

### [54] COUNTER EJECTOR

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**271/88; 198/35, 24; 254/133, 134**

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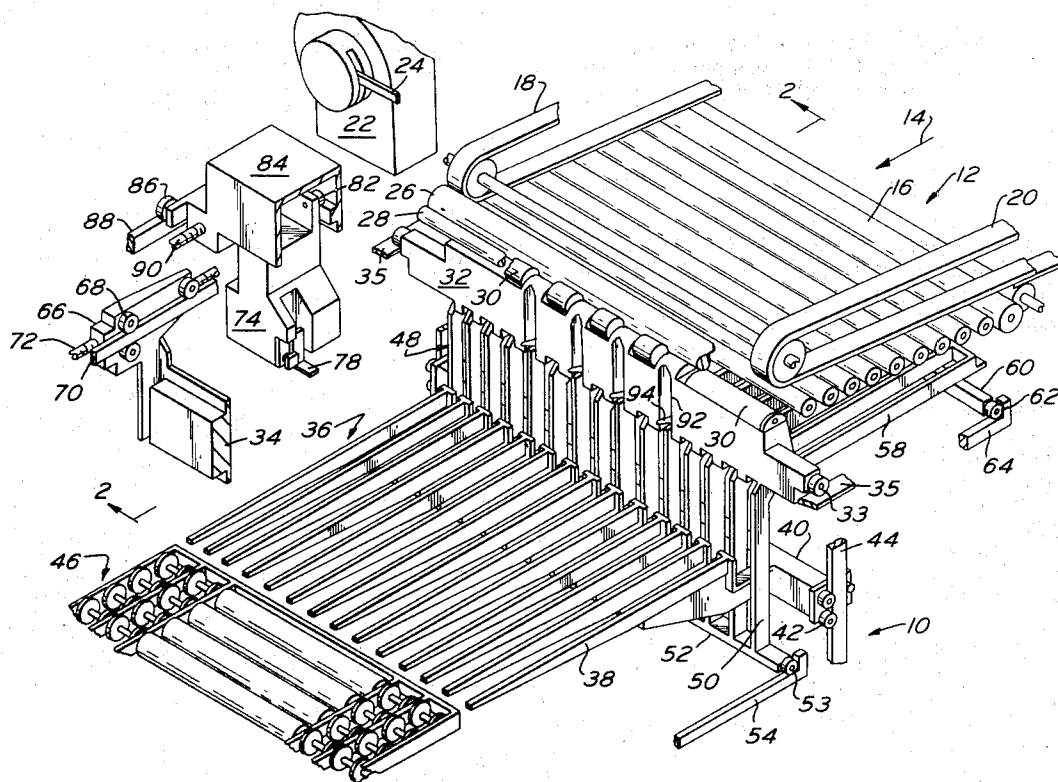
