Feb. 4, 1958 F. B. CICHACZEWSKI 2,822,209

CLAMP ARMS FOR LIFT TRUCK

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Fig. 1.

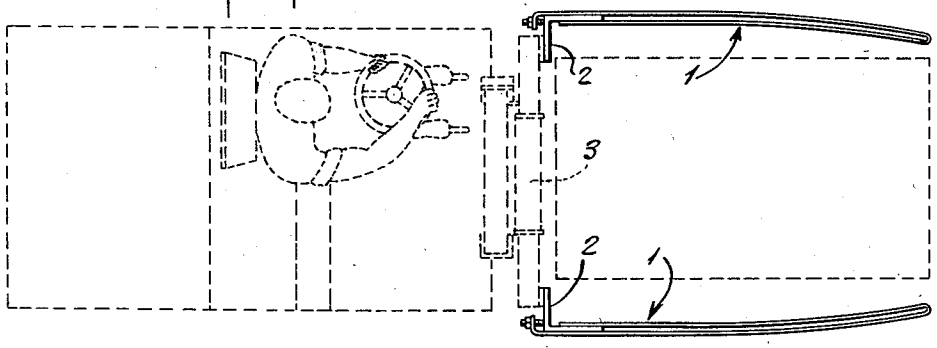


Fig. 2.

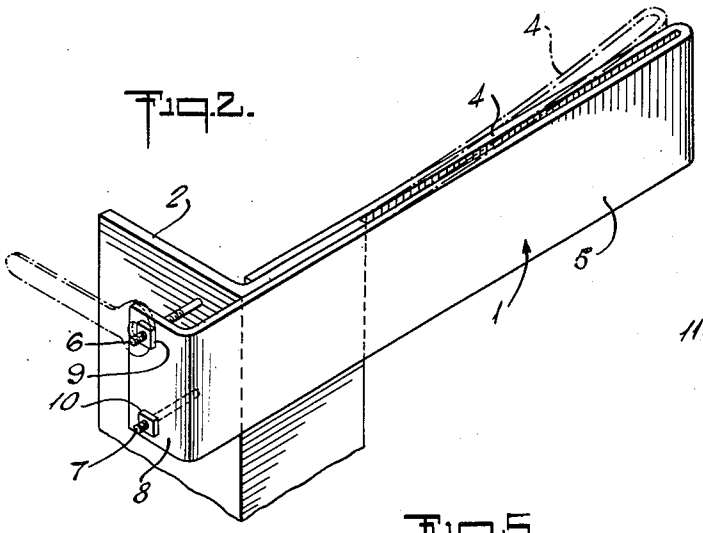


Fig. 3.

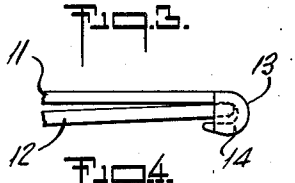


Fig. 4.

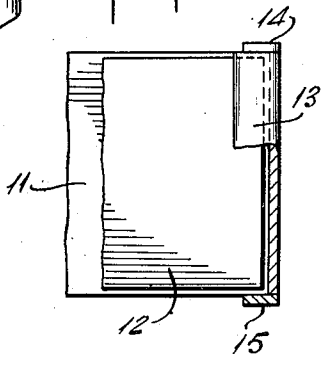


Fig. 5.

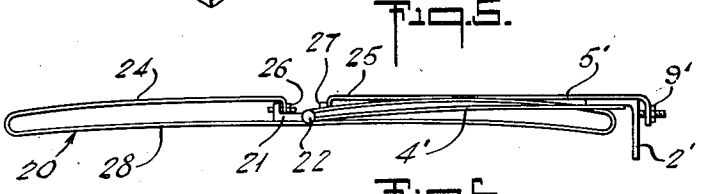


Fig. 12.

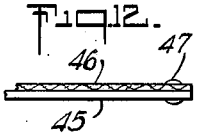


Fig. 13.

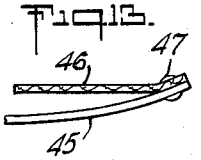
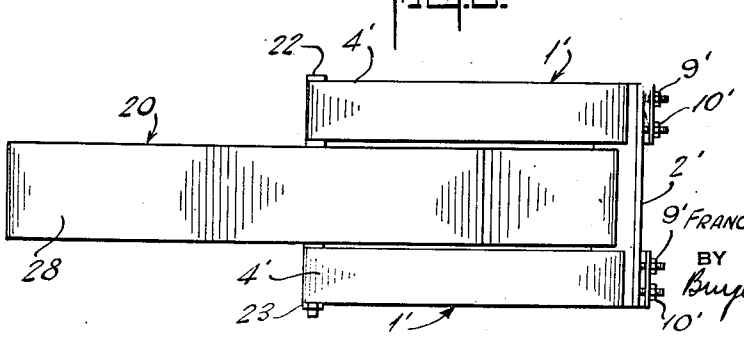


Fig. 6.



