April 27, 1954 J. L. LEPKOWSKI 2,676,672

AUTOMATICALLY ADJUSTING FORK

Filed Feb. 20, 1953

2 Sheets-Sheet 1

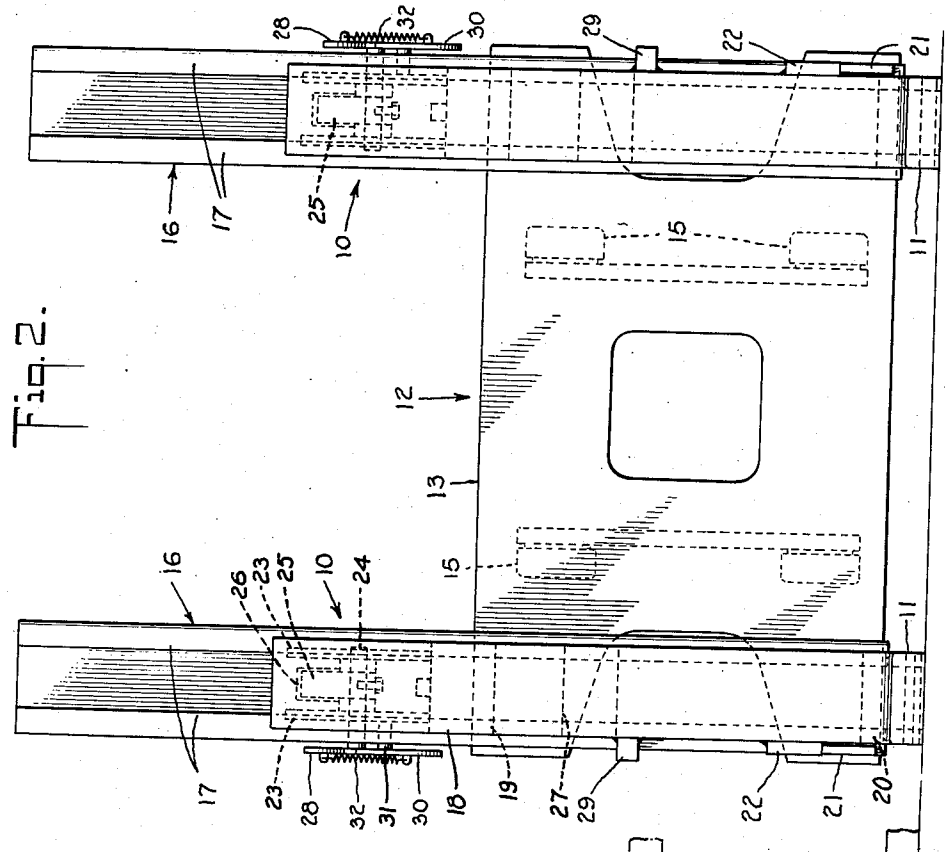


Fig. 2.

