

Dec. 31, 1968

M. D. MARTIN

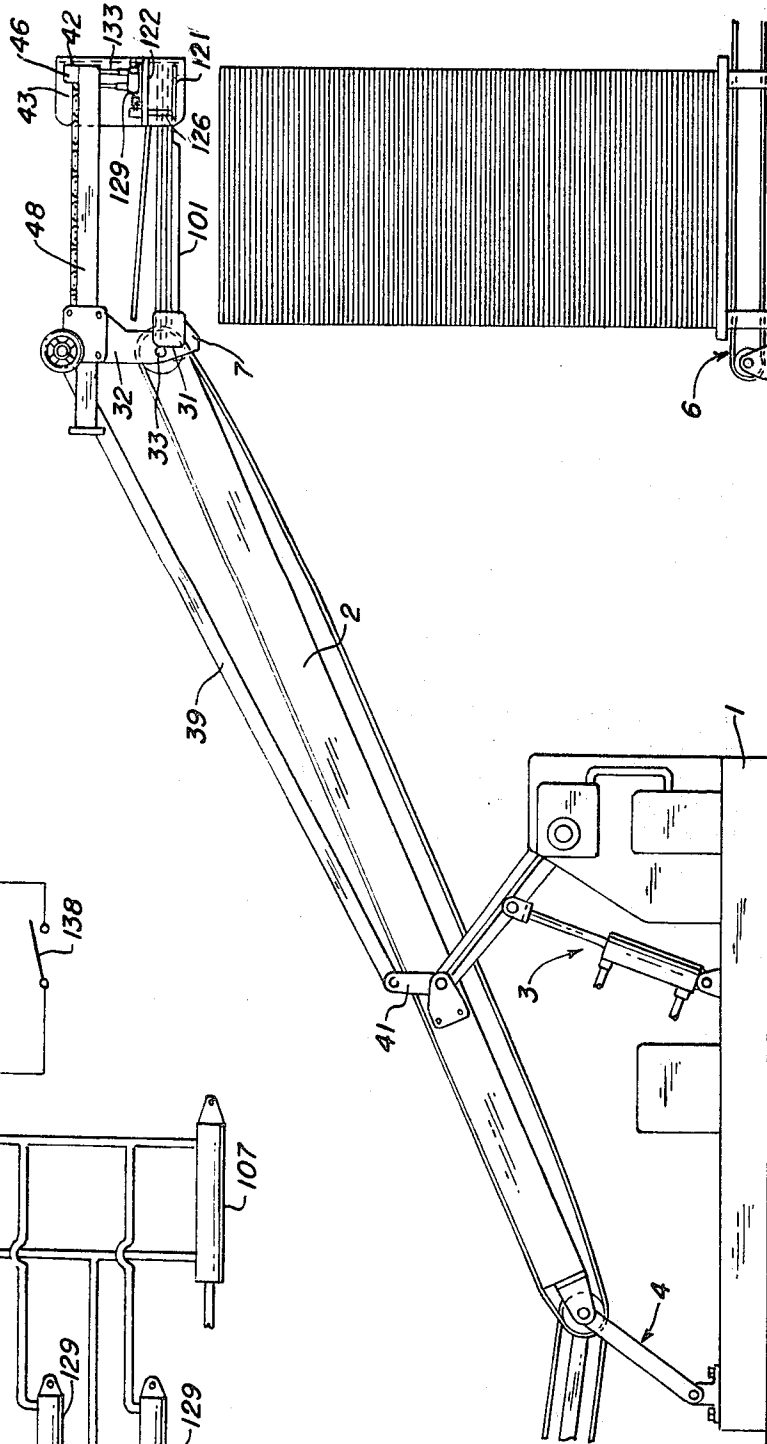
3,419,266

SHEET ACCUMULATOR DEVICE FOR AUTOMATIC SHEET STACKERS

Filed Feb. 20, 1967

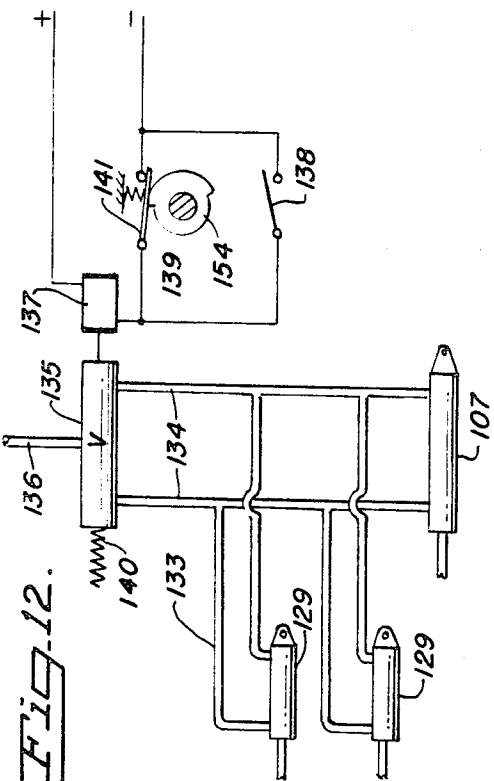
Sheet 1 of 5

Fig. 1.



