Oct. 1, 1968 W. H. LAPE 3,403,792

VERTICAL STACKER

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Fig. 1

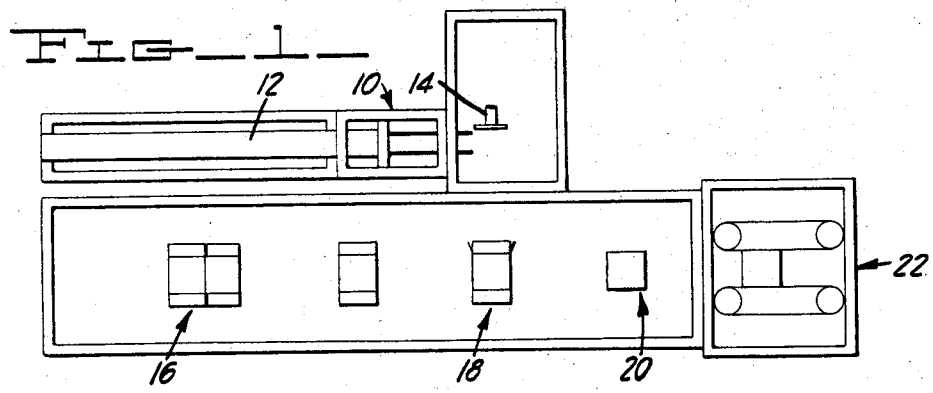
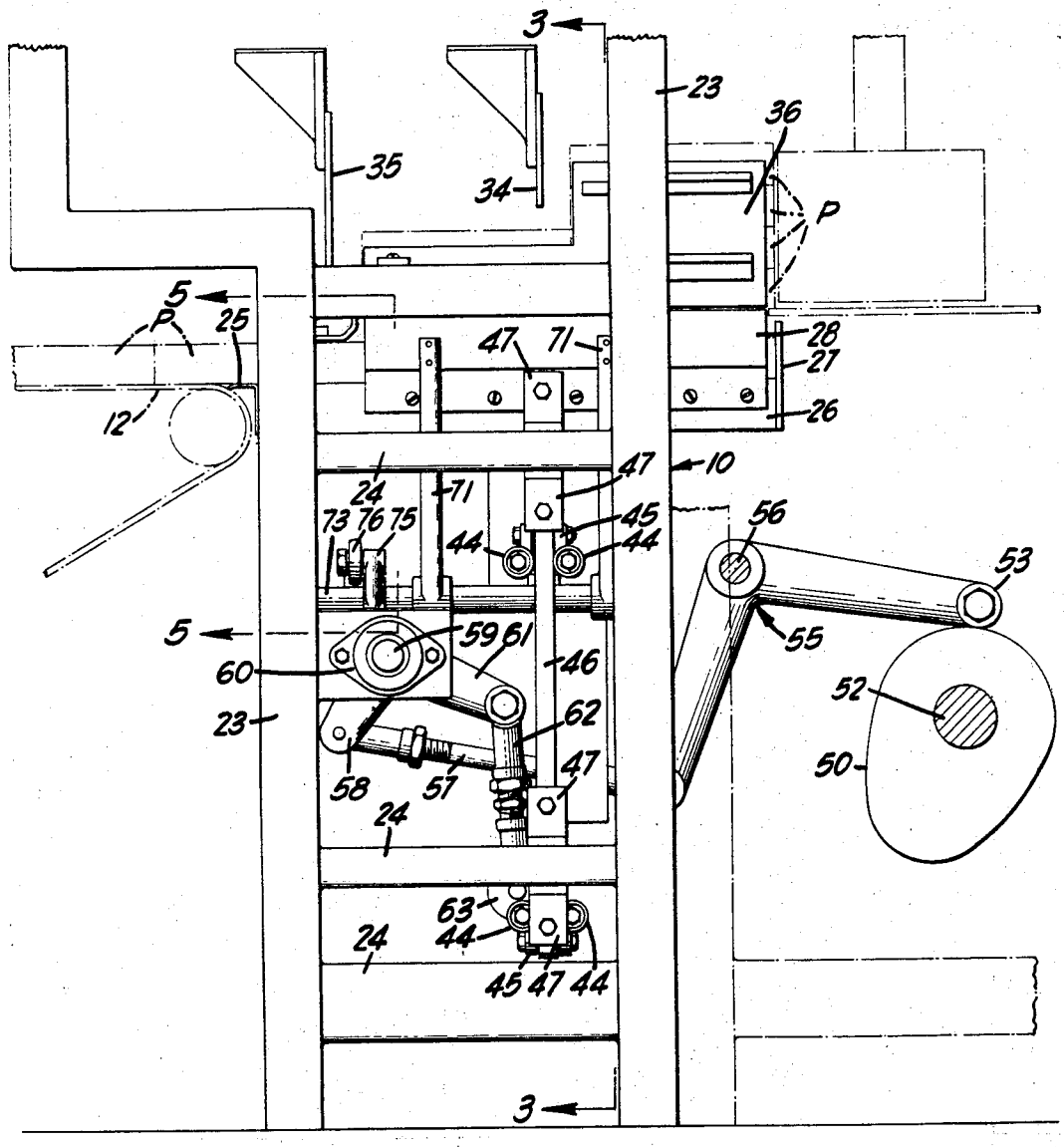


