Oct. 27, 1970 H. U. BACKTEMAN 3,536,350

ADJUSTABLE SPREADER

Filed Feb. 2, 1968 2 Sheets-Sheet 1

Fig.1

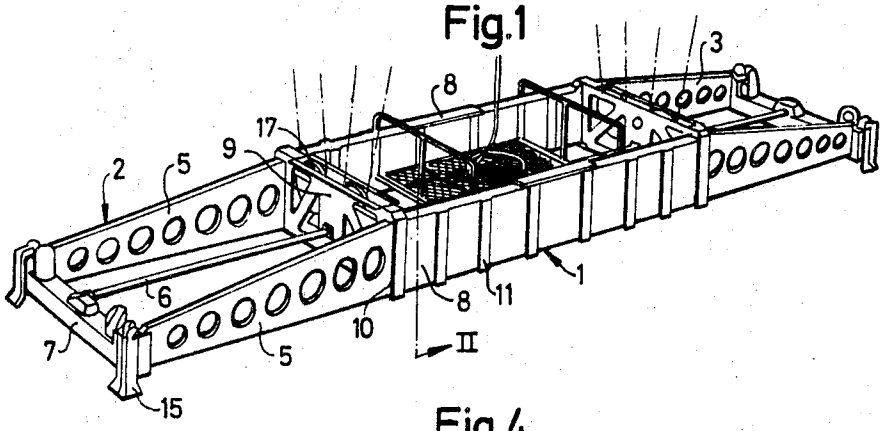


Fig.4

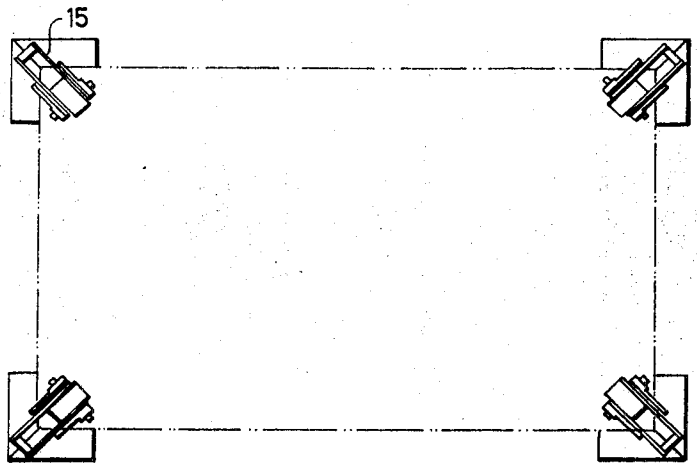
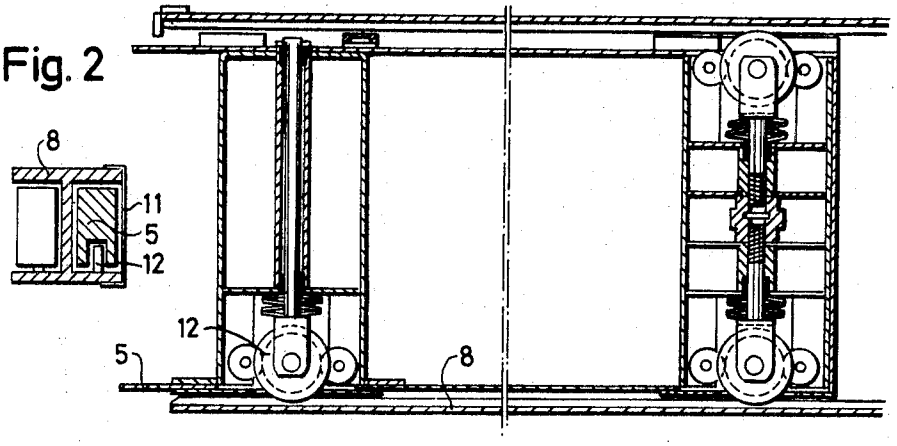


Fig.3

Fig. 2



Oct. 27, 1970 H. U. BACKTEMAN 3,536,350

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Filed Feb. 2, 1968 2 Sheets-Sheet 2