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Fig. 7.

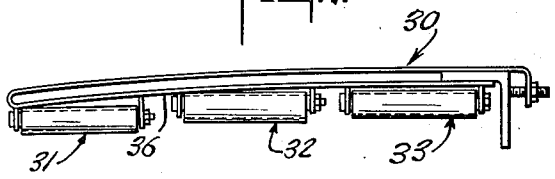


Fig. 9.

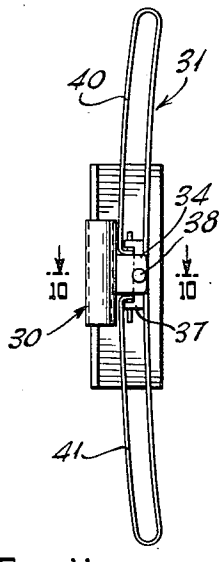


Fig. 8.

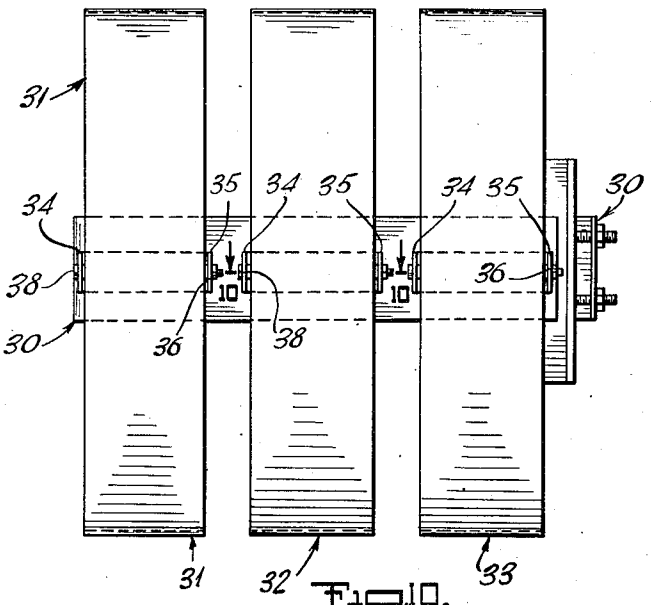


Fig. 11.

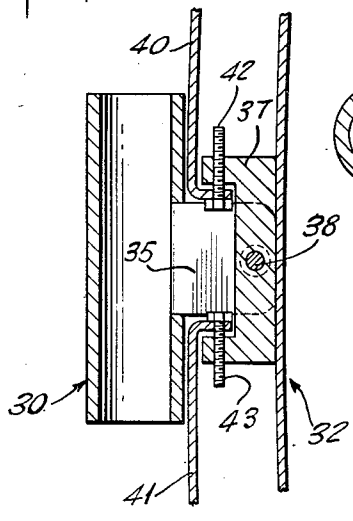
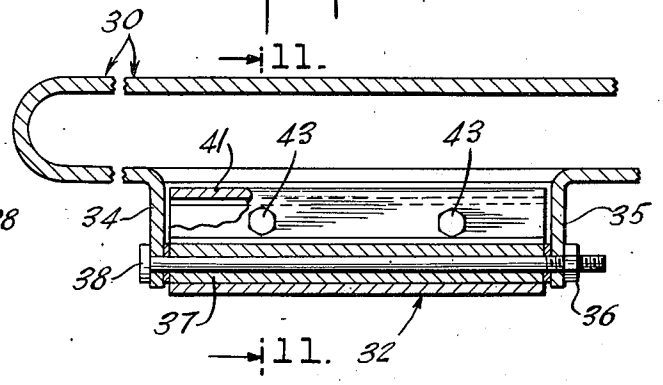


Fig. 10.



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CLAMP ARMS FOR LIFT TRUCK

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Application January 14, 1955, Serial No. 481,905

5 Claims. (Cl. 294—99)

This invention relates generally to lift trucks of the kind equipped with projecting spaced arms, either horizontally disposed or depending, and mechanism for bringing the arms toward each other to grip and lift boxes, packaged articles and the like, and transport them from one place to another.

In order to insure adequate gripping of the objects to be lifted, these clamp arms are usually provided with a certain amount of toe-in, so that when the arms are idle their free ends are somewhat closer together than their supported ends, also, horizontally disposed arms are given a slight camber or skew, so that their free ends are somewhat closer together at their lower than at their upper edges. In the result, the closing pressure of the mechanism which operates the arms flattens them out against the sides of the object to be lifted and a strong grip is assured.

It has been found, however, that such arms are relatively short lived, the repeated flexing causing metal fatigue and fracture, especially adjacent the supported ends of the arms.

