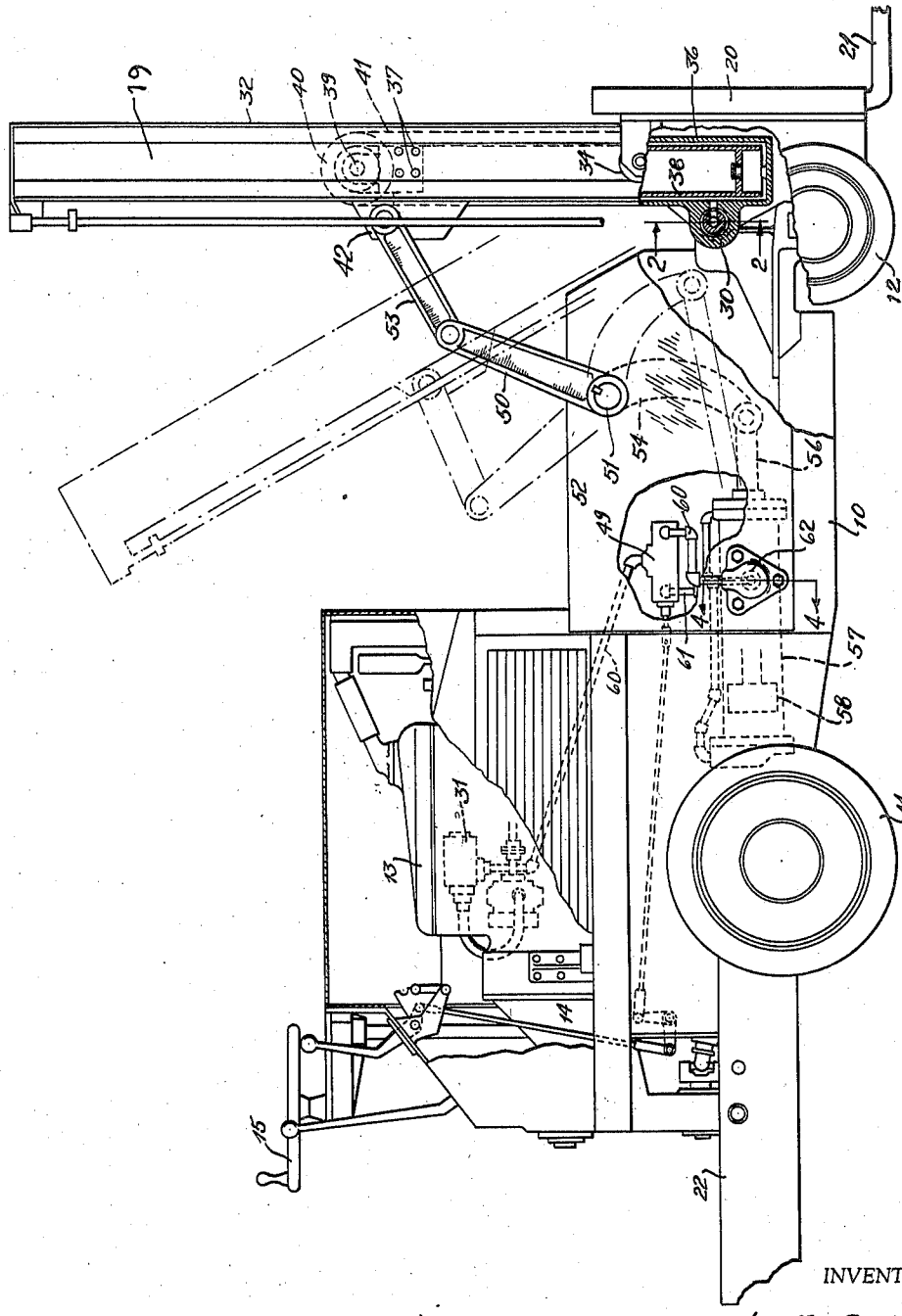


Fig. 1

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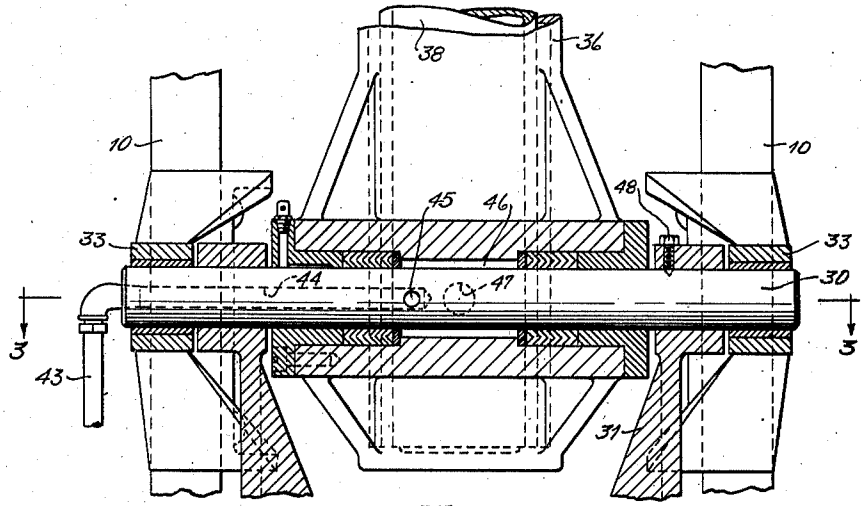


FIG. 2

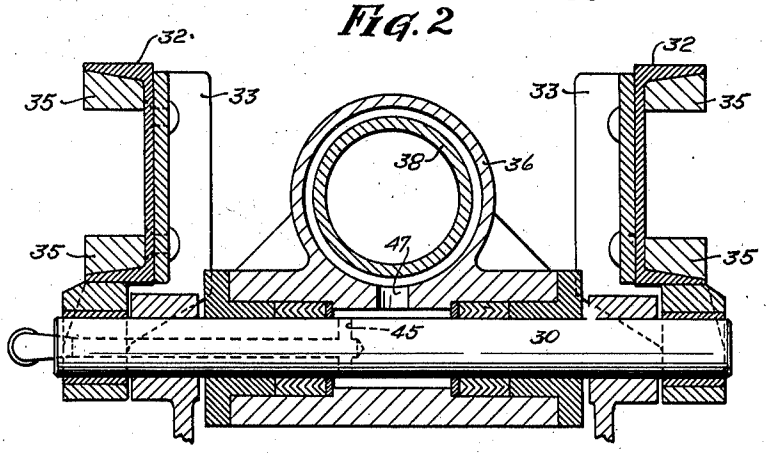


FIG. 3

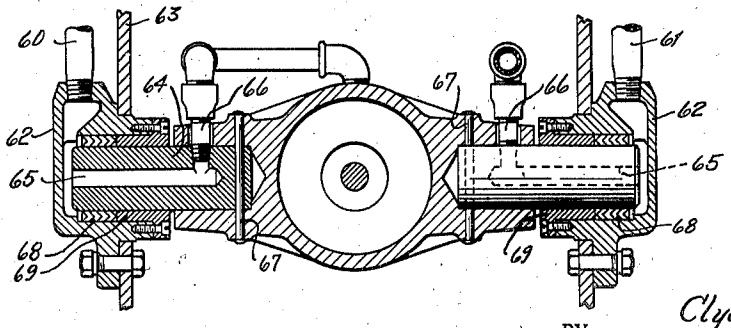


FIG. 4

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Patented July 27, 1937

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UNITED STATES PATENT OFFICE

2,088,260

HYDRAULIC LOAD HANDLING SYSTEM FOR INDUSTRIAL TRUCKS

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Application August 20, 1936, Serial No. 97,000

2 Claims. (Cl. 214—75)

This invention relates to an industrial truck, and particularly to an improved hydraulic system for the load handling mechanism of such a truck.

Industrial trucks for handling loads and transporting them from place to place in manufacturing establishments are comparatively well known at the present time. Such industrial trucks generally comprise a relatively short frame supporting a power unit at the forward end and supporting at its rearward end a load-engaging member, such as a platform adapted to engage a load resting comparatively close to the truck-supporting surface. Many of such trucks employ a load-engaging member arranged to be raised and lowered in a substantially vertical plane. Likewise, such load engaging member is generally pivotally mounted on the truck frame to enable a load to be tilted rearwardly into a position overlying, to a great extent, the truck frame, thereby decreasing the overall length of the truck and load, as well as positioning the weight of the load forwardly of the rear wheels of the truck, thereby to maintain a more nearly balanced weight distribution on the truck chassis.

The general object of the present invention is to provide an improved hydraulic system for the load handling mechanism of an industrial truck, which system will enable the handling of comparatively heavy loads without danger of leakage of the fluid used or failure of the fluid conduits.

A more specific object of this invention is to provide an improved hydraulic system for tilting and raising a load-handling device or load carrier relative to the frame of the industrial truck, which system will be so arranged that it may be conveniently operated and will eliminate the use of flexible or hydraulic conduits and enable substantially rigid conduits and conduit connections to be used throughout the entire hydraulic system.