Fig.5

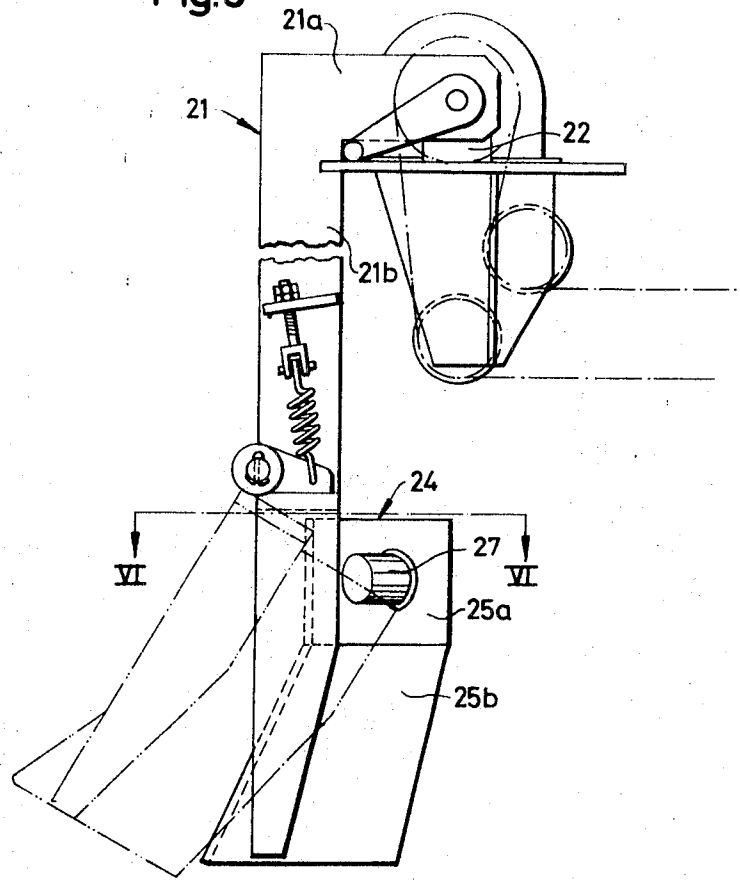
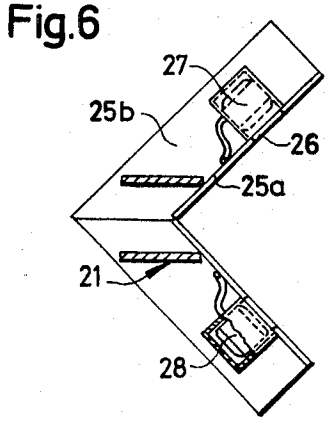


Fig.6



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ADJUSTABLE SPREADER

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Int. Cl. B66c 1/00
U.S. Cl. 294—67 2 Claims

ABSTRACT OF THE DISCLOSURE

The invention relates to loading arrangements and refers particularly to a spreader for standard containers or similar loads, adapted rapidly and simply to be adjusted to loads of varying size and comprising retractable extension supporting rollers and corner load sensing devices.

This invention relates to loading arrangements and refers particularly to a spreader for so-called standard containers or similar loads, adapted rapidly and simply to be adjusted to loads of varying size.

In this field an international standard is applied which covers a definite width and several different lengths. For meeting the demand for spreaders of different lengths, heretofore one had to keep a suitable number of spreaders available or to utilize lower frames of different length which were mounted at one and the same main frame, which latter in its turn was in connection with a crane or the like.

According to the present invention an arrangement for lifting standard containers of varying length is proposed, which is more rapid and cheaper and, besides, substantially easier to adjust. The invention refers to an adjustable spreader which comprises a preferably rectangular main frame with means for lift cables and the like, and is characterized in that the main frame has two extension pieces adapted to be projected out from two opposite sides of the main frame, the outer ends of said pieces being provided on their lower side with holding means for the standard container.

The invention is described in greater detail in the following, with reference to the accompanying drawings.

FIG. 1 shows a perspective view of the spreader according to the present invention.

FIG. 2 shows a cross-section through one of the main frame beams, illustrating the position of the extension beams in relation to one another.

FIG. 3 shows a longitudinal section through one of the main beams with extension beam and bearing pulleys.

FIG. 4 shows in a schematic way a horizontal view from above of the spreader and the arrangement of the sensing members.

FIG. 5 shows one of the sensing members in folded-down position.

FIG. 6 shows a cross-section through a sensing member.

The preferred embodiment of the invention comprises a rectangular main frame **1** with extension pieces **2** and **3** respectively projecting from the two short ends thereof. Said extension pieces are mounted in the main frame and adapted upon demand to be projected out therefrom. When the extension pieces are entirely retracted into the main frame, the length of the spreader substantially corresponds to the shortest standard container, and in the outermost projected position of the extension pieces the

spreader length substantially corresponds to the longest standard container.