Fig. 2



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Fig. 3

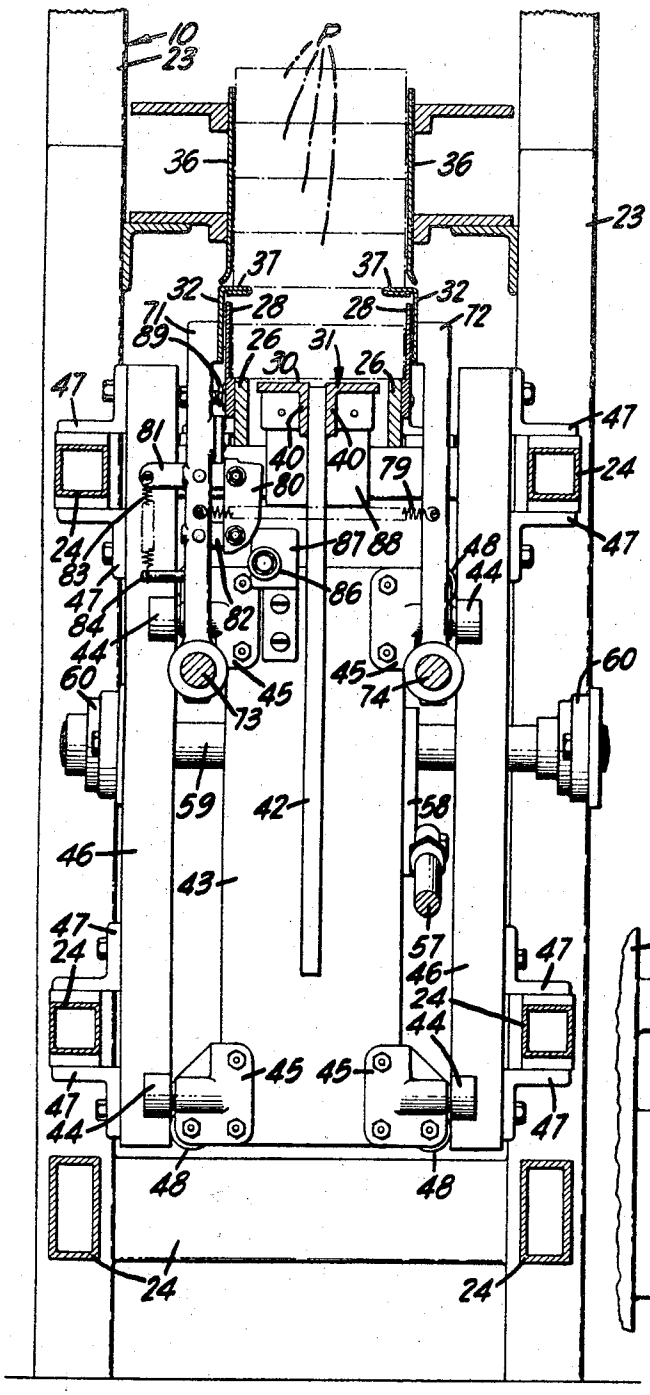


Fig. 4

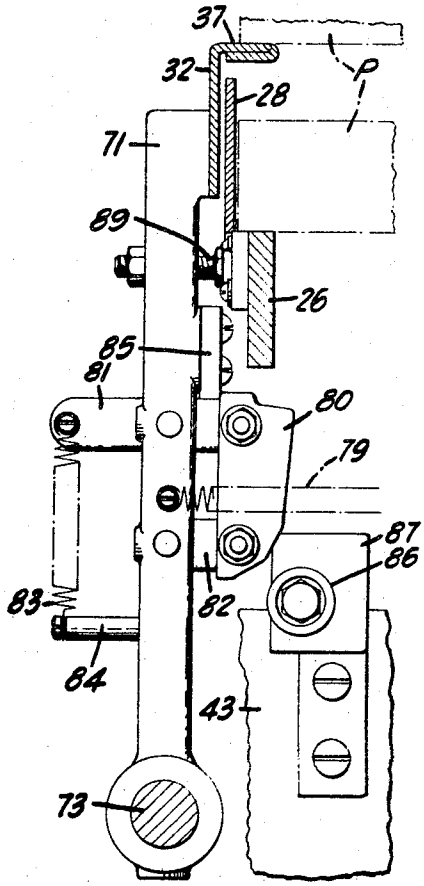
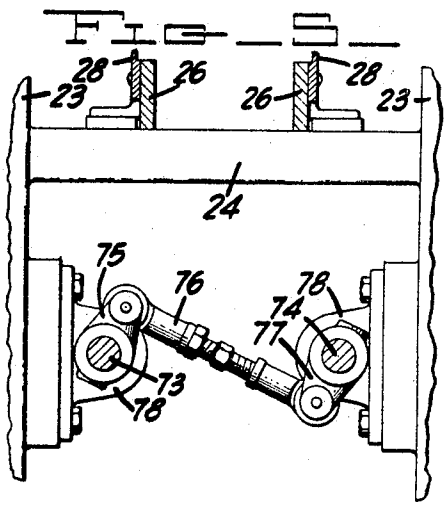