Other objects of the present invention will become more apparent from the following description, reference being had to the accompanying drawings in which a preferred embodiment of the invention is illustrated. The novel features of the invention will be more fully set forth in the claims.

In the drawings, Fig. 1 is a side elevation of an industrial truck embodying my invention, certain parts of the truck being broken away to more clearly illustrate the internal construction; Fig. 2 is a fragmentary vertical section, as indicated by the lines 2—2 on Fig. 1, and on a somewhat larger scale; Fig. 3 is a horizontal section, the plane of the section being indicated by the lines 3—3 on Fig. 2; Fig. 4 is a fragmentary vertical section, as indicated by the line 4—4 on Fig. 1, the scale being substantially the same as that of Figs. 2 and 3.

In the drawings, I have illustrated my invention embodied in an industrial truck of the type generally indicated in the application of Sheldon K. Towson, Serial No. 80,276, filed May 18, 1936, and assigned to my assignee, The Elwell-Parker Electric Company. In general, this truck comprises a main frame 10, supported at its forward end by a pair of dirigibly arranged driving wheels 11 and at its rearmost end by a pair of load-supporting wheels 12. Supported on the forward end of the frame 10 is an internal combustion motor 13, which is connected with the dirigible driving wheels 11 by suitable clutch and power transmission mechanisms mounted within a housing 14. A detailed description of such clutch and transmission mechanism may be had by reference to the copending application of Letters Patent of Sheldon K. Towson, Serial No. 76,372, filed April 25, 1936, and assigned to my assignee. The wheels 11 and 12, all of which are preferably dirigibly arranged, are suitably connected to be controlled by a steering wheel 15.

At the rearward end of the truck is an upright guideway 19, on which a load-supporting carriage 20 is mounted for vertical movement. This load-supporting carriage may be provided with a platform member, or as indicated, with a pair of rearwardly extending load-engaging forks 21, which are adapted to be positioned relatively close to the truck supporting surface to enable them to be projected beneath a load by the rearward movement of the truck, whereupon the carriage 20 may be raised to lift the load clear of the truck-supporting surface, and the load transported from place to place. The forward end of the truck is provided with an operator's platform 22, adjacent which are various control members including the steering wheel 15, heretofore mentioned.

As illustrated in Fig. 1, the load-handling mechanism includes an upright guideway 19. This guideway is pivotally mounted adjacent its lower end to a transversely extending shaft member 30, which is mounted in suitable brackets 31 carried by the main frame 10. This pivotal arrangement of the guideway permits the load and guideway to be tilted forwardly in a position indicated by the dotted lines in Fig. 1, thus enabling

the weight of the load to be moved to a position substantially over the axis of the load-bearing wheels 17, thereby permitting movement of comparatively heavy loads from place to place, without the use of excessive counter-weights at the forward end of the truck.

The motor 13 operates a hydraulic pump 31, which serves as a source of power to raise and lower the carriage 20 in the guideway 19. As illustrated in Figs. 1 and 3, the guideway 19 comprises a pair of outwardly facing channel members 32, supported by bearing members 33, which are journalled on the shaft 30, heretofore mentioned. The carriage 20 is provided with suitable rollers 34, to engage guiderails 35, carried by the flanges of the guideway channels 32, thus enabling the carriage to be raised or lowered relative in the guideway with a minimum amount of friction. Mounted between the channel members 32 of the guideway 19, and pivotally secured at its lower end to the pivot shaft 30, is a hydraulic cylinder 36, which, at its upper end, is secured as by suitable rivets 37, to the channels 32 of the guideway. Mounted for vertical movement in the usual manner within this cylinder is a piston 38, at the upper end of which is mounted a crosshead 39, provided with a sprocket 40, around which a chain 41 is looped, one end of this chain being secured to a suitable bracket 42, rigidly connected with the guideway 19, while the other end is secured to the carriage 20 in the usual manner. Consequent upon the raising of the piston in the cylinder the load engaging carriage will be moved upwardly.

Pressure is applied to the cylinder 36 from the pump 31. In Fig. 2, I have shown a conduit 43. This conduit leads from the pump 31 to the pivot shaft 30, which is provided with an axially extending passageway 44, and a counterbore 45. This counterbore communicates with an annular recess 46 formed between the shaft and the cylinder housing, and which in turn communicates with the interior of the cylinder through a suitable opening 47. The shaft 30 is prevented from rotation by a set screw 48, as shown in Fig. 2.

A suitable valve, similar to that indicated at 49 in Fig. 1, is provided to control the passage of oil from the pump to and from the cylinder 36. A detailed description of a valve mechanism suitable for this purpose is given in the copending application for Letters Patent, Serial No. 80,276, heretofore referred to.