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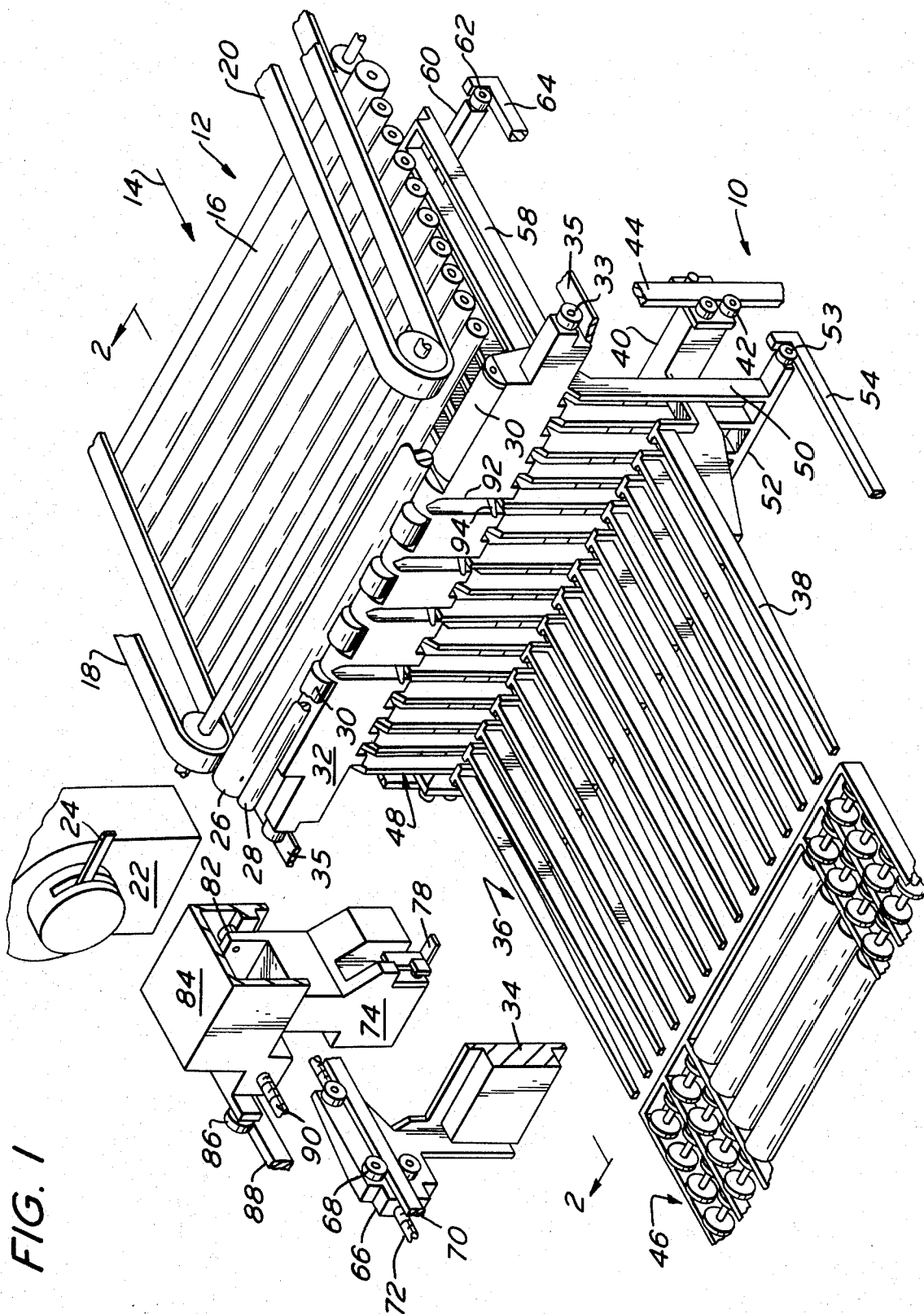
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### ABSTRACT

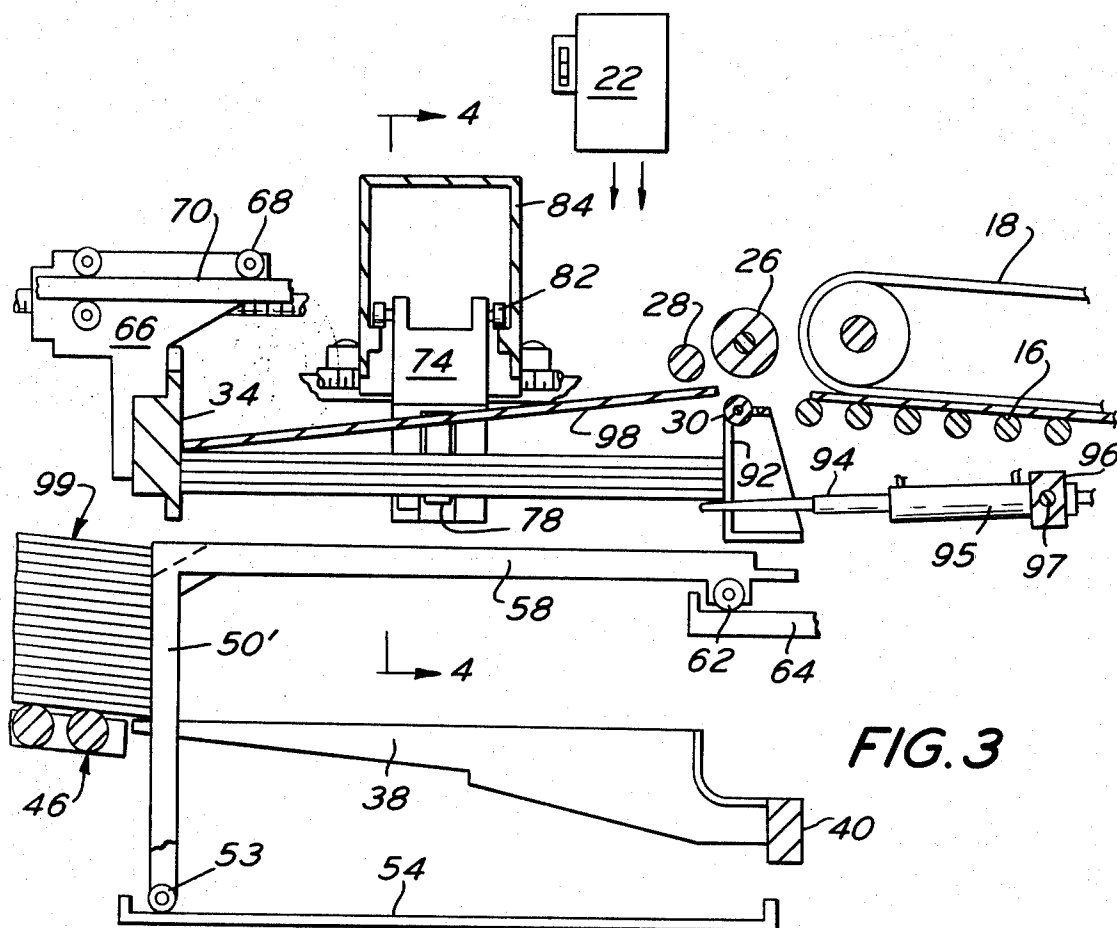
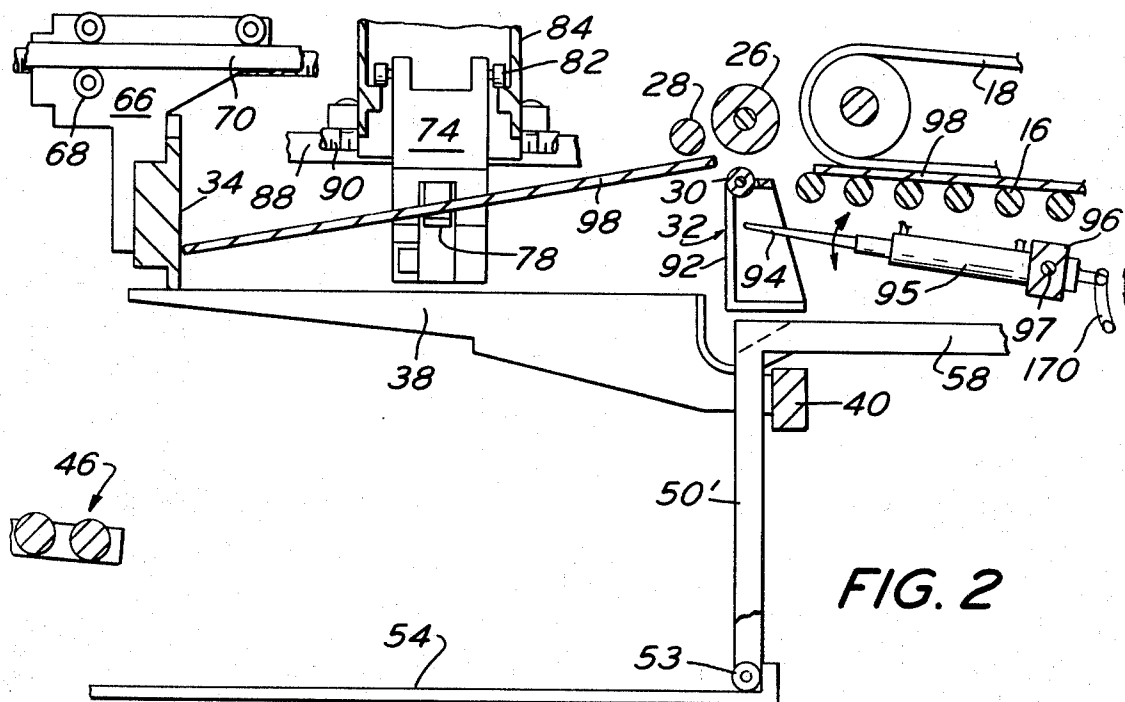
In apparatus which counts the number of sheets accumulated on an elevator and then transfers the pile to a conveyor, some of the members which push the pile off the elevator onto the conveyor have an angled camming surface at their upper end.