Fig. 5



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VERTICAL STACKER

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FIG. 6

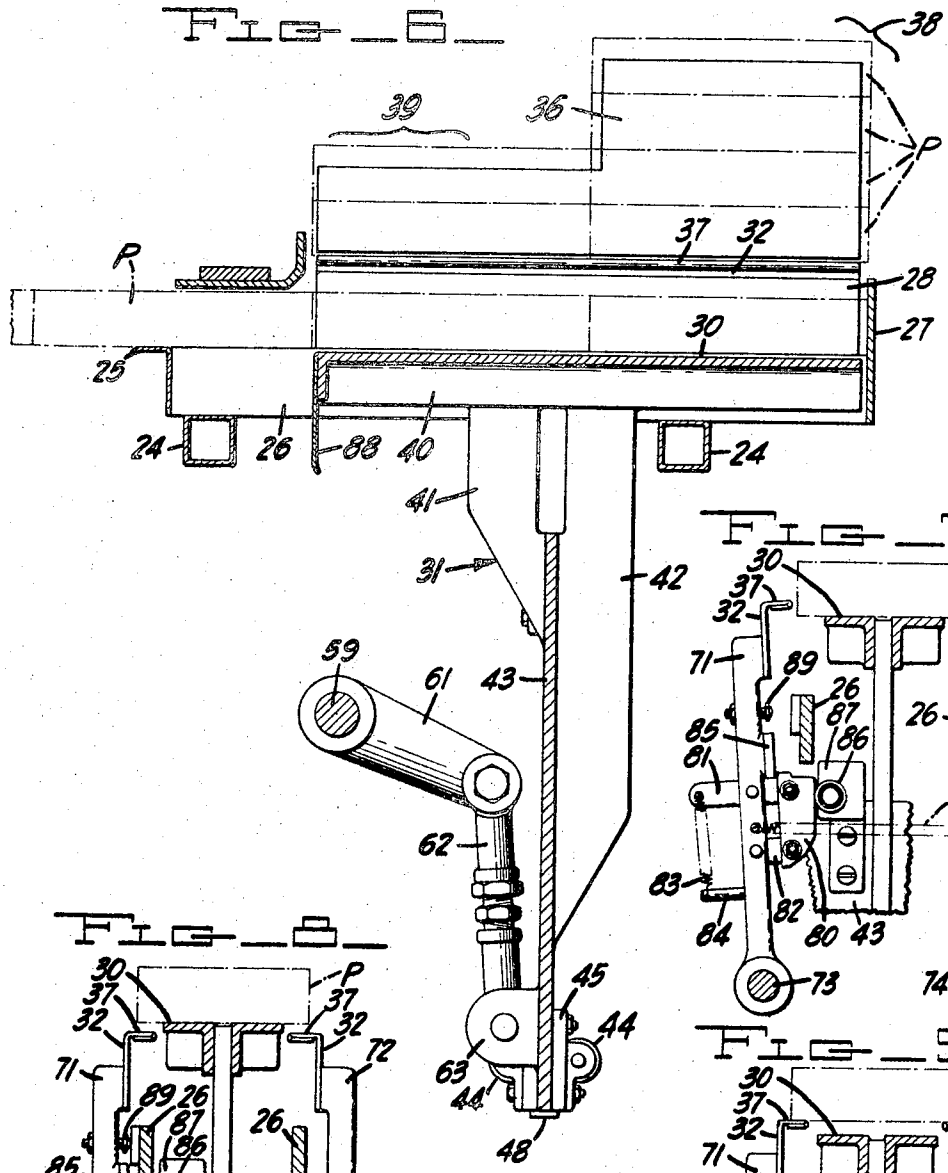


FIG. 7

FIG. 8

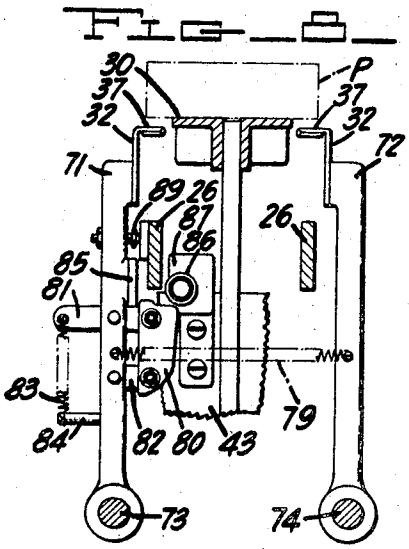
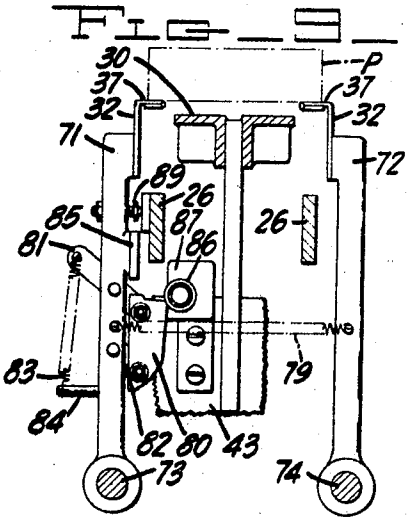


FIG. 9



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3,403,792

VERTICAL STACKER

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4 Claims. (Cl. 214—6)

ABSTRACT OF THE DISCLOSURE

The invention relates to an article stacking device to be employed for example with a case loading machine. The device includes an elevator to which the articles to be stacked are delivered and a pair of spaced ledges for supporting the packages raised by the elevator. The ledges are mounted on swingable arms for movement between active package supporting positions and inactive positions in which the elevator with a package thereon can pass between them in its upward movement. Cam and follower means are employed to swing the arms to move the ledges to their inoperative position the cam being so supported and controlled that it is effective to perform its arm swinging function only during the upward movement of the elevator.

The instant invention to article stacking means and particularly to improved means for forming a stack of superposed articles from a horizontal procession of said articles. The invention finds a principal field of utility in connection with the grouping of articles such as packages in tiers for loading into cases and will be described in that connection but it will be understood that the invention is not so limited and may find utility in other fields.