The arrangement of the cylinder 36, together with the improved pivotal mounting therefor, and the connection between the shaft 30 and its connection with the conduit 43, permits the use of a rigid conduit and eliminates the use of flexible conduits or coupling members, which might cause serious damage due to seepage of oil, especially when the truck is used for comparatively heavy loads of say from five to ten tons, as is often the practice in modern industrial establishments which use this type of industrial trucks.

As heretofore mentioned, the load-engaging member 20 and the guideway 19 are rocked as a unit about the shaft 30 to tilt the load to a position indicated by the dotted lines shown in Fig. 1. As there shown, the guideway 19 is tilted by a lever 50, which is shown as rigidly secured to a shaft 51 journalled in a frame member 52. This lever is connected at its upper end by a link 53, with the guideway bracket 42. Rigidly secured to the shaft 51 is a second lever 54, which extends downwardly, and is pivotally connected at its lowermost end with a piston 56 of a second hydraulic cylinder 57. The piston 56 has as indicated an enlarged head 58, enabling pressure to be applied thereto from either end of the cylinder, so as to rock the lever members 50 and 54 in either a clockwise or counter-clockwise position about the axis of the shaft 51, and thereby tilt the guideway either forwardly or rearwardly, as desired.

The cylinder 58 is supplied with fluid pressure from the pump 31. As shown, a suitable rigid conduit 60 leads from the pump 31 to the valve 49, heretofore mentioned. From this valve rigid conduits 61 and 62 lead to opposite ends of the cylinder. As shown in Fig. 4, each of the conduits 60 and 61 communicate with respective hollow bearings 62. Each bearing is secured to the truck frame by a bracket 63, and journalled in each bearing is a stub-shaft 64, each of which, as shown in Fig. 4, has an axially aligned opening 65, communicating with the hollow interior of its bearing and through a suitable conduit 66 communicates with respective cylinders 58. The stub-shaft 65 is secured to the cylinder housing by suitable pins 67. The bearings 62 each are provided with the packing 68 and a packing gland 69, to prevent the escape of the fluid pressure. Thus it will be seen that the piston 58 may rock about the axis of the bearings 62, without disturbing the hydraulic connections and without necessitating the use of either flexible conduits or universal connections in the hydraulic conduit connecting the source of fluid pressure with the tilting cylinder.

From the foregoing description, it will be seen that I have provided a tier-lift industrial truck with hydraulic operating mechanism for both raising the load and tilting the load, which mechanism eliminates the use of flexible conduits or universal connections between the operating cylinders and the source of hydraulic power, which is advantageously mounted on the main truck frame, and permitting a very compact and economical arrangement, which is well adapted for handling of comparatively heavy loads with safety both to the truck and the load.

I claim:

1. A hydraulic load-handling system for an industrial truck, having a frame, supporting wheels therefor and a load-engaging member pivotally mounted on said frame, said system comprising an operating mechanism to rock the load-engaging member about its pivot and including a hydraulic cylinder having a pivotal connection with the truck frame, a piston within said cylinder, a link pivotally connecting the piston to the load-engaging member, a source of hydraulic energy carried by the truck frame, the pivotal connection between said cylinder and the truck frame comprising a pair of hollow shaft-like members extending in opposite directions in a plane normal to the axis of said cylinder, a pair of cap-like bearing members cooperating with respective shaft members, each bearing member being secured to the truck frame and being provided with a chamber adapted and arranged to be in communication with the respective hollow shaft member, a rigid conduit interconnected between the source of hydraulic energy and its respective shaft, a second rigid conduit connected between one of said hollow shaft members and one end of said cylinder, and a third rigid conduit interconnecting the other hollow shaft member with the other end of said cylinder.

2. In an industrial truck, the combination with a wheel supported frame, a normally vertically

extending guideway pivotally mounted on said frame, a load-engaging member mounted for vertical movement in said guideway, hydraulic operating means to rock the load-engaging member about its pivot, said means including a hydraulic cylinder pivotally mounted on said frame for movement as a unit with said guideway, a piston cooperating with said cylinder and operably connected to the load-engaging member, the pivotal connection between said cylinder and said frame including a hollow bearing member secured to said cylinder and having an annular oil chamber therein, a passageway between said chamber and said cylinder, a source of hydraulic energy carried by said truck frame, a shaft extending through said bearing member and secured against movement relative to said frame, a passageway in said shaft in communication with said chamber and a rigid conduit connecting said passageway with the source of hydraulic energy.

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