The main frame comprises two longitudinal outer I-beams **8** having the upper and lower flange of each beam connected by stiffening tie-rods **11**. These beams hereinafter will be called main beams. On the upper surface of the main frame, means for lift cables or the like are provided, and the main frame, further, includes drive means for operating the extension pieces **2**, **3** and their holding members for the load.

Each of the extension pieces **2**, **3** comprises two longitudinal outer beams **5** and therebetween a likewise longitudinal rod **6**. Said beams hereinafter will be called extension beams. The outer ends of said beams are connected by transverse pieces **7** which on the lower surface at their ends are provided with holding means for a load. The extension beams are supported on bearing pulleys **12** which project through openings in the lower surface of the extension beams and are vertically displaceable in the beams and outwardly pre-stressed by a force corresponding to the share of every pulley in the load of the extension piece. When this load is being exceeded, the bearing pulleys **12** are pressed into the extension beams **5**, thereby eliminating jerkiness of the lift caused by springiness in the bearing pulleys and preventing the pulleys from being damaged by too heavy loads.

The transverse pieces **9** of the main frame are provided with suitable holes **10** for the extension beams **5** and the rod **6**. The intermediate rod **6** is arranged for operating the extension pieces and, to this end, provided with suitable guide means, such as a rack, pressure cylinders or the like, whereby the extension pieces can be controlled mechanically, hydraulically, pneumatically, electrically or in another way.

When the extension beams are subjected to a load, the bearing pulleys **12**, as already mentioned, are pressed into the beams **5** whereby these beams directly rest upon the lower flanges in the main beams **8**. Hereby the space between the upper edges of the extension beams and the upper flanges of the main beams **8** is widened more than necessary. The load being suspended in the outer ends of the extension beams, said beams will swing in vertical direction about a point of support which is the outermost contact surface with the main beams. The extension beams thereby tend to rocker outwardly about said point. In order to prevent such motion, the clearance between the upper edges of the extension beams **5** and the upper flanges of the main beams **8** is compensated for by distance members, for example spacers or the like. These members may be remote-controlled, as other members in the spreader.

The sides and ends of the extension pieces are in known manner provided with upwardly foldable sensing members **15** which will be described later on.

As at times a load must be directed out of a vertical plane and be positioned oblique for placing it in narrow spaces, the spreader according to the present invention is adapted to be adjusted about a longitudinal central axis in that blocks **17** for the lift straps are suspended in the spreader. Thereby the load can be swung out of the vertical plane without using the lift straps, and unevenness in the lift straps can be compensated for to some extent by this movability of the spreader.

Concerning the hinged sensing members it is to be pointed out, that a great number of such members of different type already are in use at spreaders. It is highly important that the sensing of a standard container takes

place automatically and in such a manner, that a spreader can be placed in right position above the container and so be lowered that its rotary projections correctly and simultaneously penetrate into the four corner boxes of the standard container. Most of these sensing members are intended for sensing the sides of the standard container. A slight skewness of the spreader position in relation to the standard container to be sensed is not recorded by the conventional sensing members, nor can such a small deviation be observed by the crane operator from his place high up in the air. Therefore it can happen that the rotary projections fail to penetrate correctly into the corner boxes and, consequently, do not get a safe hold, which can give rise to serious damages on the standard container or even personal injuries, for example when the lifting operation is carried out without the rotary projections being in correct positions.

There is a further circumstance which has restricted the applicability of conventional sensing devices, namely in such cases when the containers are placed tightly, for example on a ship, so that only one side of the containers or the two corner boxes on said side can be sensed. In these cases it is very difficult with the constructions at present available to place the spreader correctly without manual assistance.

The sensing device according to the present invention has as its object to eliminate said shortcomings and to produce a more accurate sensing device adapted to be remote-controlled with greater safety than it is possible with the conventional devices.

As appears from FIG. 4, four sensing devices **15** according to the invention are mounted on the upper surface of an adjustable spreader, one device in every corner of the spreader. Said devices are identical, so only one of them will be described hereinafter.

The sensing device comprises a sensing arm **21** bent to form a right angle. The free leg **21***a* is pivotally mounted in a holder **22** on the upper surface of the spreader, and the other leg **22***b* is adapted to swing outwardly downwardly to a position vertically downwards, seen from the spreader corner.