AIR SUPPLY

Fig. 12.



INVENTOR
MERRILL D. MARTIN
BY

George White
ATTORNEY

Dec. 31, 1968

M. D. MARTIN

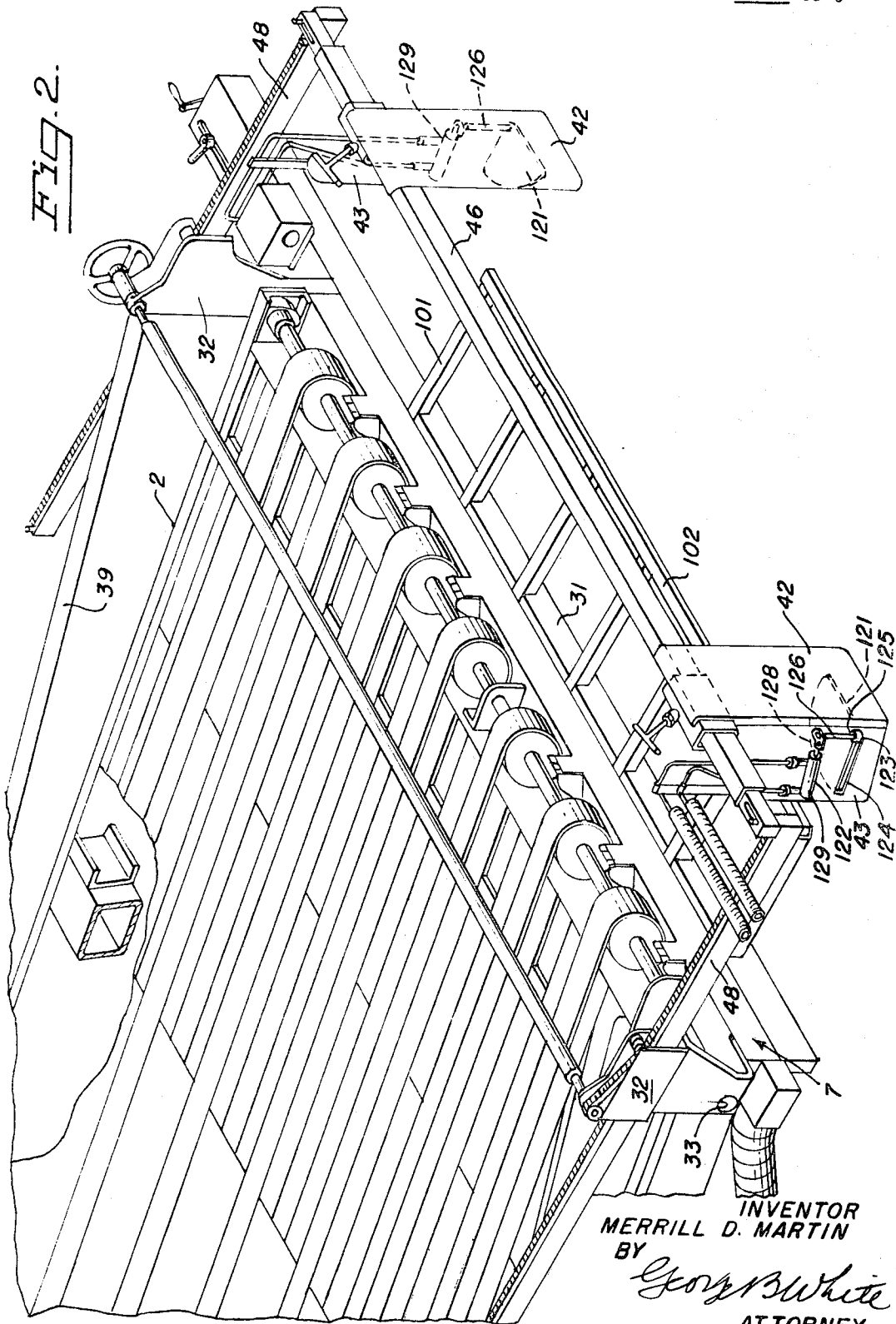
3,419,266

SHEET ACCUMULATOR DEVICE FOR AUTOMATIC SHEET STACKERS

Filed Feb. 20, 1967

Sheet 2 of 5

FIG. 2.