The principal object of this invention is to provide a clamp arm which avoids the foregoing difficulty and, at the same time, has a further advantage over the standard type of arm now in use, in that it can be adjusted readily and accurately from time to time to provide and maintain whatever degrees of toe-in and camber are suitable for the particular type of object required to be handled.

In general, a preferred form of the invention achieves these objectives by means of a double leaf-spring type of construction which can be flexed as desired, as by the simple adjustment of a screw or screws by means of a wrench.

The invention will be readily understood from the following description of the accompanying drawings, in which:

Fig. 1 is a top plan of one form of the invention applied to a lift truck shown in broken outline;

Fig. 2 is a perspective view, enlarged, of a clamp arm of the form shown in Fig. 1;

Figs. 3 and 4 are broken out top plan and side elevational views, respectively, of a slightly modified form of tip construction;

Figs. 5 and 6 are top plan and side elevational views of another form of clamp arm construction according to the invention;

Fig. 7 is a top plan view of a further modification;

Fig. 8 is a front or side elevation of the Fig. 7 form;

Fig. 9 is an end elevation of the Fig. 7 form;

Fig. 10 is a broken out, enlarged section on the line 10—10 of Fig. 9;

Fig. 11 is a section on the line 11—11 of Fig. 10;

Fig. 12 is a top plan view of the outer or free ends of a modified pair of clamp arm members; and

Fig. 13 is a top plan view of the members of Fig. 12 adjusted for use.

Referring first to Fig. 1, the clamp arms 1 are shown

mounted on angles 2 which are carried by the mechanism 3 (usually hydraulic), by which the arms are moved toward or from each other by the truck operator. Such mechanism forms no part of the present invention and, since it is well-known, will not be described. Also, the clamp arms are identical and the description of one will serve for both.

The clamp arm consists essentially of two leaf spring members 4, 5 (Fig. 2) disposed side by side. The outer or unsupported ends of these members are interlocked, in this instance by reason of the fact that an integral spring is used.

The inner end of one of the members is provided with a support which serves to hold it against longitudinal movement. The inner end of the other member is provided with adjustment means whereby such member can be moved lengthwise to cause the interlocked ends of the members to flex laterally, and to enable such adjustment and flexing to be effected readily, suitable force multiplying means are provided.

In this form of the invention the inner end of member 4 is welded or otherwise secured to angle 2. As illustrated in Fig. 2, two bolts 6, 7, fixedly supported in the angle 2 and spaced apart widthwise of the arm, project through holes in the bent over, or laterally extending, end 8 of member 5, the projecting ends of the bolts carrying nuts 9, 10. As will be understood, the clamp arm toe-in is secured by merely tightening up the nuts and, to secure camber, by tightening the lower nut more than the upper. By using a torque wrench, any prescribed degree of flexure appropriate for the particular articles to be handled can be achieved and maintained by the operator right at the job and can be changed readily if he is required to switch to the handling of some other type of article.

Figs. 3 and 4 simply illustrate another method by which the outer ends of the leaf spring members can be interlocked. In this instance, they are shown as separate members 11, 12, the former having a hook-shaped end 13 encircling the end of member 12. It will be apparent that if end thrust is applied to member 12, to the right as viewed in Figs. 3 and 4, the two members will flex laterally, just as in Fig. 2. By the same token, the members will flex in the same manner if the endwise movement is applied to member 11 (or member 4 of Fig. 2) but in the opposite direction, that is, to the left. The retainer pieces 14, 15 which are secured to the upper and lower open ends of the hook-shaped end of member 11 serve to hold the ends of members 11 and 12 from getting out of alignment under the flexing forces applied to them.

The constructions illustrated in the other figures of the drawings are in the nature of more elaborate applications of the same principles as are exemplified in the Fig. 2 form and having particular utility in special lifting situations.

Thus, the arrangement of Figs. 5 and 6 is adapted for use where a long reach is required. Primed reference characters have been used to designate the parts corresponding to those already described and it will be seen (Fig. 6) that two sets of arms 1′ are used in this arrangement, that is, a pair of arms on each side of the truck, but with a supplemental arm 20 mounted between and on the arms of each pair. As before, each arm 1′ comprises leaf spring members 4′, 5′, the former anchored to angle 2′ and the latter adjustable by means of upper and lower nuts 9′, 10′ to impart toe-in to the free ends of the two arms, just as in the Fig. 2 form.

At their free ends, the two arms 1′ carry a block 21, as by means of a bolt and nut connection 22, 23; and block 21 serves to support supplemental arm 20 which is the true clamp arm, that is, it is the arm which grips the article to be lifted.

