FORK LEVEL INDICATOR FOR A LIFT TRUCK

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ABSTRACT

A lift truck, including a mast and fork structure movable upwardly and downwardly thereof, includes a level indicating device associated with such mast. The level indicating device includes a casing fixed to the mast, and a cylindrical member pivotally mounted within the casing and having its center of gravity spaced from the pivot axis thereof. Indicating marks associated with the cylindrical member and casing may be viewed by the operator of the lift truck to indicate the relative positions of the cylindrical member and casing, the position of the cylindrical member always being such that the center of gravity thereof lies directly below the pivot axis, so that the levelness of the mast and fork lift structure may be observed.

4 Claims, 4 Drawing Figures
FORK LEVEL INDICATOR FOR A LIFT TRUCK

BACKGROUND OF THE INVENTION

This invention relates to level indicating devices, and more particularly, to such a device for assisting the operator of a lift truck in positioning the lifting fork thereof in a level fore and aft position during operation.

In the use of a lift truck which utilizes forks for lifting and transporting loads, it is extremely important for the proper efficient use thereof that such forks be positioned in a substantially level manner. Such positioning, for example, is required in order to prevent the tips of the forks from striking pallets, or the products stacked upon such pallets, when attempting to load them on to such forks. Similarly, it is necessary that the load on the forks be disposed in a substantially level position to prevent damage when depositing the load on storage racks or upon other loads. It is also particularly important for the loads to be disposed in a substantially level manner at extreme lifting heights for safety reasons. However, in relation to this important point, it is extremely difficult under ordinary circumstances for an operator of the vehicle to determine if the load is in such a level position, if the forks are at such extreme heights that they are substantially above his eye level.

In an attempt to overcome these problems, several types of level indicating devices have been previously devised for assisting the operator in determining the position of his lifting forks. One type of level indicator currently being used includes a pair of relatively movable indicating elements connected between the mast and the body of the truck. However, such an indicator is capable of only providing the operator with the position of the forks relative to the lift truck by measuring the angle therebetwean, and thus is not capable of indicating a true horizontal position of the forks. Consequently, deviations due to an irregular or a sloped floor surface or the bending of the forks and mast under the weight of the load are not taken into account by such an indicator. Also such an indicator has been found not to be readily adaptable to a wide variety of lift trucks, and is relatively expensive.

Another type of level indicator uses various types of gravity sensing electrolytic potentiometers which are relatively complex and expensive, and have been found to become relatively frequently inoperative, due to a failure in any of many components thereof.

Devices which indicate the position of one element relative to another, similar to the first-described prior art system above, are disclosed in U.S. Pat. No. 2,767,394 to Arnott et al., U.S. Pat. No. 3,017,046 to Runci et al., U.S. Pat. No. 3,049,257 to Bertenshaw et al., U.S. Pat. No. 3,077,179 to Evanson, U.S. Pat. No. 3,141,563 to Fisher, and U.S. Pat. No. 3,251,493 to Popelier. Similar to such first-described prior art embodiment, these devices are not capable of indicating a true level or horizontal condition but are only capable of indicating the position of one member relative to another.

Of more general interest in this area are U.S. Pat. No. 2,611,188 to Bell, and U.S. Pat. No. 3,319,816 to Christenson.

SUMMARY OF THE INVENTION

It is an object of this invention to provide level indicating apparatus which is capable of indicating to the operator of a lift truck a true substantially horizontally or level position of the forks thereof.

It is a further object of this invention to provide level indicating apparatus which, while fulfilling the above object, may be adapted to any of a wide variety of lift trucks.

It is a still further object of this invention to provide level indicating apparatus which, while fulfilling the above objects, can easily be adjusted for wear in the lifting apparatus, for bent forks of the lifting apparatus, or the like.

It is a still further object of this invention to provide level indicating apparatus which, while fulfilling the above objects, is extremely simple in construction and convenient for use.