Heretofore in the grouping of articles, such as packages, for loading into cases it has been known to separate the articles, hereinafter referred to for convenience as packages, from a succession thereof and to form a group including one or more stacks said group constituting a case load or a portion thereof. Thereafter the group is inserted by suitable means into a case positioned to receive it. The separation of the individual packages from the succession has, in certain types of machines, been performed by an elevator arranged to move through strokes to lift a package, or a plurality of in line packages, from the succession into an elevated position and above package retaining means movable out of and into operative positions to permit the elevator and package to pass therebetween in the lifting stroke and to retain the package in its elevated position upon the return stroke of the elevator. A series of packages are thus lifted to form a vertical stack, each package as it passes between the retaining means raising the packages thereabove until the stack has acquired the desired number.

Conventionally the package retaining means comprises opposed spaced ledges on which opposite edges of the packages may rest when the ledges are in their operative positions, the elevator platform being dimensioned to pass therebetween when the retaining members are in such positions. The ledges are normally hinged and as a package is brought into contact with the bottoms of the ledges by the elevator the ledges are swung upwardly by the package itself until the package clears the ledges, the latter then being rotated by gravity or by other means to their original horizontal positions to form the support for the package. As the elevator moves through the initial portion of its downward stroke it deposits the package, and any superposed packages, thereon.