INVENTOR
MERRILL D. MARTIN
BY

George B. White
ATTORNEY

Dec. 31, 1968

M. D. MARTIN

3,419,266

SHEET ACCUMULATOR DEVICE FOR AUTOMATIC SHEET STACKERS

Filed Feb. 20, 1967

Sheet 3 of 3

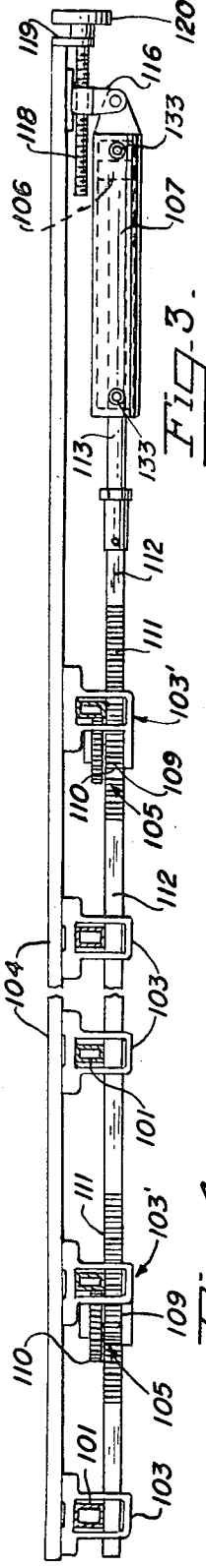


FIG. 3.

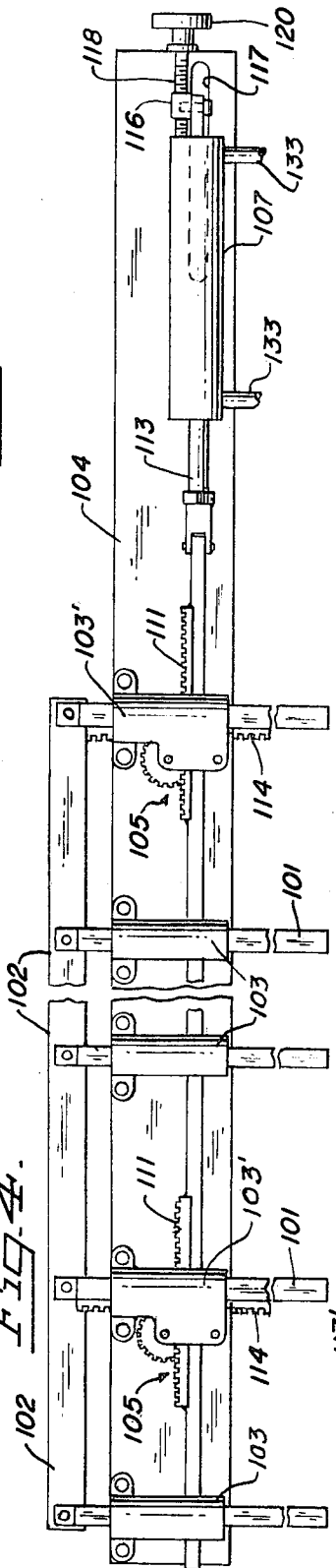


FIG. 4.