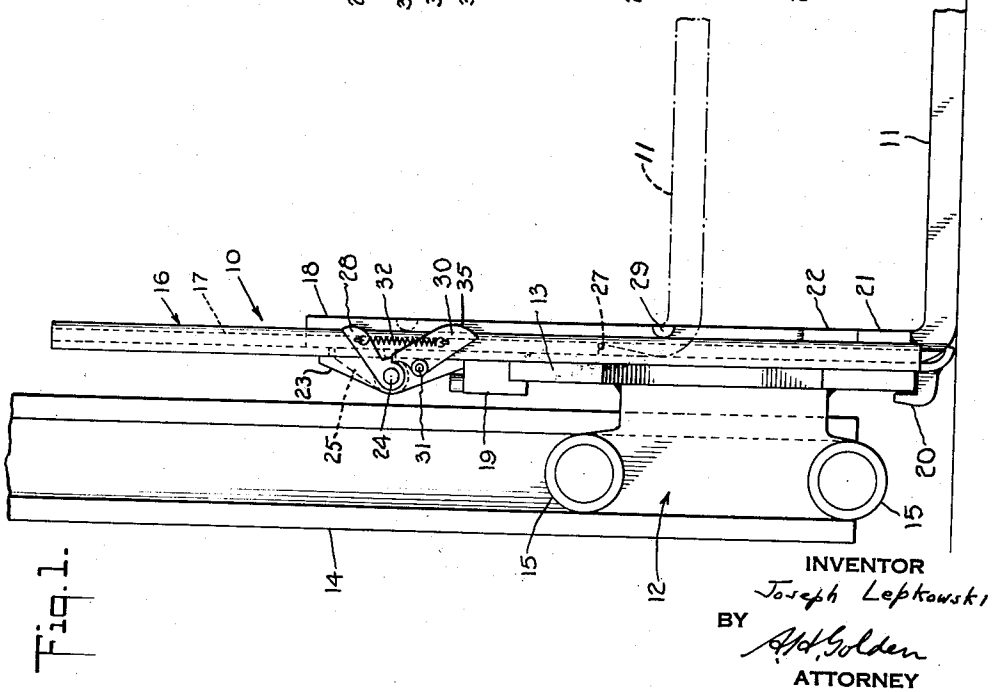


Fig. 1.

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Fig. 3.

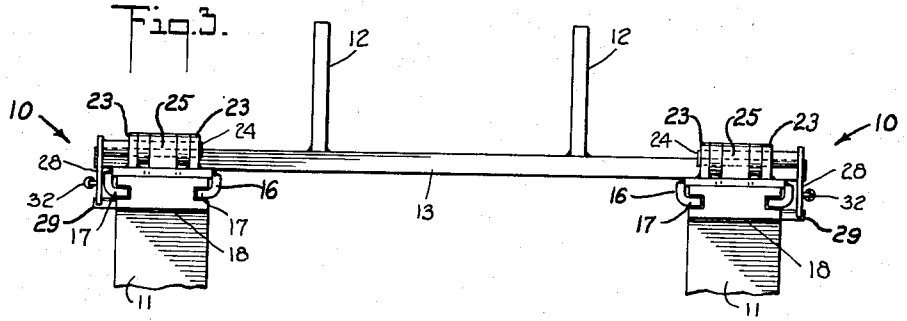


Fig. 4.

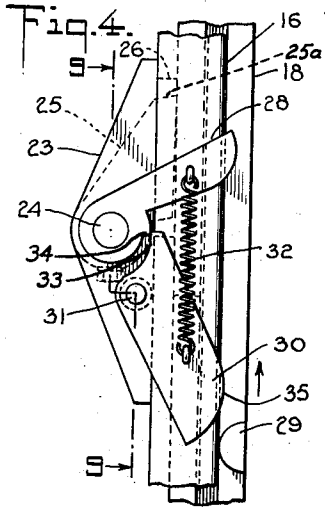


Fig. 5.

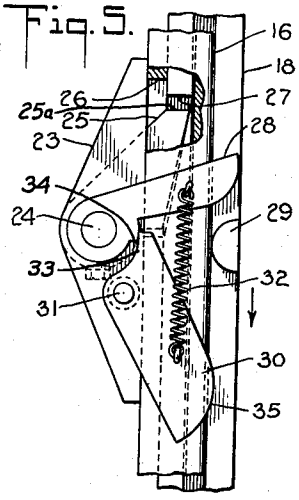


Fig. 6.

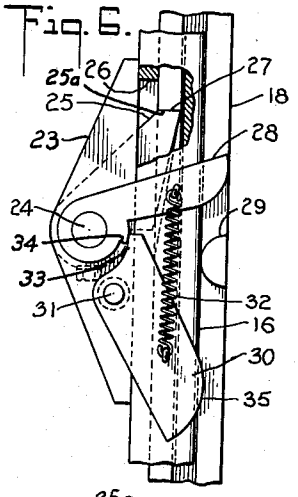


Fig. 9.