The prior mechanisms operate successfully with packages having such structural characteristics that they are unharmed by the load to which the packages are subjected as they perform their ledge opening functions and

are unharmed by the scraping action of the ledges on the packages. However with packages of other structural characteristics, such as readily deformable packages or those with abradable wrappings, etc. the forced opening or upward swinging of the ledges by the packages have caused serious damage thereto.

A principal object of the instant invention is the provision of a mechanism generally of the type referred to above for forming stacks of packages or the like but in which the packages supporting ledges are moved apart independently of the packages and slightly in advance of the raising of the packages therebetween whereby the above noted disadvantages of the prior constructions are overcome.

Another object of the invention is the provision of a vertical stacker attaining the above object in which the ledge opening function is automatically timed by the upward movement of the elevating means.

A further object of the invention is the provision of a vertical stacker attaining the foregoing objects in which the ledge members are mounted on rockable supports the supports being rocked from their inactive positions, in which the ledges are adapted to underlie the margins of the packages, to remote positions in which the ledges are sufficiently spaced apart to permit packages to pass freely therebetween. The means for so rocking the supports comprises an interconnection between the supports and also cooperating cam and follower means carried in part by one of the supports and in part by a portion of the elevator means.

Briefly described the invention resides in a package stacking apparatus including rail members on which the packages are moved in succession into position above an elevator adapted for movement between a level below the rails and a level above package supporting ledge members. The ledge members are carried by downwardly extending arms mounted for rocking movement. The arms are connected by a suitable linkage whereby upon inward and outward movement of one the other correspondingly moves inwardly and outwardly.

One of the arms supports a cam plate by a parallel linkage whereby the cam plate may be moved between an active camming upper position, as determined by a stop, and a lower inactive position the cam plate being normally maintained in its upper position by resilient means such as a spring. The elevator means has a cam follower or roller mounted thereon for vertical movement therewith the roller and cam plate being so constructed and arranged that when the latter is in its stopped position the roller, during the upward movement of the elevator and as the latter brings a package to a point adjacent the ledges, contacts the cam plate causing the arms to be swung outwardly to remote positions hence separating the ledges to permit the package to rise therebetween. As the ledges continue to swing outwardly they finally release any packages previously supported thereon, which drop slightly onto the newly raised package, and the elevator then raises the new package, as well as the packages now superposed thereon, until the new package is clear of the retaining ledges. At this point the roller rides off the cam plate permitting the ledge supporting members to swing inwardly under the influence of resilient means such as a spring to bring the ledges into package supporting position. The relative strengths of the resilient means normally maintaining the cam plate against the stop and the resilient means urging the ledge supporting arms into operative positions is such that upon downward movement of the elevator following deposit of the package on the retaining ledges and the contact of the roller with the cam, the latter is swung downwardly whereby the cam plate becomes ineffective. The elevator then con-

tinues its downward travel without causing outward swinging movement of the ledge supporting arms.

The extent of the inward swinging movement of the ledge supporting arms is determined by an adjustable stop whereby the ledges may be adapted for supporting packages of various widths within reasonable limits.

The invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description which follows and to the accompanying drawings in which:

FIG. 1 is a diagrammatic view in plan of a typical case opener and loader system in which the stacker of the instant invention finds a principal field of use;

FIG. 2 is a front elevational view of a vertical stacker embodying the instant invention;

FIG. 3 is a cross-sectional view on an enlarged scale taken on line 3—3 of FIG. 2;

FIG. 4 is a view on an enlarged scale of a portion of the apparatus illustrated in FIG. 3;

FIG. 5 is a sectional view of an enlarged scale taken on the line 5—5 of FIG. 2;

FIG. 6 is a view on an enlarged scale partially in section and partially in elevation illustrating a portion of the apparatus; and

FIGS. 7, 8 and 9 are elevational views with parts broken away for clearness of illustration showing various stages in the operation of the mechanism of the instant invention.