**13 Claims, 9 Drawing Figures**





**SHEET 2 OF 4**



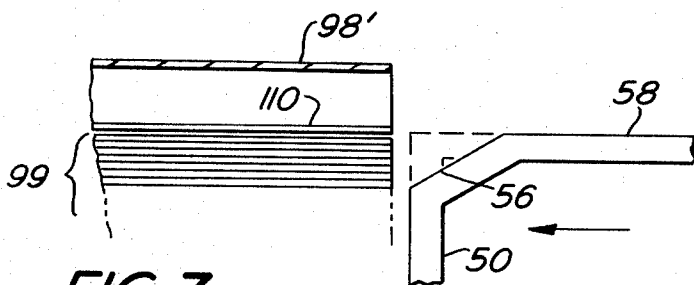
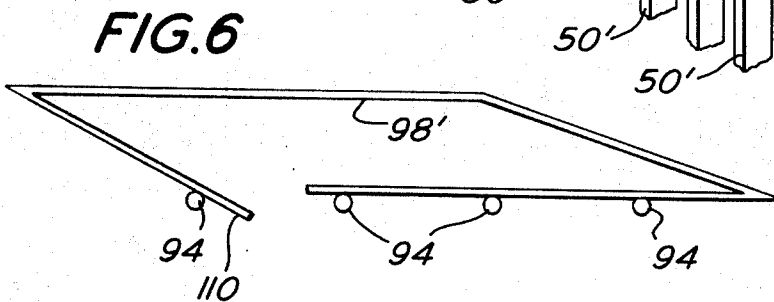