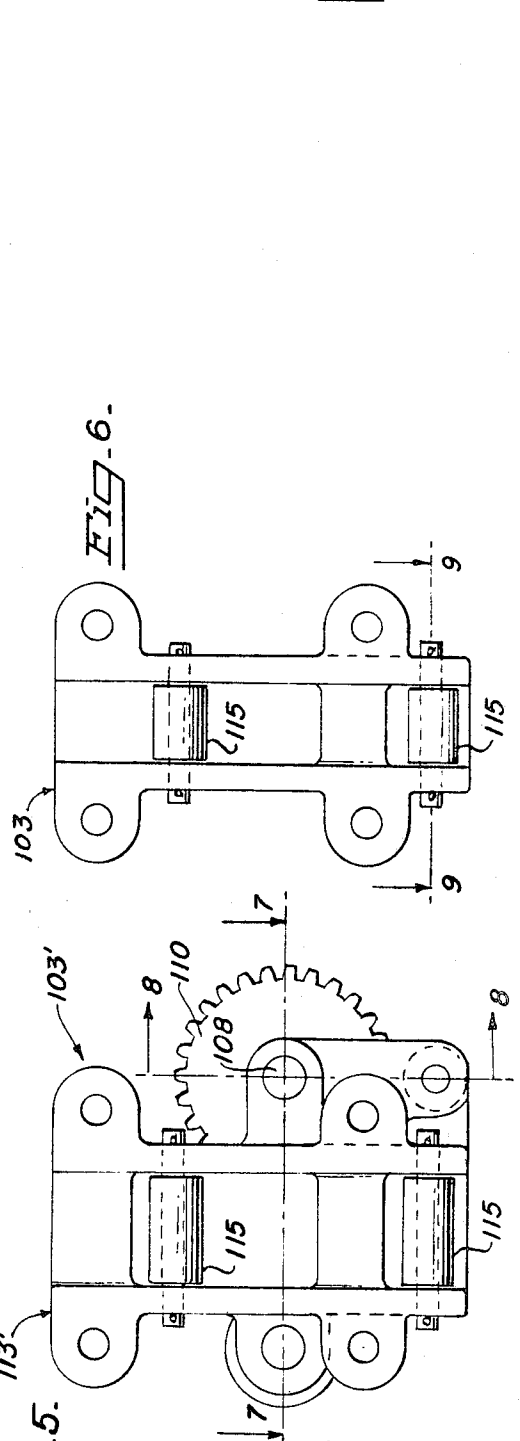


FIG. 6.

FIG. 5.

INVENTOR
MERRILL D. MARTIN
BY *George White*
ATTORNEY

Dec. 31, 1968

M. D. MARTIN

3,419,266

SHEET ACCUMULATOR DEVICE FOR AUTOMATIC SHEET STACKERS

Filed Feb. 20, 1967

Sheet 4 of 5

Fig. 7.

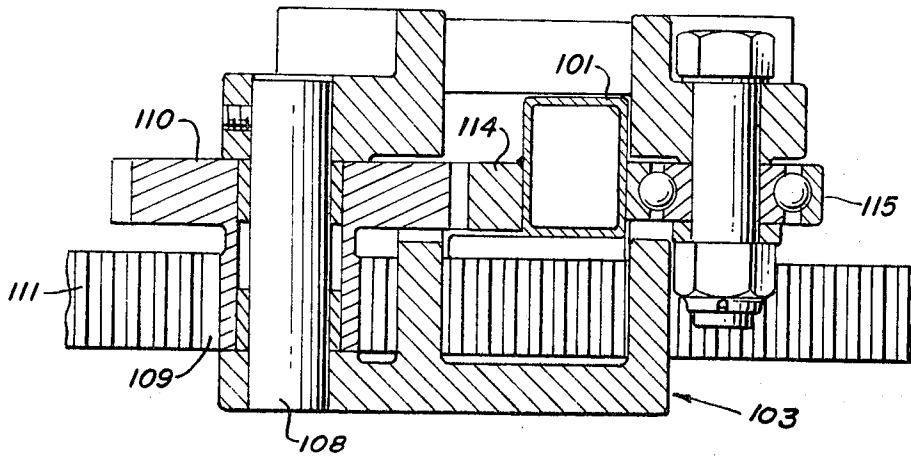


Fig. 8.

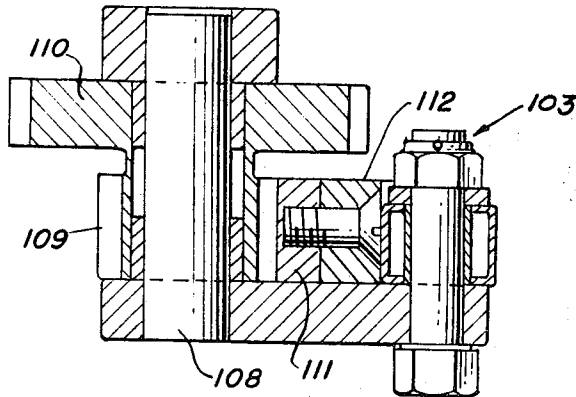
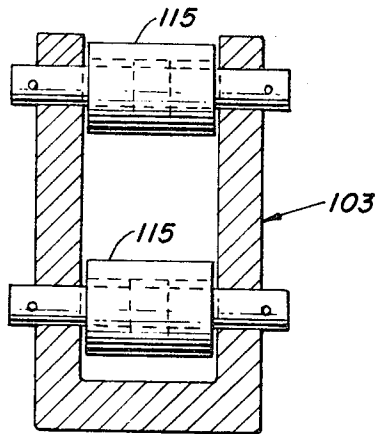


Fig. 9.