Referring now to the drawings and particularly to FIG. 1, a typical case loading system is illustrated, the system including a vertical stacker unit or article grouping mechanism **10** of the instant invention. In addition the system illustrated includes a conveyor **12** on which a succession of the articles to be loaded are delivered to the mechanism **10**. The system further includes a loader unit **14** in front of which groups of articles, assembled by the stacker unit **10**, are delivered by a pusher unit, not shown, and a typical case opening station **16** in which case blanks are set up to form open ended cases which are then conveyed to a loading station **18** in front of loader unit **14** with an open side aligned with the path of travel of the loader unit. Following loading the cases are conveyed to a gluing station **20** where glue is applied to the open flaps which are then plowed or folded into closed positions and thereafter the cases are conveyed to a compression station **22** where the glued flaps are held closed while the glue sets. While the case loading system briefly described above is an example of a system in which elevating and article grouping mechanism of the instant invention may be employed it will be understood that the latter finds utility in other systems.

Referring now particularly to FIGS. 2 to 9 inclusive the article elevating and grouping unit **10** comprises vertical frame members **23** and various cross frame members, such as those shown at **24**, supporting the mechanism of the instant invention. Article conveyor **12**, previously referred to, terminates adjacent the left end vertical frame members **23**, as illustrated in FIG. 2, and delivers articles such as packages P over a threshold plate **25** and onto spaced rails **26** (see FIGS. 2, 3 and 7 to 9, inclusive).

An end stop **27** and side plates **28** (see FIGS. 2 and 3), both secured by suitable means to the rails **26**, serve to limit the movement of the packages along the rails and to position them thereon. When so positioned the packages overlie the platform **30** of an elevator mechanism **31** hereinafter to be described in detail. Package retaining ledge members **32** having supporting ledges **37** are mounted for rocking movement, in a manner hereinafter described, between an operative position as illustrated in FIGS. 3, 8 and 9 and an inoperative position as illustrated in FIG. 7, and are at a level sufficiently above rails **26** to permit packages of varying thicknesses within reasonable limits to be accommodated between the rails and the bottoms of the ledges.

The apparatus specifically disclosed is adaped for what is termed progressive tiering, i.e. a system in which two or more packages are elevated at the same time to form forward and rearward vertical tiers **38** and **39** (FIG. 6), the forward tier being composed of packages shifted from the rearward tier as well as by packages elevated into the forward tier by the elevator means. Thus if, for example, the stack of packages to be inserted into a case is, as illustrated, a single tier four packages high elevator platform **30** is of a length to accommodate two packages in line to form two tiers. Assuming that the operation is started with two packages in the forward tier **38** with opposite margins of the lower of the two resting on the ledges **37**, elevator platform **30** is operated through two cycles to add two packages to the forward tier and to form a rearward tier of two packages. At this point a pusher member comprising suitably two pusher plates **34** and **35** one to contact the upper packages in the forward tier and the other to contact the packages in the rearward tier are driven through a stroke to shift the forward tier in front of loader unit **14** and to shift the rearward tier into the position formerly occupied by the forward tier. Hence in each two cycles of operation of the elevator mechanism a tier of four packages is formed. It will be understood that this particular type of tiering is disclosed for purposes of example only and that single tiering may be substituted as desired. The elevated packages resting on the ledges **37** are maintained in aligned position by side plates **36** carried by angle members which are in turn supported from the framework of the machine.

The platform **30** of elevator **31**, previously referred to, comprises angle members **40** secured on opposite sides to webs **41** and **42** which in turn are secured as by welding to the opposite faces of a plate **43** (see FIGS. 3 and 6). Plate **43** is guided for vertical movement by rollers **44** carried by brackets **45** at both edges of the plate, one set of the brackets being adjacent the lower end of the plate and a second set being at an upper position as illustrated in FIG. 3. The rollers contact opposite sides of vertical guides **46** which in turn are supported from horizontal frame members **24** of the machine by brackets **47**. Brackets **45** also support rollers **48** mounted to ride on the edges of guides **46** to laterally stabilize the elevator.

The elevator is caused to move through its ascending and descending strokes to move platform **30** between a position below the upper edges of rails **26** and a position somewhat above ledges **37** by means now to be described. These means include a cam **50** mounted for rotation on a camshaft **52** driven in any suitable manner. A cam follower roller **53** is adapted to ride on the profile of cam **50** the cam follower being mounted on one arm of a lever **55** the lever in turn being rotatably supported by shaft **56**. A second arm of lever **55** is pivotally connected to one end of an adjustable link **57** the other end of which is pivotally connected to one end of a lever arm **58**. The other end of arm **58** is fixed to a shaft **59** mounted for rocking movement in bearings **60**. Keyed or otherwise secured to shaft **59** is lever **61** having its outer end pivotally connected to one end of an adjustable link **62** the other end of which is pivotally mounted in a bracket **63** secured to plate **43**. As will be understood upon rotation of cam **50** roller **53** rides on the profile of the cam from the low point which it occupies in FIG. 2 to the high point and thence back to the low point thereby causing lever **55** to first rotate in a counterclockwise direction whereby, through the levers and linkages described, shaft **59** is rotated in a counterclockwise direction to, through lever **61** and linkage **62**, cause the elevator platform to be lifted from its lower position to its highest position. Thereafter as the follower rides off the high point of the cam lever **55** and

