May 13, 1941. S. WEISS 2,241,798

SPRING ATTACHMENT FOR INDUSTRIAL TRUCKS

Filed Oct. 14, 1940 2 Sheets-Sheet 1

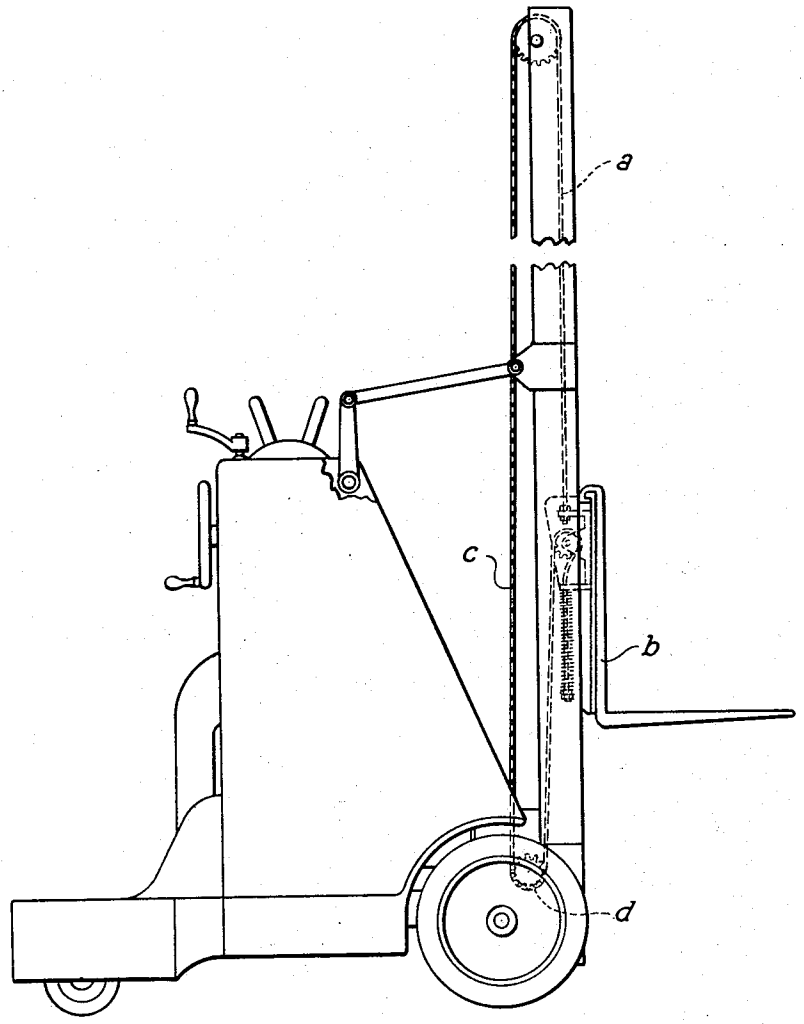


Fig. 1

Inventor
Samuel Weiss
By T. J. Quisler
and H. H. Quisler
Attorneys

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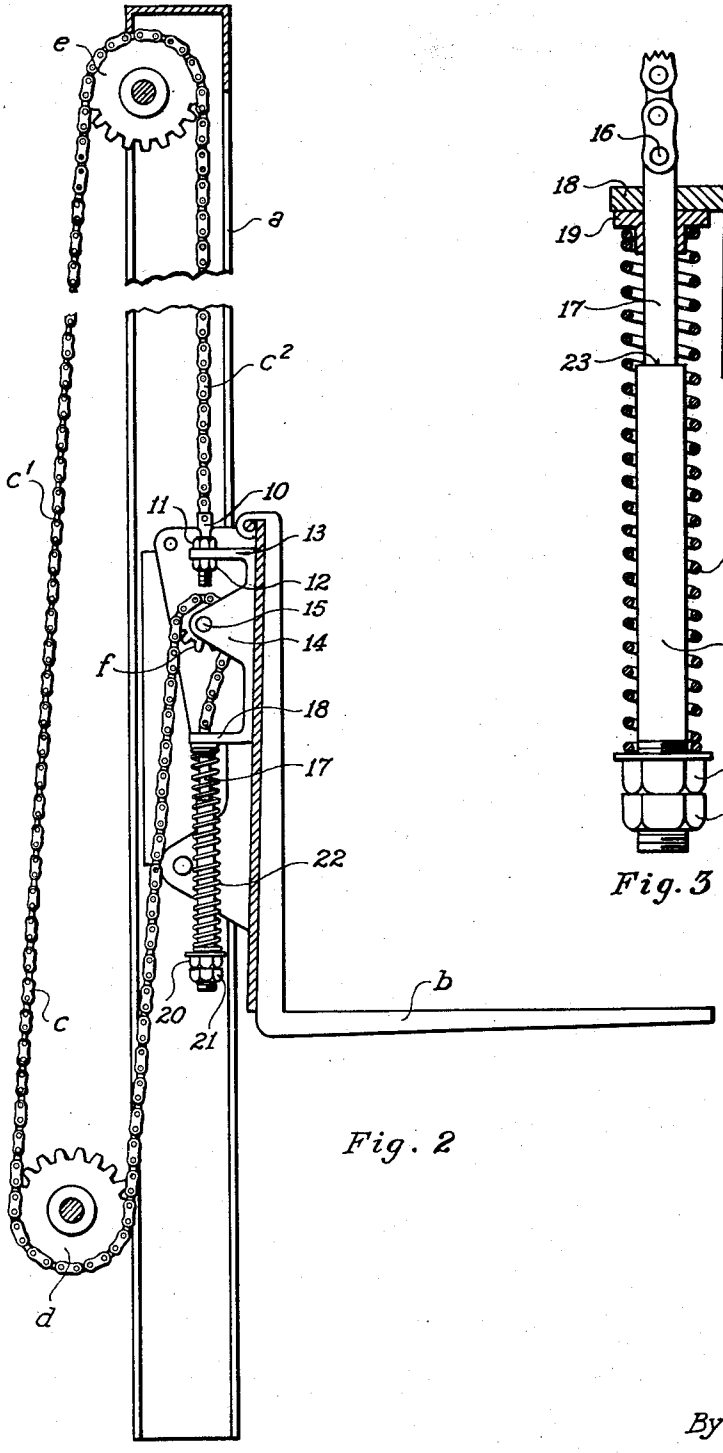


Fig. 2

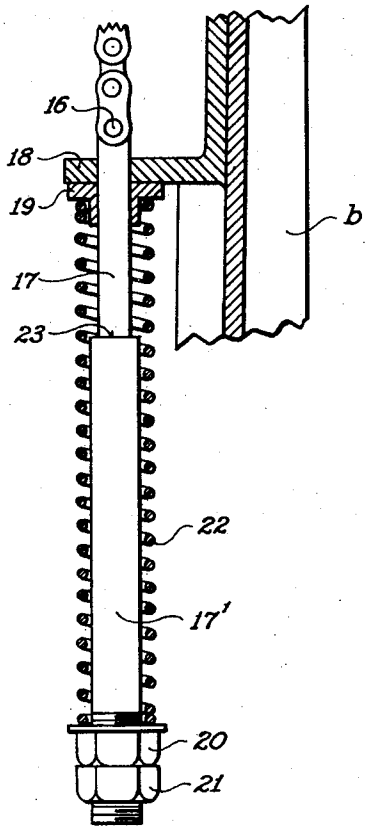


Fig. 3

Inventor
Samuel Weiss
By T. J. Quisler
and H. Quisler.
Attorneys

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SPRING ATTACHMENT FOR INDUSTRIAL TRUCKS

Samuel Weiss, Portland, Oreg., assignor to Vaughan Motor Company, Inc., Portland, Oreg., a corporation of Oregon

Application October 14, 1940, Serial No. 361,144

1 Claim. (Cl. 254—4)

My invention relates in general to mechanism in which a sprocket chain is used as part of the driving or moving means and in which the movement imparted by such driving means is restricted to reciprocal movement within certain limits; thus distinguishing from a mechanism in which an endless sprocket chain would be required, inasmuch as this invention is not concerned with endless sprocket chains.

