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Lifting device for loads, particularly for containers

The invention comprises of a lifting device for loads, particularly for containers with crosspieces on which the predominantly cuboid load is suspended by the upper four corners.

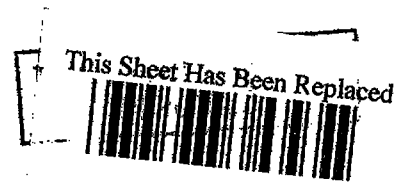
An ever increasing proportion of freight is transported in containers. These often have to be transferred - for example from trucks onto freight trains or from freight trains onto ships, etc. Special lifting devices with crosspieces exist for this purpose. The four upper corners of the container are attached to such a device and then lifted.

Overloading of the lifting device or, of course, the means of transportation (eg truck) must be avoided during this process. The usual way of controlling this is to compare the maximum permitted loading weight of the container (which is documented) with the actual weight (which has to be declared). Mistakes, which result in the lifting device or transportation vehicle being damaged due to overloading, can occur using this method. There is also the danger that the weight distribution in the container is uneven, either due to inconsistent loading or to displacement of the contents during transportation. Not only is the lifting device subjected to extreme strain in such cases, but problems can also arise during subsequent transportation. The fact is, that in most cases, such overloading or irregular distribution of the load is only perceived when damage - sometimes with immense financial consequences - occurs.

The aim of the invention is to create a lifting device which will enable problems caused by overloaded containers to be avoided.

The invention provides a solution to these problems in that the crosspieces are fitted with load-measuring means on the suspension means to which the load is secured. If the crosspieces on the suspension means (i.e. the bolts usually situated there) are thus fitted with load-measuring means, then the forces measured on these four load-measuring points have only to be added together in order to achieve the total weight of the container. On the one hand, it is possible in this manner to check whether the actual weight of the container is within the maximum permitted weight and, on the other hand, the declared weight can be controlled to see if a false declaration has been made. The weighing of the container does not in any way affect the transfer of the container from





one means of transportation to another. The necessary equipment can also easily be fitted as a supplement to existing crosspieces or spreaders.

It has been found to be particularly effective if the load-measuring means have strain gauges.

Another advantageous form is the use of load-measuring means with load cells.

If the load-measuring means are connected to an evaluation unit by way of low-pass filters, voltage surges due to abrupt movements of the container are filtered out and only the actual weight is determined.

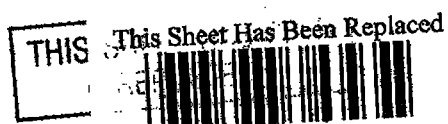
If the differences in the forces of the individual load-measuring means can be shown by use of an evaluation unit, it can easily be determined whether the load is equal at all four points. If unequal values are shown, then the container is unevenly loaded.

The signals emitted by the load-measuring means can easily be evaluated if the load-measuring means emit a voltage proportional to the force acting thereon.

In a very simple and effective form, the voltages of the load-measuring means coming from the corners of the short sides of the load are added in an analog warning circuit and the totals are subtracted from one another, making it possible to determine if the load is unevenly packed near one of the short sides. Alternatively, or additionally, the same process can be carried out with the voltages of the load-measuring means coming from the corners of the long sides of the container.

Expediently, the resulting voltages are fed to a threshold value circuit, which in turn emits a visual or acoustical alarm at the spreader (or a controlling device) if the maximum permitted weight is exceeded, or if the load is unevenly distributed in the container.

The resulting voltages can also be passed on to a local or central computer in order to be collated or, where necessary, controlled.



The invention is described hereafter in one of its forms, with reference being made to the attached drawing, which sets out the principle of the invention in a schematic form.

Sensors are attached to the keep-bolts on which the containers are suspended. These sensors emit voltages in proportion to the suspended load (e.g. a bridge circuit with strain gauges or load cells, which measure the voltage of the four corners U_1 to U_4). The signals are passed through low-pass filters TP in order to filter out voltage surges caused by abrupt movements of the container. Subsequently, the signals are amplified in an amplifier V. The amplified signals can then be entered into an analog/digital transformer and forwarded via a corresponding interface-circuit to a computer where they can be analysed. The computer can then sound an alarm if the difference in the voltages U_1 to U_4 exceeds a given tolerance.

The drawing shows a simple circuit, by means of which such differences in the distribution of the load can be determined. It shows a simple analog connection, in which the voltages of the corners situated on the same short side of the container are added together. This results in

$$U_1 + U_2 = U_{Add1} \text{ and } U_3 + U_4 = U_{Add2}$$

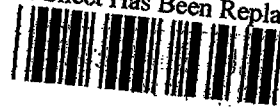
In order to achieve a measurement for the uneven distribution of the load in the container, the two resulting voltages are subtracted from one another (U_{aus1}). By adding the two voltages together, a measurement for the total weight (U_{aus2}) can be obtained. The two signals U_{aus1} and U_{aus2} are entered into a threshold value transmitter, which can emit a visual and/or acoustical warning (U_{Alarm1} or U_{Alarm2}) if a certain input voltage is exceeded.

This circuit can also determine an uneven distribution of the load to one of the long sides of the container by means of a corresponding analog warning circuit, which compares the loads of the corners situated on the same long sides of the container.



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Claims

1. A lifting device for loads, in particular for containers, having crosspieces on which the substantially cuboid load is suspended at its four upper corners, characterized in that the crosspieces are provided with load-measuring means on their suspension means to which the load is secured.
2. A lifting device according to claim 1, characterized in that the load-measuring means have strain gauges.
3. A lifting device according to claim 1, characterized in that the load-measuring means have load cells.
4. A lifting device according to any of claims 1 to 3, characterized in that the load-measuring means are connected to an evaluation unit by way of low-pass filters.
5. A lifting device according to any of claims 1 to 4, characterized in that with the evaluation unit differences in the forces acting on the individual load-measuring means can be displayed.
6. A lifting device according to one of claims 1 to 5, characterized in that the load-measuring means emit a voltage proportional to the force acting thereon.
7. A lifting device according to claim 6, characterized in that the voltages of the load-measuring means coming from the corners of the short sides of the load are added in an analog warning circuit, and these totals are subtracted from one another.
8. A lifting device according to claim 6 or 7, characterized in that the voltages of the load-measuring means coming from the corners of the long sides of the load are added in an analog warning circuit, and these totals are subtracted from one another.



9. A lifting device according to one of claims 6 to 8, characterized in that the resulting voltages are fed to a threshold value circuit.

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