shaft 59 are rotated in the opposite directions to again lower the elevator platform to its original or lower position. As will be understood the elevator platform is of a width to pass freely between rails 26 as well as between ledges 37 when the latter are in their package supporting or operative positions. Also the elevator platform is provided with a downwardly projecting flange 88 (FIG. 6) to prevent forward movement of following packages when the elevator is raised.

Ledge members 32 carrying ledges 37 are secured to preferably pairs of arms 71 and 72 (see FIGS. 2 and 3), in any suitable manner. The pairs of arms 71 and 72 have their lower ends affixed by keying or otherwise to rockable shafts 73 and 74 respectively mounted in bearings 78 on opposite sides of the machine (FIG. 5). Shaft 73 has keyed thereto one end of a lever arm 75 the other end of which is pivotally connected to one end of an adjustable link 76. The other end of the adjustable link is connected to an end of a lever arm 77 keyed at its other end to shaft 74. As will be noted lever arms 75 and 77 project in opposite directions from their shafts and upon the rocking of one shaft, as for example, in a clockwise direction the other shaft will be rocked to the same degree but in the opposite or counterclockwise direction and vice versa.

Arms 71 mounted on shaft 73 are rocked between inner, or substantially upright, positions in which they support their associated ledge member 32 in its operative position (see FIGS. 3, 8 and 9) and outer positions (see FIG. 7) by means now to be described. It will be understood that such rocking movement of arms 71 causes, through levers 75 and 77 and link 76, corresponding rocking movements of arms 72 and their ledge member 32 between operative and inoperative positions. As will be observed particularly from FIG. 3 the inner or operative positions of arms 71 and hence of their ledge members 32 are determined by an adjustable stop 89, whereby the spacing of the ledges 37, when in their operative positions, may be adjusted to accommodate packages of different widths within reasonable limits. The arms 71 and 72 are yieldingly urged in a direction to maintain the ledges in their operative positions by a tension spring 79 having an end secured to one of the arms 71 and its other end to the opposite arm 72.

The mechanism for rocking arms 71, and hence arms 72 in outward directions comprises a cam assembly including a vertically extending cam plate 80 pivoted adjacent its opposite ends to parallel links 81 and 82 which in turn are pivotally mounted on one of the arms 71. Link 81 is extended rearwardly of the arm 71 and a tension spring 83 has one end connected to the rearward extension and the other end connected to a pin 84 projecting from said arm 71 whereby the links tend to rotate, under the influence of the spring, in a counterclockwise direction as viewed in FIGS. 3 and 4 and 7 to 9. The extent of the counterclockwise rotating movement of the links is controlled by a stop plate 85 secured to arm 71, the links when against the stop lying in substantially horizontal planes.

A cam follower roller 86 is mounted for rotation on a bracket 87 secured to elevator plate 43, the roller being positioned to contact the profile of cam plate 80 in the upward movement of the elevator. The profile of cam plate 80 is such that upon such contact and continued upward movement of the elevator, roller 86 forces cam plate 80 to move outwardly and to rock arms 71 in a counterclockwise direction against the action of spring 79 until the roller rides off the profile of the cam plate at the upper end thereof. As the roller rides off the profile of the cam plate arms 71 are rotated in a clockwise direction to their original or operative position by spring 79. Due to the linkage connecting arms 71 and 72, arms 72 will follow similar but opposite movements to those of arms 71.

The relative strengths of springs 79 and 83 are such that upon downward movement of the elevator, and as roller 86 contacts cam plate 80, spring 83 yields whereby the parallel links 81, 82 are rotated in a clockwise direction (see FIG. 9) by the roller which travels along the cam profile without causing outward rocking movement of arms 71 and 72.