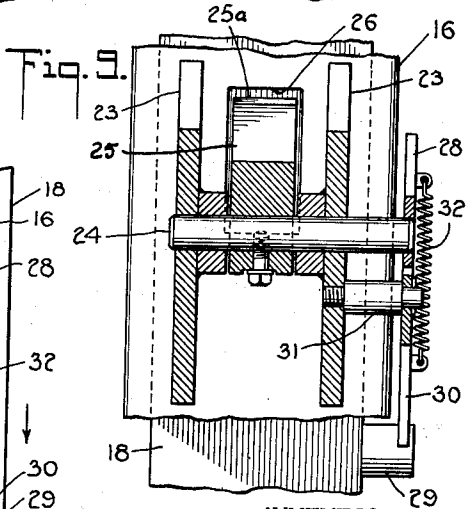


Fig. 7.

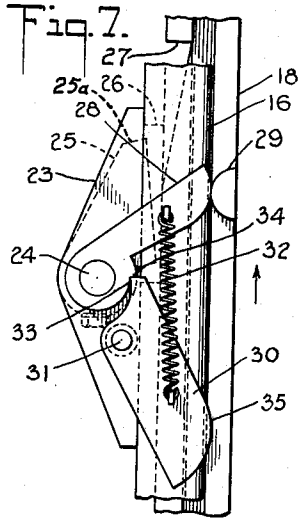
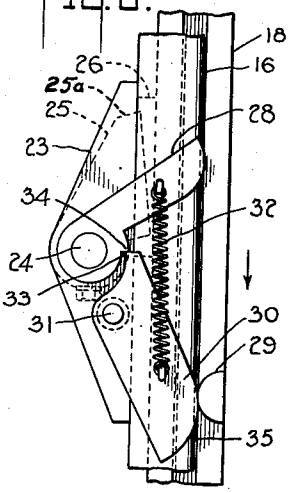


Fig. 8.



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UNITED STATES PATENT OFFICE

2,676,672

AUTOMATICALLY ADJUSTING FORK

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Application February 20, 1953, Serial No. 337,960

7 Claims. (Cl. 187—9)

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This invention relates to industrial trucks of the class having a lifting carriage that moves vertically to lift a load. It has been proposed to make vertically adjustable the members through which the lifting carriage actually lifts the load in trucks of this class so that the truck is enabled in the normal vertical range of the lifting carriage to handle loads at a higher elevation than would otherwise be possible. This is accomplished through an assembly having automatic detent means for adjusting each lifting member and holding the said lifting member in an upper position relatively to its normal lower position on the carriage, and it is to an assembly of this description that my invention particularly relates.

It has been proposed to utilize a detent that is pivoted on a lifting carriage for adjusting and holding a lifting member relatively to the carriage. However, the pivot point of the detent must be almost directly over the lifting member whereby to prevent the weight of the lifting member from throwing the detent out of supporting engagement with this member. This construction limits the possible movement of the lifting member relatively to the carriage because a part of the detent is always in the path of the lifting member.

As a feature of my invention, I contribute in an assembly of the class described a novel automatic detent means that allows unrestricted movement of the lifting member relatively to the carriage in a vertical direction. More particularly, I utilize a detent that, when releasing the lifting member, moves entirely out of the path of the vertical movement of the lifting member. I accomplish this by pivoting the detent on an axis that is out of the path in which the load-lifting member moves, with only a portion of the detent entering this path to support the lifting member relatively to the carriage. Preferably, I pivot the detent at its lower end, and in the particular arrangement, the weight of the load-lifting member holds the detent in engagement with it because of the position of the pivot axis. I further utilize means for actuating the detent that does not obstruct the movement of the lifting member, and for this purpose I prefer to locate the actuating means at the side of the lifting member. This construction enables me to facilitate the assembly of the lifting member to the carriage because the detent means permits the lifting member to be inserted longitudinally into guides on the carriage. Also, I can thereby provide more than one of the detent means for holding the lifting member in more than one upper position on the lifting carriage.

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As a further feature of my invention, I provide means that, when the detent moves to release position, positively locks the detent in release position. For this purpose, I prefer to utilize a spring pressed dog that moves automatically to dog the detent in release position, this dog allowing the detent to move to a holding position when engaged by a trip block that moves vertically with the lifting member.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter, and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claims be regarded as including such equivalent constructions, as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

Referring now to the drawings:

Fig. 1 is a side view showing a preferred form of my invention with the lifting members shown by full lines in a lower position and in broken lines in an upper position.