Broadly stated, the invention comprises a level indicating device for use with a member, such level indicating device comprising a first body fixed relative to the member, and a cylindrical body having a center of gravity spaced from the longitudinal axis of the cylinder. Means pivotally interconnect the cylindrical body and first body so that the cylindrical body is pivotable relative to the first body about the longitudinal axis of the cylinder. First indicia means are fixed relative to the first body, and second indicia means are fixed relative to the cylindrical body and movable therewith upon pivoting thereof, variations in the levelness of the member which causes pivoting of the cylindrical body relative to the first body being indicated by variations of the relative positions of the first and second indicia means.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the invention will become apparent from a study of the following specification and drawings, in which:

FIG. 1 is a side elevation of a lift truck incorporating the inventive level indicating device;

FIG. 2 is a perspective view of the level indicating device of FIG. 1;

FIG. 3 is a front elevation of the level indicating device of FIGS. 1 and 2; and

FIG. 4 is an exploded perspective view of the level indicating device as shown in FIGS. 1–3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a level indicating device is generally shown at 10 in association with a fork-type truck 12. The lift truck 12 includes a lift truck body 14 having an operator's station provided thereon generally indicated at 16. A substantially upright mast 18 is pivotally attached at its lower end to the body 14 about a pivot axis shown at 20 for tilting movement in a fore and aft direction relative to the body 14. One or more tilt jacks 22 are pivotally connected between the mast 18 and body 14 to effect such fore and aft tilting of the mast 18. A vertically movable lifting platform 24 is
connected to a movable mast member 26 associated with the mast 18 and includes a pair of horizontally extending laterally spaced forks 28 suitably connected thereto. The platform 24 and forks 28 make up load carrying means movable upwardly and downwardly of the mast 18.

As best shown in FIGS. 2-4, and more particularly in FIG. 4, the level indicator 10 of the present invention includes a first body 32 or casing having a pair of vertically disposed laterally spaced sidewalks 34,36. The peripheries of the sidewalks 34,36 are interconnected by a forwardly disposed upright mounting wall 38, opposite top and bottom walls 40,42, respectively, and an arcuately shaped face wall 44. The face wall 44 defines an opening 46 which is closed by a magnifying lens 48. A centrally disposed inwardly projecting cylindrical sleeve 50 is formed on the sidewalk 36, and the opposite sidewalk 34 is provided with a circular opening 52 which is normally closed by a circular cover plate 54. The cover plate 54 includes a transversely disposed shaft 56 extending inwardly therethrough, having an enlarged cylindrically shaped boss 58 formed on its end adjacent to the cover plate 54. In the instant embodiment, the shaft 56 and the boss 58 are formed integrally with the cover plate 54 and are of the same material, i.e., for example, nylon. The opposite end of the shaft 56 is received within and mounted by the sleeve 50 which is coaxially aligned therewith.

The casing 32, made up of sidewalks 34,36, wall 38, top and bottom walls 40,42, face wall 44, magnifying lens 48, and cover plate 54, defines a chamber 60. A cylindrical body 62 is disposed within the chamber 60 (FIG. 4). Such cylindrical body 62 defines a bore 64 formed therethrough along the longitudinal cylindrical axis 66 thereof. A sleeve bearing 68 is secured within the bore 64 for pivotally or rotatably mounting the cylindrical body 62 on the shaft 56. The cylindrical body 62 is pivotable relative to the casing about the longitudinal axis 66 of the cylinder. The opposite ends of the sleeve bearing 68 are disposed adjacent the inward ends of the sleeve 50 and the boss 58, respectively, to limit the axial movement of the cylindrical body 62 on the shaft 56.

The cylindrical body 62 includes a first body portion 70 which defines the cylindrical outer surface of the cylindrical body 62, and is of material of relatively low density, such as plastic. The cylindrical body portion 70 defines a bore 72 spaced from the longitudinal axis 66 of the cylinder as shown, and in which is disposed a second body portion 74 of relatively high density material, such as lead. It will be seen that, by the above construction, the center of gravity of the cylindrical body 62 is spaced from or offset from the longitudinal axis 66 of the cylinder defined by such cylindrical body 62, and the body 62 will adopt a position on shaft 56, under the force of gravity, with the center of gravity thereof substantially directly below the longitudinal axis 66 of the cylinder.

A segment of colored tape 76, i.e., indicia means, having a horizontal transversely disposed bisecting line 78 formed thereacross, is affixed to the cylindrical surface of the cylindrical body 62. The magnifying lens 48 permits clear viewing of the line 78 across the tape 76. A pair of strips of tape 80,82 (i.e., indicia means), are affixed to the outside of the face wall 44 on opposite sides of the lens 48. The strips of tape 80,82 are individually provided with horizontally disposed lines 84,86 respectively, extending thereacross.

A threaded aperture 88 which is normally closed by a plug 90 is formed in the top wall 40 to permit the filling of the chamber 60 with viscous fluid, such as glycerine, for damping oscillatory movement of the cylindrical body 62 during operation of the device 10.