INVENTOR
MERRILL D. MARTIN
BY

George B. White
ATTORNEY

Dec. 31, 1968

M. D. MARTIN

3,419,266

SHEET ACCUMULATOR DEVICE FOR AUTOMATIC SHEET STACKERS

Filed Feb. 20, 1967

Sheet 5 of 6

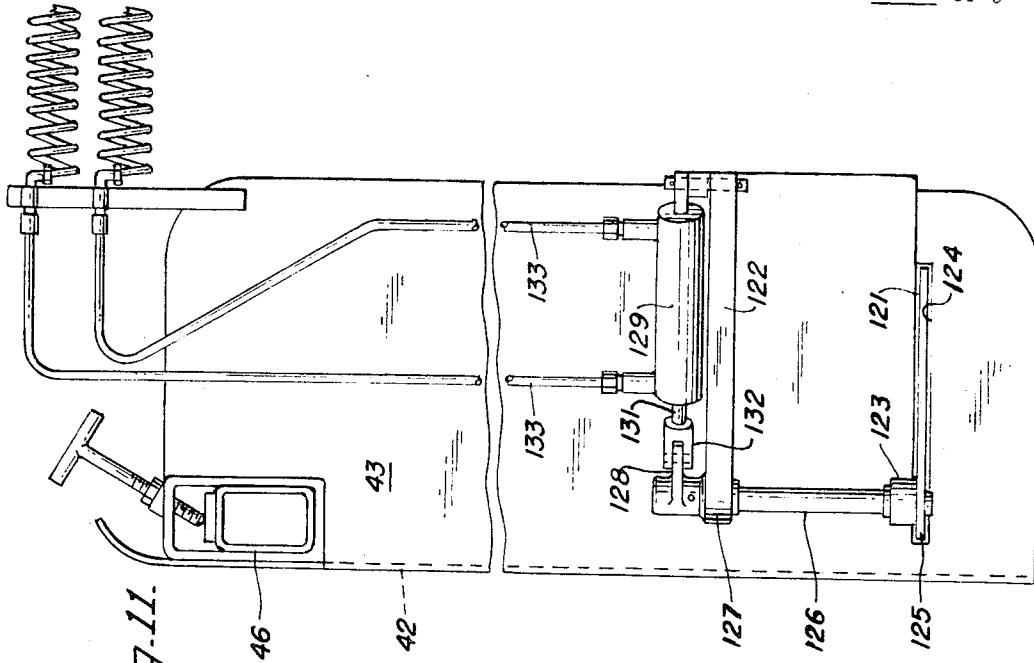


Fig. 11.

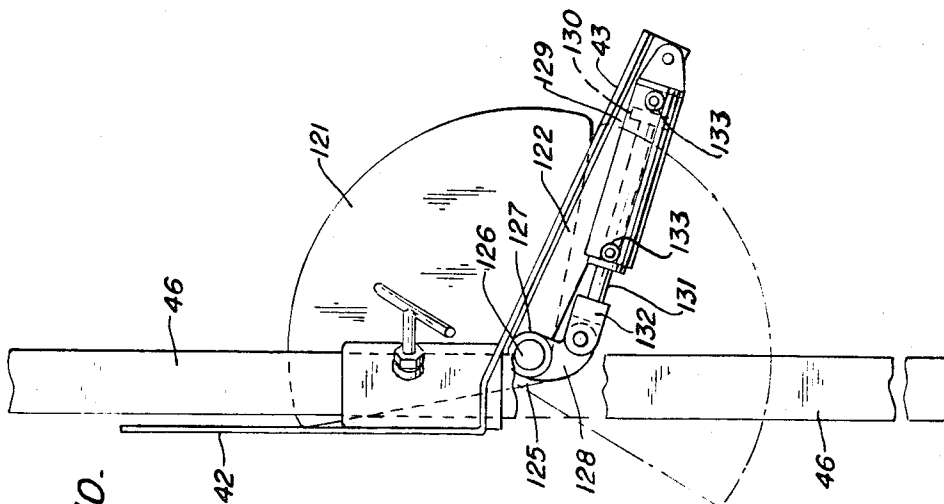


Fig. 10.

INVENTOR
MERRILL D. MARTIN

BY

George B. White
ATTORNEY

1

2

3,419,266

SHEET ACCUMULATOR DEVICE FOR AUTOMATIC SHEET STACKERS

Merrill D. Martin, 2 Mall Court, Oakland, Calif. 94611

Filed Feb. 20, 1967, Ser. No. 617,400
11 Claims. (Cl. 271-86)

ABSTRACT OF THE DISCLOSURE

In automatic sheet stackers of the type shown in Patent No. 2,901,250, issued Aug. 25, 1959 to Geo. M. Martin, the sheets are discharged from the end of the conveyor frame, the discharge end of which frame is swung upwardly in a straight line so as to drop the discharged sheets on the top of the stack evenly. In an improvement on that type of machine shown in U.S. Patent No. 3,321,202, issued May 23, 1967, to Merrill D. Martin, there is provided a bracket pivoted at each end of the conveyor frame, and being turned in proportion to the change of angularity of the conveyor frame thereby to maintain a constant attitude relatively to the ground or to the stack. On each bracket there are also supported adjustable corner guide abutments spaced from the ends of the conveyor frame against which the sheet abuts so as to be accurately located with respect to the stack. The improvement of the present application consists of supporting catcher fingers on a cross frame between and on said brackets so that the catcher fingers can be withdrawn into an out of the way position beneath the conveyor frame. A system of gears and racks on the support for the catcher fingers is operated by pneumatic devices for moving the catcher fingers simultaneously into position to catch and support the discharged sheets. There is also pivoted a catcher plate in each guide abutment swingable into and out of position in registry with the level of the catcher fingers to support the corners of the sheets. The catcher plates are also operated by pneumatic devices, which latter are timed with the stacker controls for raising and lowering the discharge end of the conveyor frame.