More particularly, this invention relates to a sprocket chain mechanism such as that employed in industrial lift trucks in which sprocket chains constitute part of the means used for raising and lowering the end-lift or elevator mounted on the truck.

In mechanism which includes sprocket chains, there is a tendency for slack to develop in the chain. This is due in part to the stretching which is likely to occur under strong pulls because of the comparatively large number of individual links, each of which must be freely mounted on the connecting pins, necessitating a slight clearance with respect thereto, and in part to the wear which occurs in the chain with use. The development of too much slack in the chain is undesirable and may lead to difficulties such as the slipping of the chain off of a driving sprocket, etc.

An object of this invention is to provide means for automatically taking up the slack in the sprocket chain in a mechanism such as that above indicated.

Elevators or end-lifts, such as are customary in certain types of industrial trucks, sometimes encounter obstructions when being lowered. In an end lift truck the end of the truck may even be raised off the ground when the end lift in descending is brought to rest against some obstacle and the lift-lowering mechanism continues to operate. The resulting pull in such case might be too great for the means provided for taking up the chain slack with the result that the chain is pulled beyond the desired limit. A further object of this invention therefore is to provide a means for limiting the extent of the movement permitted in the chain by the slack-absorbing means when such reversing pull occurs.

The manner in which these and other objects are attained by my invention will be brought out in the following description of my invention as applied to an industrial end-lift truck. In the description reference is made to the accompanying drawings in which:

Figure 1 is a general view of an industrial truck having an end-lift or elevator in which sprocket chains are employed as part of the mechanism controlling the raising and lowering of the end-lift or elevator, and to each of which sprocket chains my invention is applied;

Figure 2 is a fragmentary, vertical, medial section through the guide frame at the end of the truck of Figure 1, showing the load-lifting platform or elevator and one of the sprocket chains connected thereto on a larger scale, and showing my invention employed with the sprocket chain; and

Figure 3 is a sectional detail view, drawn to a still larger scale, of my invention as shown in Figure 2.

The industrial truck of Figure 1 which has been selected to illustrate the principles of my invention is the same as that described in detail in my United States Letters Patent No. 2,169,440, issued August 15, 1939, entitled Industrial truck, to which patent reference is made. This truck includes the usual upright frame *a* (Figure 1) in which the platform or load-carrying elements *b* are slidably mounted, and a pair of sprocket chains *c*, (one of which is shown in Figure 1) passing over driven sprocket wheels *d* which in turn are driven through suitable transmission gears (not shown) by a motor of the truck.

The mounting of each sprocket chain *c* and the manner in which the ends of the chain are attached will be apparent from Figure 2. One end of the chain *c* is secured to a forked screw **10**, which is adjustably clamped by means of lock nuts **11** and **12** to an angular bracket **13** formed as part of the elevator or lift structure, and the chain extends thence around the idling sprocket *e* mounted near the top of the guide frame *a*. From the idling sprocket *e* the chain extends downwardly to the driving sprocket *d*, thence upwardly to another idling sprocket *f*, supported on a shaft **15** mounted in brackets **14** of the elevator structure, and finally the end link of the chain is pivotally connected as at **16**, (Figure 3) to the upper extremity of a rod **17** slideably mounted in a bracket **18**, also of the elevator structure. A flanged bushing **19** secured to the underside of the bracket **18**, serves as an additional bearing for the slideable rod **17** and as a seat for the spring **22** carried on the rod **17**. The rod **17** extends downwardly from this bearing, as shown in Figure 3, and the lower portion **17'** of the rod is made of larger diameter than the upper portion so as to constitute a shoulder **23** which shoulder, when coming in contact with the bearing **19**, will limit the upward movement of the rod. A flanged nut **20** and a lock nut **21** are

threaded on the lower end of the rod 17 and serve both to hold the helical compression spring 22 on the rod 17 and to adjust the tension of the spring, the spring thus being held compressed between the flanged bushing 19 and the flanged nut 20.