In the use of the device 10, the casing 32 is attached to the mast 18, such casing 32 being positioned so that the longitudinal axis 66 of the cylinder of cylindrical body 62 is substantially parallel to the pivot axis 20 of the mast 18. The device 10 should be attached to such mast 18 so as to be located as near as possible to the vehicle operator's eye level. The casing 32 is attached to a substantially vertical surface of the mast 18 by cementing the mounting wall 38 thereto with any suitable adhesive. Once the casing 32 is so secured to the mast 18, the device 10, is calibrated by raising the lifting forks 28 to their maximum height and accurately leveling them by the use of a carpenter's level or other device. With the forks 28 in such a level empty position, the indicating device 10 is calibrated by affixing the strip of tape 80 on the left hand side of the lens 48 under an "L" or empty designation formed on face wall 44, so that its line 84 is aligned with the line 78 on the tape 76 on cylindrical body 62. The level indicating device 10 is now set to indicate the level or tilt of the forks 28 in their unloaded state.

The above procedure is repeated with the forks 28 handling the heaviest loads that are to be handled, and raised to their maximum height. When the load is in a level position, the strip of tape 82 is affixed on the right side of the lens 48 under an "L" or loaded designation so that its line 86 is aligned with the cylindrical body line 78. The level indicating device 10 is thereby set to indicate the level position or direction of tilt when the forks 28 are loaded. It will be seen that, by noting variations of the relative positions of the indicia means, the levelness of the mast 18 and load carrying means due to the pivoting of the mast 18 about the pivot axis 20 thereof, or due to any other movement of the mast 18 relative to a level position thereof, may be noted.

The elevational difference between lines 78,86 automatically compensates for the bending of the forks 28 and the mast 18 under the load, so that the operator can readily determine if the forks 28 are level in both the loaded and empty conditions. Red and green areas on the tape 76 above and below the line 78 thereon may be included, and may with advantage be indicated with aluminum paint, in order that the tape 76 may be clearly visible when the vehicle 12 is being operated in a dimly lit area.

The red or warning indication on the level indicating device 10 will be seen when the forks 28 are tilted forwardly to denote the possibility of the load shifting the center of gravity of the vehicle ahead of the front axle, resulting in the danger of tipping or the load sliding off the forks 24. Conversely, the green or safe indication on the level indicating device 10 will be noted when the forks 28 are tilted rearwardly, which denotes that the load is being safely carried.

The device disclosed herein, it will be seen, may be adapted to the stationary mast of any lift truck for assisting the operator of such lift truck in positioning the lifting forks thereof in a level position. The device is extremely simple, and will perform properly for an extremely great period of time. The viscous fluid used in
the chamber 60 acts to dampen the oscillation of the cylindrical body 62 in its operation, and provide an accurate reading with minimum time delay.

The level indicating device 10 can be periodically checked for accuracy and adjusted, if necessary, to compensate for wear in the mast assembly, lifting platform, or for bent forks, by simply replacing or adjusting the strips of tape 80, 82 on either side of the magnifying lens 48.

What is claimed is:

1. In combination with a vehicle having a mast pivotable relative to the vehicle about a pivot axis, means to pivot said mast, load carrying means movable upwardly and downwardly on said mast and a device for indicating the levelness of said mast and load carrying means in a plurality of load carrying conditions comprising:
a first body fixed on said mast;
a cylindrical body having its center of gravity spaced from the longitudinal axis of said cylindrical body;
means pivotally interconnecting the cylindrical body and first body so that the cylindrical body is pivotable relative to the first body about the longitudinal axis of said cylindrical body, the cylindrical body being further positioned so that said longitudinal axis of the cylinder is substantially parallel to the pivot axis of the mast;
first and second indicia means fixed relative to the first body to indicate the levelness of said mast and load carrying means when they are in a first and second load carrying condition, respectively; and
third indicia means fixed relative to the cylindrical body and movable therewith upon pivoting thereof, variations in the levelness of the mast and load carrying means due to pivoting of the mast about the pivot axis thereof being indicated by variations of the relative position of the first and second indicia means relative to said third indicia means.

2. The device of claim 1 wherein the cylindrical body comprises a first portion defining the cylindrical outer surface of the cylindrical body, and a second portion of density greater than the first portion, the first portion defining a bore spaced from the longitudinal axis of said cylindrical body, and in which is disposed the second portion.

3. The device of claim 2 wherein the first body comprises a casing defining a chamber within which the cylindrical body is disposed, and further comprising viscous fluid substantially filling the remainder of the chamber.

4. The device of claim 3 wherein the second indicia means are fixed to the cylindrical outer surface of the cylindrical body, and wherein the casing further comprises window means through which the second indicia means may be viewed.