Cross reference

This patent application is an improvement on the aforesaid U.S. Patent No. 3,321,202.

Brief description of the invention

The sheet accumulator is necessary on sheet stackers, particularly of the type wherein the discharge end of the accumulator is raised vertically to discharge sheets one by one, thereby to form a stack either on a pallet or on a conveyor. In order to permit time for carrying a stack of sheets away from the discharge end of the conveyor frame without stopping the feeding of the sheets, the accumulator device of this invention is rendered operative when a stack is completed to catch the sheets from the stacker while the previously formed stack is removed; then as the stacker frame is lowered, the catcher elements are withdrawn from operative position thereby to drop accumulated sheets onto the pallet or conveyor. The spacing of the catcher fingers and plates forming the accumulator below the level of the discharge end of the conveyor frame in such that the accumulated stack of sheets does not rise above the level of the conveyor frame during the interval needed for removing the previously formed stack and the returning of the conveyor frame to its initial position.

Description of figures in the drawings

FIG. 1 is a side view of a stacker illustrating relative

positions of the parts and of the accumulator device relatively to the stacker and the stack of sheets.

FIG. 2 is a fragmental perspective view of the delivery end of the stacker showing the accumulator device in extended position.

FIG. 3 is a fragmental end view of the support and the actuating mechanism for the catcher fingers.

FIG. 4 is a fragmental plan view of the support and actuating mechanism for the catcher fingers.

FIG. 5 is a sub-assembly view of one of the guides and supports for one of the catcher fingers, removed from the supporting base and being viewed from its base face.

FIG. 6 is a view of one of the guides for a finger without gear and rack drive.

FIG. 7 is a cross-sectional view of one of the guides with gear and rack taken substantially on line 7-7 of FIG. 5.

FIG. 8 is a sectional view of said guide taken substantially on line 8-8 of FIG. 5.

FIG. 9 is a sectional view of the guide shown in FIG. 6, the section being taken substantially through the lines 9-9 of FIG. 6.

FIG. 10 is a plan view showing one of the catcher plates and its operating mechanism.

FIG. 11 is an edge view of one of the catcher plates and its operating mechanism mounted on the adjacent sheet aligning element.

FIG. 12 is a diagram illustrating the controls for the accumulator.

Detailed description

The improvement herein is preferably used on a stacker apparatus shown and described in more detail in said U.S. Patent No. 3,321,202. In the description of parts of said stacker apparatus, the part numbers used in said last mentioned patent will be used to denote corresponding parts herein referred to. On a base 1 is swingably supported a conveyor frame 2 partly by an adjustable raising and lowering mechanism 3 connected to about the middle of the conveyor frame 2 and by a compensating lever device 4 at the intake end of the conveyor frame 2. Under the delivery end of the stacker frame 2 is either a suitable pallet or a delivery conveyor 6 which is coordinated with the position of the conveyor frame 2 so that it operates when the conveyor frame 2 is raised to the predetermined height of the stack. An air cushion device 7 is mounted on the delivery end of the conveyor frame 2 on adjustable mountings to maintain a constant attitude relatively to the stack for producing an air cushion on the top of the stack and below the sheets delivered from the conveyor frame 2. This air cushion device 7 is spaced at a substantial distance below the level of the delivery end of the conveyor frame 2. This air cushion device 7 includes a manifold 31 mounted at each end on a pivoted bracket plate 32, which latter are journaled on a conveyor shaft 33 in the delivery end of the conveyor frame 2. This manifold 31 is held generally horizontally or parallel with the top of the stack by the turning of the pivoted bracket plates 32 in conformance with the changing of the angular position of the conveyor frame 2 by means of a link 39 pivotally connected to the upper portion of each bracket plate 32 at one end thereof, and to a crank arm 41 extended at an angle from the lever arm of the raising and lowering device 3. For locating the sheets on the stack, angle or corner guides are formed respectively by an abutment wall 42 and guide wall 43 supported adjustably on a cross bar 46 spaced from the delivery end of the conveyor frame 2. The cross bar 46 in turn is supported on spaced adjusting bars 48 adjustably mounted on the pivoted bracket plates 32 in the manner shown in said copending application.

The sheet catching or accumulating device is mounted on the delivery end of the conveyor frame 2.

Sheet catching fingers 101 are mounted at the outer ends thereof on a cross bar 102 which extends parallel with the delivery end of the conveyor frame 2. The catching fingers 101 are supported and guided in guides 103 mounted on a base plate 104, which latter in turn is suitably mounted on the bottom of the manifold 31. Thus the base plate 104 is supported on the pivoted bracket plates 32 and supports the catcher fingers 101 in a generally horizontal attitude below the level of the delivery end of the conveyor frame 2.