In making the initial adjustment for the sprocket chain, the nuts 11 and 12 (Figure 2) are manipulated to draw the screw attachment 10 downwardly so as to take up any initial slack in the chain. Further adjustment is then made by adjusting the nuts 20 and 21 so as to increase the compression of the spring 22 or as to maintain the force of the spring sufficient to hold the chain taut should any stretching of the chain occur as a result of use. Thus, with the spring 22 sufficiently compressed at all times, any subsequent slack which may develop in the chain will be immediately taken up by the spring.

Ordinarily, due to the weight of the elevator structure as well as the weight of any load which is carried on the load-supporting arms *b*, the section of the sprocket chain *c* between the driven sprocket *d* and idler *e*, namely the section designated *c'* in Figure 2, and the section c^2, between idler sprocket *e* and the screw 10 at the corresponding end of the chain, will be stretched taut, and any slack in the chain will be located in the remaining sections between the driven sprocket *d* and the other end of the chain. However, such slack will always be taken up by the spring attachment. Thus, assuming that it is desired to raise a load on the elevator, the driven sprocket *d* will be rotated in a counterclockwise direction causing a downward pull on the long span *c'* of the chain and an upward pull on the span c^2, resulting in a stretching force on those portions of the chain. Any stretching of these portions will produce slack in the remaining sections between the driven sprocket *d* and the rod 17 attached to the other end of the chain. But this slack will cause the spring 22 to expand and force the rod 17 downwardly until the slack is entirely absorbed.

In the lowering of the elevator, should the elevator be caused to encounter an obstacle, suddenly stopping the movement of the elevator, the movement of the chain and of the sprocket *d* and of the connected mechanism will not be stopped with the usual sudden jerk but the shock will first pull the rod 17 upwardly against the force of the spring 22, and increase the tension of the spring, thus cushioning the shock and, under ordinary conditions, slowing up the movement of the chain and sprockets and connected mechanism more gradually until these are brought to a complete stop, whereupon the subsequent expansion of the spring will again take up the slack which has resulted. However, should the driving of the sprocket *d* be continued under such circumstances, thus causing the end of the truck itself to be lifted since the elevator is prevented by the obstacle from descending any farther, the rod 17 will nevertheless be prevented from being pulled upward too far by the engagement of the shoulder 23 with the bushing 19. Were it not for the shoulder 23, and without any other means for limiting such upward movement of the rod 17, under such conditions the pull on the end of the chain would compress the spring 22 to such extent that a very undesirable amount of slack would be developed in the chain on the other side of the driven sprocket *d* in the section *c'*. Since a simple way of lifting the end of the truck of Fig. 1, for instance when removing a wheel, is to place a block under the elevator and then continue the operation of the elevator-lowering mechanism after the elevator has been brought to bear against the block, it is essential with the tension spring device to provide also a proper restraining means to permit this reverse chain pull with safety.

Although it would be possible to provide several modifications in the spring attachment without departing from the principle of this invention, the simple means as described I believe to be most satisfactory and practical.

I claim:

In an industrial truck of the character described, an upright frame, an elevator movable up and down in said frame, sprocket chain mechanism for moving said elevator, said mechanism including a pair of sprocket chains each having one end attached to said elevator and extending upwardly from said elevator, a pair of pulleys near the top of said frame, said chains passing over said pulleys respectively and extending thence downwardly, a pair of driven sprocket wheels near the bottom of said frame, said chains passing around said driven sprocket wheels respectively, a pair of bearings on said elevator, a rod vertically slidable in each bearing, the other ends of said chains attached to ends of said rods respectively, a compression spring on each rod between the bearing and the opposite end of the rod, adjustable means on said opposite rod ends for holding said springs on said rods, and a shoulder on each rod between the bearing and said opposite end to limit the sliding of the rod in said bearing, whereby said springs will act at all times to take up the slack in said chains except when said elevator is obstructed in its downward movement and, when this occurs, said shoulders will prevent too much slack being developed in said chains.

SAMUEL WEISS.