Fig. 2 is a front view of parts shown in Fig. 1.

Fig. 3 is a plan view of the structure of Fig. 1.

Figs. 4, 5, 6, 7 and 8 are detail views illustrating the cycle of operation of my invention.

Fig. 9 is a sectional view on the line 9—9 of Fig. 4.

In the drawing, I have indicated generally by the numeral 10 the adjustable mounting means that serves in my invention to support the load-lifting member upon the lifting carriage of the truck. Actually, in the example illustrated, a pair of the mounting means 10 is utilized to support a pair of load-lifting members that are in the form of forks 11, but it is to be understood that my invention is not limited to the use of two forks or to any particular form of load-engaging member. Because the mounting means 10 are duplicates in construction, I shall generally refer to only one of the mounting means in the following description. The lifting carriage is indicated by the numeral 12 and is of the type that has a vertical front plate 13 for the mounting of suitable load-handling apparatus to be

lifted on the carriage, and that moves vertically along truck uprights 14 relatively to which it is guided by rollers 15. However, the particular structural details of the carriage 12 and the means whereby it is moved vertically are not important to an understanding of my invention, and it is merely necessary to know that the carriage 12 moves vertically to lift a load-engaging member that is adjusted relatively thereto through the means 10.

Each of the mounting means 10 has a vertical guide member 16 that guides one of the forks 11 so that it may slide vertically relatively to the lifting carriage 12. For this purpose, I make the guide member 16 channel-shaped in cross section, thereby providing inwardly turned flanges 17 that are engaged in grooves in opposite edges of a vertical arm 18 of the fork, as shown in Fig. 3. Secured integrally to the back of the guide member 16, as shown in Fig. 1, are an upper clip 19 and a lower clip 20 that engage over the upper and lower edges of the front plate 13 of the lifting carriage so as to support the guide member 16 upon the carriage, as will be understood by those skilled in the art. To support the fork 11 in its normal lower position relatively to the lifting carriage 12, a stop block 21 shown in Figs. 1 and 2, is attached to the front of the guide member 16 at its lower end, this block 21 engaging a block 22 on the vertical arm 18 of the fork. Actually, the mounting means 10 may be considered a part of the lifting carriage 12, for the purposes of my invention.

I shall now describe the extremely novel detent means whereby I hold the fork 11 in an upper position relatively to the lifting carriage 12. As shown in Figs. 1, 3, 4 et seq., an intermediate portion of the guide member 16 carries a pair of rearwardly extending vertical bracket plates 23 on which is mounted a transverse pivot shaft 24. Fixed upon this pivot shaft between the bracket plates 23 is a detent 25, and an upper portion 25*a* of this detent 25 swings about the pivot axis between holding and release positions relatively to the vertical arm 18 of the fork. The detent 25 moves in a clearance hole 26 in the back of the guide member 16, as best seen in Fig. 9, and when the fork moves upwardly relatively to the lifting carriage 12, the upper portion 25*a* of detent 25 moves under an abutment 27 in a notch formed in the back of the vertical arm 18, as may be seen in Figs. 5 and 6. The fork must thereafter move vertically with the lifting carriage 12. It will be understood that movement of the fork 11 to its upper position relatively to the carriage 12 may be very conveniently accomplished by moving the carriage 12 downwardly relatively to the fork 11 while the said fork 11 is held against downward movement.

It is well to note at this point that the detent 25 can move entirely out of the path of movement of the vertical arm 18, as shown in Fig. 7, and this detent 25 therefore does not restrict the possible vertical movement of the fork 11 in the guide 16. Further, because of the position of the pivot shaft 24, the detent 25 when in holding position is inclined upwardly and toward the vertical arm 18 of the fork 11, and I am enabled thereby to utilize the weight of the fork 11 to hold the detent portion 25*a* engaged with the abutment 27.