In the operation of the mechanism described above (see particularly FIGS. 2, 3 and 6 to 9) and starting with the cam 50 of the elevator in the position shown in FIG. 2 with the elevator platform below two packages P, which in the meantime have been shifted thereabove onto rails 26 with the forward package against end stop 27 by following packages on the conveyor 12, as cam 50 rotates and follower 53 travels along its profile the elevator rises against the packages resting on the rails 26 and starts their upward movement. Upon continued rising movement of the elevator platform and before the packages reach the bottoms of ledges 37 roller 86 contacts cam 80. Cam 80 and its supporting linkage is prevented from being rotated in a counterclockwise direction under the thrust of the roller 86 by stop plate 85. Hence the cam and arms 71 and 72 are gradually rocked outwardly (counterclockwise for arm 71 and clockwise for arm 72) to in turn carry the ledges outwardly to such an extent as to permit the packages P supported by the elevator to pass freely therebetween (see FIG. 7). During the outward swinging movement of the ledges, if there are packages presently supported thereon, such packages drop a short distance, as the ledges clear them, onto the packages being elevated. Thereafter the packages on the elevator platform together with any packages now superposed thereon are raised until follower 53 reaches the high point of cam 50 and the elevator is at the upper end of its stroke with lower margins of the packages on the elevator platform above the level of the ledges. Just before this point roller 86 rides off cam 80 and spring 79 causes the arms to rock in their return directions to bring the ledges again into package supporting or operative position. As cam 50 continues to rotate follower 53 rides from the high point toward the low point causing the elevator to descend. During the descending movement roller 86 again contacts cam 80 but due to the greater strength of spring 79 as compared to spring 83 the arms 71 and 72 are not rocked but remain in their operative positions with their ledges 37 positioned to receive and support the packages.

As will be understood from the foregoing description of the construction and operation of the vertical stacker of the instant invention the opening of the package retaining ledges is entirely independent of the packages themselves. Hence soft or deformable packages, or those having wrappings readily subject to injury, may be stacked successfully. It will also be understood that the number of tiers or stacks and the number of packages added to each tier or stack may be varied as desired the particular tiering shown being only for purposes of illustration.

Having thus described the invention in rather complete detail it will be understood that these details need not be strictly adhered to and that various changes and modifications may be made all falling within the scope of the invention as defined by the following claims.

What is claimed is:

1. In a vertical stacker for articles said stacker including an elevator, means for moving said elevator from a first level to a second level, means for supplying articles in the path of movement of said elevator between said levels, spaced ledge means movable between inoperative positions and operative positions in which they serve to retain said articles adjacent said second level, a rockably mounted arm for each of said ledge means and a linkage connecting said arms for causing outwardly and inwardly rocking movements of one arm upon corresponding movements of the other arm; the improvement comprising a cam follower carried by said elevator for raising and lowering movements therewith, a cam plate assembly including a cam plate projecting inwardly of one of said

rockable arms and supported from said arm by parallel linkages pivotally connected to said cam plate and to said one arm whereby swinging movement of said cam plate is permitted between an active position in the path of movement of said cam follower and an inactive position, a stop for contact with a portion of said assembly for maintaining said cam plate in said active position during upward movement of said elevator whereby said rockable arms are rocked outwardly by the travel of said follower along said cam plate during said upward movement and means causing the cam plate to move to said inactive position during downward movement of said elevator.

2. In a vertical stacker for articles said stacker including an elevator, means for moving said elevator from a first level to a second level, means for supplying articles in the path of movement of said elevator between said levels, spaced ledge means movable between inoperative positions and operative positions in which they serve to retain said articles adjacent said second level, a rockably mounted arm for each of said ledge means and a linkage connecting said arms for causing outwardly and inwardly rocking movements of one arm upon corresponding movements of the other arm; the improvement comprising a cam follower carried by said elevator for raising and lowering movements therewith, a cam plate projecting inwardly of one of said rockable arms, means supporting said cam plate from said arm for movement between an active position in which it is in the path of said follower and when contacted thereby causes rocking of said arm

to move said ledge means to said inoperative positions, and an inactive position, means for maintaining said cam plate in said active position upon upward movement of said follower with said elevator, and means for swinging said cam plate to its inactive position upon downward movement of said follower.

3. A vertical stacker as defined in claim **1** wherein there is means for resiliently urging said portion of said assembly against said stop.

4. A vertical stacker as defined in claim **3** wherein there is resilient means urging said rockable member inwardly to position said cam plate in the path of said follower, said last named resilient means being of greater force than the resilient means urging the plate against said stop whereby upon downward movement of said elevator said cam plate is moved to its inactive position by said follower.

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