Said other free leg of the sensing arm is connected with a corner sensing member **24**, which comprises two plates so interconnected at a right angle as to fit the shape of the corner box on the standard container. The plates comprise upper and lower parts **25***a* and **25***b* respectively, whereof the lower parts **25***b* are bent slightly outwardly in relation to the upper parts **25***a*. Each of the upper parts **25***a* is provided with a hole **26** and a sleeve **27** mounted on the outside of the plate. Within the sleeve an electromagnet **28** is disposed to attract a corner box which according to the standard instructions is of iron or steel. The electromagnet **28** normally is pre-stressed inwardly in order not unnecessarily to project outside of the inside of the plate and to obstruct the plate in sliding along a corner box.

The corner sensing member **24** is pre-stressed to a position flushing with the sensing arm **21**, for example by springs, so as to be able to spring aside somewhat when being pressed against the standard container, and to spring in the opposite direction when the arm is being removed from the standard container, so that the electromagnet **28** can maintain its engagement with the corner box at small oscillations of the spreader.

The spreader usually is suspended on very long lifting straps and, therefore, very easily can be caused to swing by wind or for other reasons. Due to the very heavy weight of the spreader and the great length of the cables, it can be difficult entirely to stop these swinging movements before the spreader is lowered onto a container. If the spreader during its swinging strikes against a standard container too rigidly, great damage of the container can be caused.

The flexibility and springiness of the corner sensing members **24**, together with the magnets, are intended

to damp the swinging of the spreader as much as possible, so that it takes less time to make the catch for lifting.

The invention operates as follows: When the spreader approaches the standard container to be lifted, the crane operator folds down the sensing arms **21**, but from his place high above the spreader he cannot definitely find out when the spreader suitably is to be lowered entirely for its engagement with the container. As mentioned before, even small swinging movements of the spreader can have a destroying effect on the container or its contents. Upon its approach to the container, the spreader, particularly when the approach is made from the side, tends to continue in the swinging direction, due to its inertia. If it strikes non-resiliently against the container, the aforesaid inconveniences may occur. Due to the fact that the corner sensing members **24**, in the moment of the impact spring aside, the impact energy partly is taken up by the springs between the corner sensing member **24** and the sensing arm **21**, and partly also by the latter. The crane operator at the same time switches in current to the electromagnet **8** which adheres to the corner box and, when the spreader swings in the opposite direction, maintains its engagement with the corner box, thanks to the ability of the corner sensing member to spring in the opposite direction. If the swinging of the spreader in the direction away from the container is not too strong, the magnets are capable of retaining the spreader, thereby damping the swinging movement very rapidly, whereafter the electromagnets are switched off and the spreader is lowered in place, so that its lift projections can engage with the corner boxes.

The spreader normally can be lowered from above with all of the four sensing devices being in operation. However, when the containers are placed in tightly packed relationship, for example on a ship deck, there is only a space of about 5 cm. between them, and, therefore, no space for the arms **21**.

According to the present invention this problem can be solved by applying only two of the sensing devices, viz. two devices which from the same side engage with the corner boxes of a container. As the sensing devices according to the present invention are shaped after the corner boxes, two sensing devices are sufficient for safely directing the spreader before it is placed upon and engages with the standard container. The operation yet can be carried out with high safety by the crane operator, which is not possible with conventional sensing devices, which in such a case cannot be used at all or must be operated manually by a person at the container.

What I claim is:

1. Adjustable lifting spreader for lifting a container or similar load, comprising a generally rectangular and longitudinal main frame including two main frame beams; two extension pieces embodied within and projectable from two opposite sides of said main frame; said main frame having control means and devices for lift cables; sensing devices and holding members for a load at the outer corners of the extension arms, each said extension arm comprising a pair of longitudinal extension beams projectable from and retractable within the main frame; a control rod mounted between each pair of longitudinal extension beams; operating means for extending said arms from and retracting said arms within said main frame; said operating means being stoppable precisely at any one of a number of predetermined positions by said control rods, which control rods activate switching devices mounted so as to locate said predetermined positions, each of said pairs of longitudinal extension beams being displaceable in the longitudinal main frame beams by bearing pulleys so mounted that at a certain loading they become pressed into said longitudinal extension beams which thereby abut directly to the main frame beams.

2. Adjustable lifting spreader as defined in claim **1** in which the said extension arms are mounted within the

main frame by means of spring-mounted rollers so constructed that when load is introduced to the extension arms the rollers retract against the spring pressure thus leaving direct contact between the extension arms and the main frame the whole equipment thereby becoming locked into position.

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