I provide also novel means for releasing the fork 11 from the detent 25 when it is desired to move the fork to its solid line position of Fig. 1 relatively to the lifting carriage. Thus, I mount

a cam lever 28 upon one end of the pivot shaft 24 in a position at one side of the guide member 16 and the vertical arm 18 of the fork. Upon the side of the vertical arm 18 is a trip block 29 that is so located as to engage the end of the cam lever 28 and swing it upwardly, as in Fig. 7, when the fork is lifted relatively to guide member 16. This action rotates the pivot shaft 24 to swing the detent 25 entirely away from the abutment 27, and causes the detent to be positively locked in this position by a dog 30 that is mounted below the cam lever 28 through a pivot pin 31 on one of the bracket plates 23. The actual locking action is performed by a spring 32 that swings the dog 30 in such a way as to cause a nose 33 on the dog to intercept a shoulder 34 on the cam lever 28. The spring 32 is attached at opposed ends to the dog 30 and to the cam lever 28, and not only serves to operate the dog, but is also instrumental in causing the detent 25 to engage properly with the abutment 27.

The dog 30 is actuated to release the cam lever 28 during the subsequent downward movement of the fork, as in Fig. 8, thereby conditioning the detent 25 to engage the abutment 27 upon a later movement of the fork to its predetermined upper position relatively to the carriage. This releasing action of the dog 30 is effected by trip block 29 contacting the lower end 35 of the dog 30. Thus, Fig. 8 shows the trip block 29 engaging part 35 of the dog 30 and about to move the nose 33 away from shoulder 34, so that the detent 25 will be released for movement toward the position of Fig. 4. In this position, the detent portion 25*a* is of course pressed against the vertical leg 18 of the fork through the action of the spring 32, and will engage abutment 27 when the fork is again moved to its upper position relatively to the lifting carriage 12.

I have already indicated that the detent 25 allows unrestricted vertical movement of the fork 11, and it will now be observed also that the cam lever 28 and the dog 30 do not interfere with this movement. The said lever 28 and dog 30 do coact with the trip block 29, but nevertheless can move out of the path of this trip block as the fork 11 moves vertically. I am thereby enabled to assemble the fork 11 to the guide member 16 merely by sliding the vertical arm 18 of the fork downwardly into the guide member 16. Further, my novel detent mechanism is well suited for mounting at an intermediate point in the vertical movement of the fork, and therefore it is possible to utilize this mechanism at various points along the length of the vertical guide member 16 so as to support the fork 11 in more than one upper position above its normal lower position relatively to the lifting carriage 12. It is conceivable, of course, that the parts of my novel mechanism could be reversed from the positions that I have particularly described, with the detent 25 mounted on the lifting member 18 and the abutment 27 formed on the guide member 16.

It is believed that the construction and operation of my novel adjustable fork assembly will now be understood, and that its considerable advantages will be appreciated by those skilled in the art.

I now claim:

1. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, a detent member mounted on said lifting carriage for movement relatively to the vertical path of said lifting member into and out of a

holding position, a part of said lifting member with which said detent member coacts when in holding position to support said lifting member on said lifting carriage, a cam through which said lifting member when moving upwardly relatively to said carriage moves said detent member to a release position entirely away from said vertical path, a dog acting when said detent member moves to release position to hold said member in release position whereby to allow unrestricted movement of said load-lifting member both upwardly and downwardly relatively to said lifting carriage, and means through which said lifting member when moving downwardly relatively to said carriage moves said dog to allow said detent member to move to holding position.

2. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, a detent member, means mounting said detent member on said lifting carriage for movement relatively to the vertical path of said lifting member into and out of a holding position, a part of said lifting member with which said detent member coacts when in holding position to support said lifting member on said lifting carriage, a cam for said detent member, a surface on said lifting member coacting with said cam when said lifting member moves upwardly relatively to said carriage to move said detent member to a release position entirely away from said vertical path, a dog for said detent member, means moving said dog when said detent member moves to release postion to lock said member in release position whereby to allow unrestricted movement of said load-lifting member both upwardly and downwardly relatively to said lifting carriage, and a surface on said lifting member moving said dog relatively to said detent member when said lifting member moves downwardly whereby to allow said detent member to move to holding position.

3. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, pivot means on said lifting carriage, a detent member mounted on said pivot means for movement of its upper portion relatively to the vertical path of said lifting member into and out of a holding position, a part of said lifting member with which said detent member coacts when in holding position to support said lifting member on said lifting carriage, a cam through which said lifting member when moving upwardly relatively to said carriage moves said detent member to a release position entirely away from said vertical path, a dog acting when said detent member moves to release position to hold said member in release position whereby to allow unrestricted movement of said load-lifting member both upwardly and downwardly relatively to said lifting carriage, and means through which said lifting member when moving downwardly relatively to said carriage moves said dog to allow said detent member to move to holding position.

4. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, a detent member, pivot means mounting said detent member on said lifting carriage, an upper end portion of said detent member moving into and out of a holding position relatively to said lifting member as said detent member moves on its pivot means, a part of said lifting member with which the upper end portion of said detent member coacts when in holding position to support said lifting member on said lifting carriage, said pivot means being positioned with its axis at one side of the vertical path of said lifting member whereby the weight of said lifting member acts through the said part to maintain the upper end of the detent member in holding position, a cam through which said lifting member when moving upwardly relatively to said carriage moves said detent member to a release position, a dog acting when said detent member moves to release position to lock said member in release position whereby to allow downward movement of said load-lifting member relatively to said carriage, and means through which said lifting member when moving downwardly relatively to the carriage moves the dog to allow the upper end portion of said detent member to move to holding position.

5. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, a detent member, pivot means mounting said detent member on said lifting carriage, an upper end portion of said detent member moving into and out of a holding position relatively to said lifting member as said detent member moves on its pivot means, a part of said lifting member with which the upper end portion of said detent member coacts when in holding position to support said lifting member on said lifting carriage, said pivot means being positioned with its axis at one side of the vertical path of said lifting member whereby the weight of said lifting member acts through the said part to maintain the upper end of the detent member in holding position, a cam through which said lifting member when moving upwardly relatively to said carriage moves said detent member to a release position entirely away from said vertical path, a dog acting when said detent member moves to release position to hold said member in release position whereby to allow unrestricted movement of said load-lifting member both upwardly and downwardly relatively to said lifting carriage, and means through which said lifting member when moving downwardly relatively to said carriage moves said dog to allow said detent member to move to holding position.

6. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, a detent member, pivot means mounting said detent member on said lifting carriage, an upper end portion of said detent member moving into and out of a holding position relatively to said lifting member as said detent member moves on its pivot means, a part of said lifting member with which the upper end portion of said detent member coacts when in holding position to support said lifting member on said lifting carriage, said pivot means being positioned with its axis at one side of the vertical path of said lifting member whereby the weight of said lifting member acts through the said part to maintain the upper end of the detent member in holding position, a cam through which said lifting member when moving upwardly relatively to said carriage moves said detent member to a release position, a dog for said detent member,

means moving said dog to lock said detent member in release position when said member moves to release position, and a portion of said lifting member engaging said dog when moving downwardly relatively to said lifting carriage to move said dog out of locking relation to said detent member whereby to allow said detent member to move to holding position.

7. In an assembly of the class described, a lifting carriage, a load-lifting member, means mounting said load-lifting member for movement relatively to said lifting carriage in a vertical path, a detent member, pivot means mounting said detent member on said lifting carriage, an upper end portion of said detent member moving into and out of a holding position relatively to said lifting member as said detent member moves on its pivot means, a part of said lifting member with which the upper end portion of said detent member coacts when in holding position to

support said lifting member on said lifting carriage, said pivot means being positioned with its axis at one side of the vertical path of said lifting member whereby the weight of said lifting member acts through the said part to maintain the upper end of the detent member in holding position, trip means moving with said lifting member, a cam through which said trip means when moving upwardly relatively to said carriage moves said detent member to a release position, a dog for said detent member, means moving said dog to hold said member in release position when said member moves to release position, and said trip means when moving downwardly relatively to the lifting carriage moving the dog out of locking relation to the detent member to allow the detent member to move to holding position.

No references cited.