The set of catcher fingers 101 is moved from concealed position beneath the manifold 31, into extended position beyond the delivery end of the conveyor frame 2, in unison by a gear rack mechanism 105 operated by a piston 106 in a cylinder 107, in this illustration pneumatically. Certain of the spaced guides 103', shown in FIGS. 5 to 8, have a gear shaft 108 fixed therein at right angles perpendicularly to the adjacent catcher fingers 101. The gear shaft 108 supports a drive gear 109 and a larger diameter shifting gear 110 parallel with the base plate 104. The drive gear 109 engages a gear rack 111 formed on a side of an operating bar 112 movable along the base plate 104, which operating bar 112 in turn is suitably connected to the piston rod 113 of the piston 106. The larger shifting gear is integral with the drive gear 109 and engages a gear rack 114 formed along the adjacent side of the adjacent catcher finger 101. When the piston 106 is reciprocated in the cylinder 107, it moves the operating bar 112 and its several gear racks 111 therewith, which latter in turn rotate the respective drive gears 109 and shifting gears 110 thereby to transmit movement to the gear racks 114 and the catcher fingers 101, for moving the latter into and out of catching position respectively. All the guides 103 and 103' have spaced pairs of rollers 115 between which the respective catcher fingers 101 are guided.

The cylinder 107 is mounted at one end thereof on a travel bracket 116 slideable in a groove 117 in the base plate 104 and is supported on a screw shaft 118 threaded through the bracket 116 and journaled in a bearing lug 119 on the end of the base plate 104. A handle knob 120 on the end of the screw shaft 118 facilitates the turning of the screw shaft 118, for adjusting the initial position of the catcher fingers 101.

The catcher plates 121 cooperate with the fingers 101 to support the outer corners of the sheets delivered from the conveyor frame 2. On the outside of each guide wall 43 is provided a horizontal flange 122. Spaced below the flange 122 is a bearing lug 123 adjacent a horizontal slit 124. Each catcher plate 121 is in the shape of a sector of a circle, on the corner 125 of which is secured a perpendicular shaft 126. The flange 122 has a bearing 127 therethrough in registry with the bearing lug 123, and the shaft 126 extends through said bearing lug 123 and through said bearing 127. A crank arm 128 is secured to the top of the shaft 126. A pneumatic cylinder 129 is pivotally mounted at one end thereof to the flange 122. A piston 130 works in the cylinder 129. The piston rod 131 of said piston 130 extends through the other closed end of the cylinder 129 and is connected by a pivot yoke 132 to the crank arm 128. As the double action piston 130 is reciprocated, it rocks the shaft 126, thereby swings the catcher plate 121 into and out of sheet catching position respectively. The slits 124 and the catcher plates 121 are positioned on the same plane as the catcher fingers 101.

The simultaneous actuation of the catcher fingers 101 and catcher plates 121 is accomplished in the manner illustrated in the diagram in FIG. 12.

Each cylinder 107 and 129 has an air hose or flexible conduit 133 connected to each end thereof, which are respectively connected to conduits 134. A suitable three-way valve 135 alternately connects the conduits 134 to a supply conduit 136, to operate the cylinders 107 and

129 to move the catcher fingers 101 and catcher plates 121 into sheet catching positions and back into the out-of-the-way positions respectively. The valve 135 is of suitable spring action whereby spring 140 normally holds the valve 135 in an initial position to admit air under pressure to the closed free ends of the respective cylinders 107 and 129, thereby to normally withdraw said catcher fingers 101 and catcher plates 129 into the respective out-of-the-way positions. When the valve 135 is shifted to its alternate position to admit air under pressure to the pivoted ends of the cylinders 107 and 129, then the respective pistons are moved to shift the catcher fingers 101 and catcher plates 129 into extended position below the sheets delivered from the conveyor frame 2. The shifting of the valve 135 from said initial position, in the herein illustrative diagram is accomplished by a solenoid 137 which may be controlled manually by a switch 138.

In the present illustration the solenoid 137 has one of its supply line 139 interrupted, in parallel with the switch 138, by a cam switch 141 actuated by the cam 154 of the automatic stacker in the circuit described in and shown in FIG. 12 of said U.S. Patent No. 3,321,202, thereby to energize the solenoid when the conveyor frame reaches a predetermined height and hold it energized until the conveyor frame is returned to its initial position, permitting sufficient interval for the removal of the sheets stacked on the delivery conveyor 6. The spacing of the catcher fingers 101 and catcher plates 121 below the level of the delivery end of the conveyor frame 2 is predetermined to accommodate below the level of the delivery end of the conveyor frame 2 all the sheets that may be delivered during said interval needed for the removal of the stack on said pallet or conveyor 6. This spacing of the catcher fingers 101 and plates 121 is predetermined in relation to the speed of sheet delivery from said delivery end and said needed interval for removal of the completed stack.