Arm 20, in effect is nothing more than a double form of the arm 1 of Figs. 1 and 2. Each of the short leaf spring members 24, 25 (Fig. 5), corresponds to a member 5, both being adjustable lengthwise, as by bolts 26, 27 engaged with block 21; similarly, the long leaf spring member 28 is the equivalent of two members 4, each serving as an endwise support for the other. By adjustment of bolts 26, 27 the remote ends of arm 20 thus caused to flex, as indicated in Fig. 5, to provide any desired degree of toe-in. While the scale of Fig. 5 is small, the block and bolt arrangement is the same as that illustrated on a larger scale in Fig. 11.

In the arrangement of Figs. 7 to 11, the primary arm 30 is in all respects like the arm 1 of Figs. 1 and 2 and need not be described again. Mounted transversely of this primary arm are three supplemental arms 31, 32, 33, each of which is of the same form as the "double" arm 20 of Figs. 5 and 6. The mountings of all three of the supplemental arms are the same and a description of one will serve for all.

Lugs 34, 35 are formed up from or welded to member 36 of primary arm 30 and a block 37 is secured to the lugs by bolt and nut 38, 39; and, as in the Fig. 5–6 construction, the proximate ends of leaf spring members 40, 41 are bent over and adjustably secured to block 37 by bolts 42, 43. By tightening bolts 42, 43 the members 40, 41 are forced longitudinally outward, or away from each other, and the supplemental arm 31 thereby caused to flex or bow, as indicated in Fig. 9.

It will be recognized that all of the illustrated clamp arms operate on the same principle, whether they are of the "single" form of Figs. 1, 2 or of the "double" form of the arms 20, 31, 32, 33 of the remaining figures; also that the arms, of either form, can readily be assembled in various combinations or groupings to suit the needs of the size and type of package or stack of packages to be handled, and that, in all such groupings, the stressing of the arms can be adjusted readily as may be required.

From the foregoing description of a specific, preferred form of the invention and certain modifications or applications of it, a number of general principles suggestive of still other modifications will be apparent. Thus, the leaf-spring members, as they have been called above, are in reality tension and thrust or strut members. Of whatever material it is made and no matter what its specific cross section, the essential function of member 4, for example, is to cause the companion member 5 to flex when either longitudinal outward thrust is applied to member 5 or longitudinal inward tension is applied to member 4.

This is illustrated, in one of a number of possible embodiments, in Figs. 12 and 13. In Fig. 12, member 45 is a thrust member, that is, its form and material are such that it can transmit a longitudinal thrust or serve as a strut, and member 46 is a tension member, such as a substantially inelastic strap, as of belting or webbing, for example. They are secured together, as by rivet 47. As in the forms previously described, endwise adjustment of member 45 to the right (or, of course, endwise adjustment of member 44 to the left) will result in member 45 being flexed or bowed, as in Fig. 13.

This use of a strap-like tension member, that is, one having no longitudinal rigidity, is preferred for handling lightweight, fragile articles. As will be recognized, the strap-like member, though tensioned, has a degree of lateral resiliency which is desirable for the gripping of articles of the type mentioned.

The following is claimed:

1. A lift truck clamp arm comprising an elongated flexible thrust member and an elongated flexible tension member disposed side by side; means securing one end of one member to the corresponding end of the other member and holding said ends against relative movement; support means for the other end of one member holding it against movement; and adjustment means operatively connected with the corresponding end of the other member for moving the same longitudinally in a direction to cause the first-mentioned ends of the members to flex laterally.

2. A lift truck clamp arm comprising an elongated flexible thrust member and an elongated flexible tension member disposed side by side; means securing one end of one member to the corresponding end of the other member and holding said ends against relative movement; support means for the other end of one member holding it against movement; and two adjustment means each operatively connected with the corresponding end of the other member for moving the same in a direction to cause the first-mentioned ends of the members to flex laterally, said two adjustment means being engaged with such member at points spaced apart widthwise thereof.

3. A lift truck clamp arm comprising an elongated flexible thrust member and an elongated flexible tension member disposed side by side; means securing one end of one member to the corresponding end of the other member and holding said ends against relative movement; support means for the other end of one member holding it against movement; a laterally extending portion at the corresponding end of the other member; and adjustment means operatively connected with said laterally extending portion for moving such other member longitudinally in a direction to cause the first-mentioned ends of the members to flex laterally.

4. A lift truck clamp arm comprising an integral U-shaped leaf spring; support means for the free end of one arm of the spring holding the same against movement; and adjustment means operatively connected with the free end of the other arm of the spring for moving the same in the lengthwise direction of the spring to cause the united ends of the spring arms to flex laterally.

5. A lift truck clamp arm comprising an elongated flexible thrust member and an elongated flexible tension member disposed side by side; means securing one end of one member to the corresponding end of the other member and holding said ends against relative movement; adjustment means operatively connected with the other ends of said members for moving the same longitudinally with respect to one another in a direction to cause the first-mentioned ends of the members to flex laterally.

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