It is to be noted in this embodiment, that the accumulating device is mounted below the air cushion device 7, thereby to interpose the air cushion between the discharged sheets and the fingers 101 and plates 121, for cushioning the accumulation. An advantage of so locating the accumulator device is that the air cushion prevents smearing of printed matter on the accumulated sheets.

I claim:

1. In a sheet accumulator for sheet stackers, the combination with the sheet delivery part of the sheet stacker and means to raise and lower said delivery part to deliver sheets onto a stack, the improvements of:

a plurality of catcher fingers,
guide means to support and guide said fingers in parallel spaced relation below the level of said delivery part to catch sheets delivered therefrom,
mounting means to mount said guide means on said delivery part spaced to a predetermined distance below the level of the sheet delivery to accommodate a predetermined height of accumulated sheets,
means to move said fingers in unison into and out of sheet catching position,
and control means responsive to the angular movement of said delivery part to actuate said moving means to move said fingers into sheet catching position after a predetermined height of rising of said delivery end thereby to support and stack the sheets, and to withdraw said fingers from below said sheets after said delivery end is lowered.

2. The sheet accumulator defined in claim 1, wherein said finger moving means includes:

a finger gear rack on the sides of at least two of said fingers,
an operating bar guided across said guide means, operating gear racks formed on portions of said operating bar adjacent said finger gear racks,
gear means coacting with said finger gear racks and said operating gear racks thereby to convert lineal movement of said operating bar into lineal move-

5

ment of said fingers respectively into and out of sheet catching position.

3. The sheet accumulator defined in claim 2, and spaced pairs of spaced rollers in said guide means respectively above and below the respective fingers to support and brace said fingers in parallel positions. 5

4. The sheet accumulator defined in claim 2, and a transverse member connecting the free ends of said fingers.

5. The sheet accumulator defined in claim 1, wherein said sheet stacker has abutment and guide elements and means to support said abutment and guide elements spaced from said delivery part so that said elements rise and lower with said delivery part, 10

catcher plates,

means on said abutment and guide elements to support said catcher plates in generally horizontal position in registry with said fingers to support the corners of the sheets accumulated on said fingers between said abutment and guide elements,

and means on said elements for swinging said catcher plates substantially horizontally into and out of catching position.

6. The sheet accumulator defined in claim 5, said control means operating said finger moving means and said catcher plate moving means in synchronism. 15

7. The sheet accumulator defined in claim 5, said control means being actuated by the movement of said stacker from an initial position to operate said finger moving means and said catcher plate moving means to move said fingers and plates into catching position in synchronism after a predetermined stacking movement of said delivery part of said stacker, and to withdraw said fingers and plates into inoperative position upon the return of said delivery part into said initial position. 20

8. In a sheet accumulator the combination with a conveyor frame having a delivery end and means to raise and lower said conveyor frame respectively from and to an initial position so as to move the delivery end of said conveyor frame in a substantially perpendicular plane for stacking sheets conveyed to and discharged from said delivery end, of 25

catcher means spaced below said delivery end for accumulating sheets thereon,

self-adjustable support means actuated by the swinging 30

6

of said frame to compensate for change of angular position of said conveyor frame during the raising and lowering of said delivery end thereby to maintain said catcher means in a generally horizontal attitude below said delivery end,

means to move said catcher means into and out of catching position,

and control means responsive to the angular movement of said conveyor frame to actuate said catcher moving means thereby to move said catcher means into operative position after a predetermined height of rising of said delivery end and to withdraw said catching means into inoperative position after said delivery end is returned into said initial position. 35

9. The sheet accumulator defined in claim 8, wherein the spacing of said catcher means below the level of the delivery end of said conveyor frame is so related to the speed of sheet feeding from said delivery end as to accommodate all the sheets delivered during said period between said predetermined height and said return of the conveyor frame to initial position.

10. The invention defined in claim 9 and said catcher means including:

first catcher elements movable outwardly beyond the delivery end,

and other catcher elements spaced outwardly from said delivery end and movable inwardly toward said delivery end in registry with said first catcher elements.

11. The invention defined in claim 8 wherein an air cushion producing device is provided on the conveyor frame beneath said delivery end, and said catcher means being mounted under said air cushion producing device to interpose an air cushion between the discharged sheets and catcher device. 40

References Cited

UNITED STATES PATENTS

1,305,501 6/1919 Steele.
2,878,947 3/1959 Thrasher.

EDWARD A. SROKA, *Primary Examiner*.

U.S. CI. X.R.

45 214—6