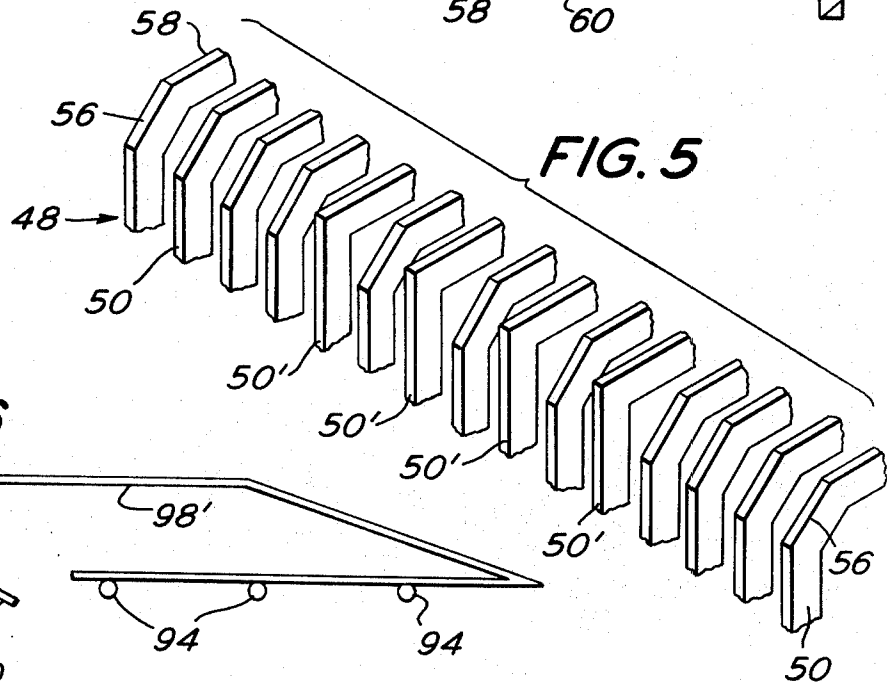
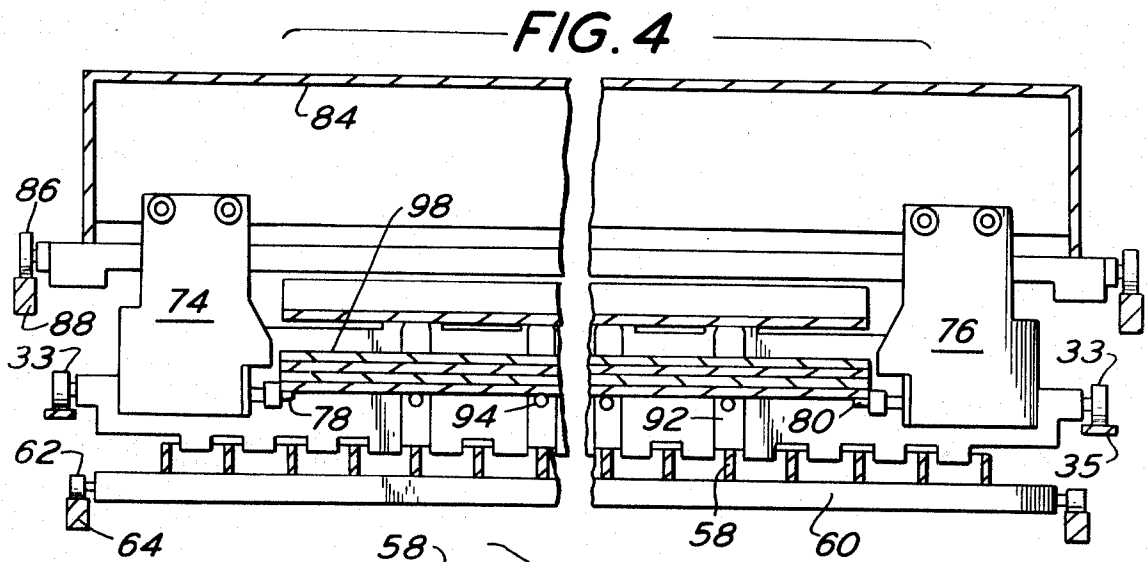
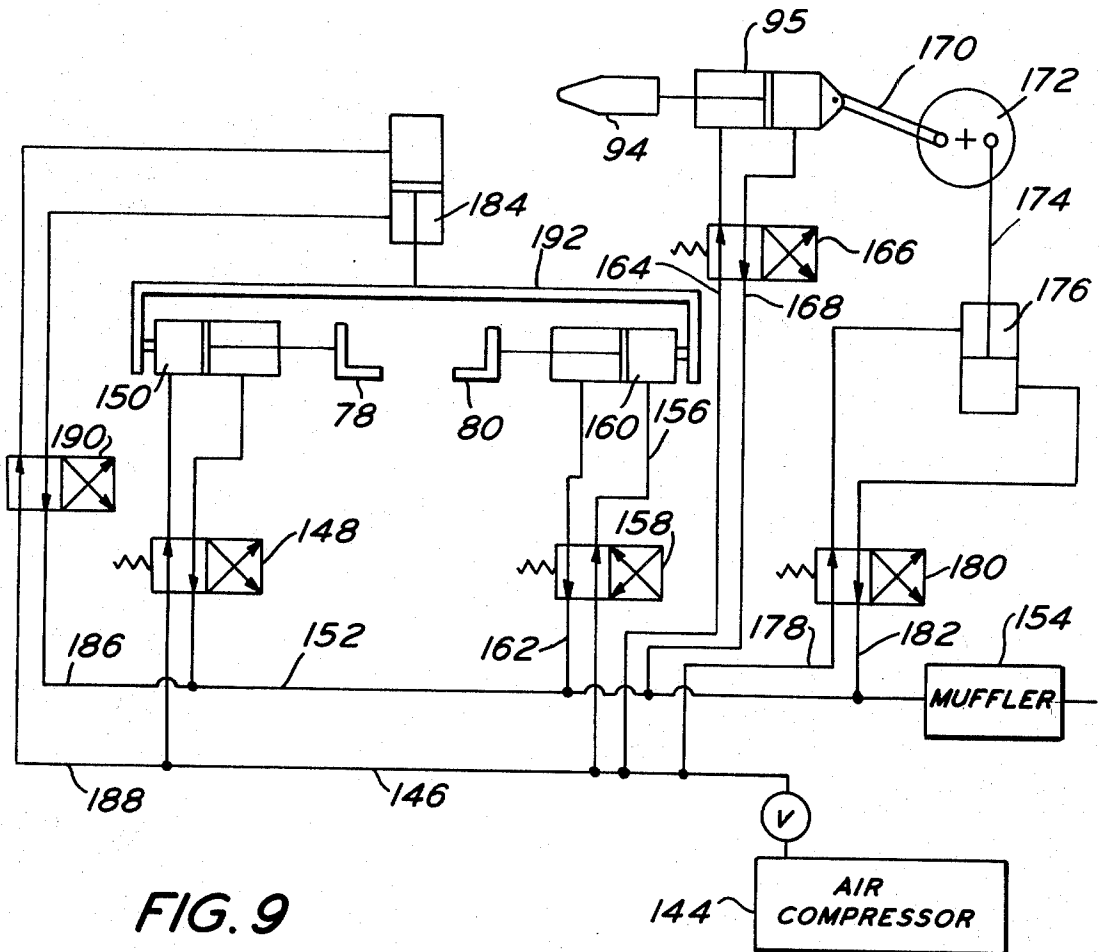
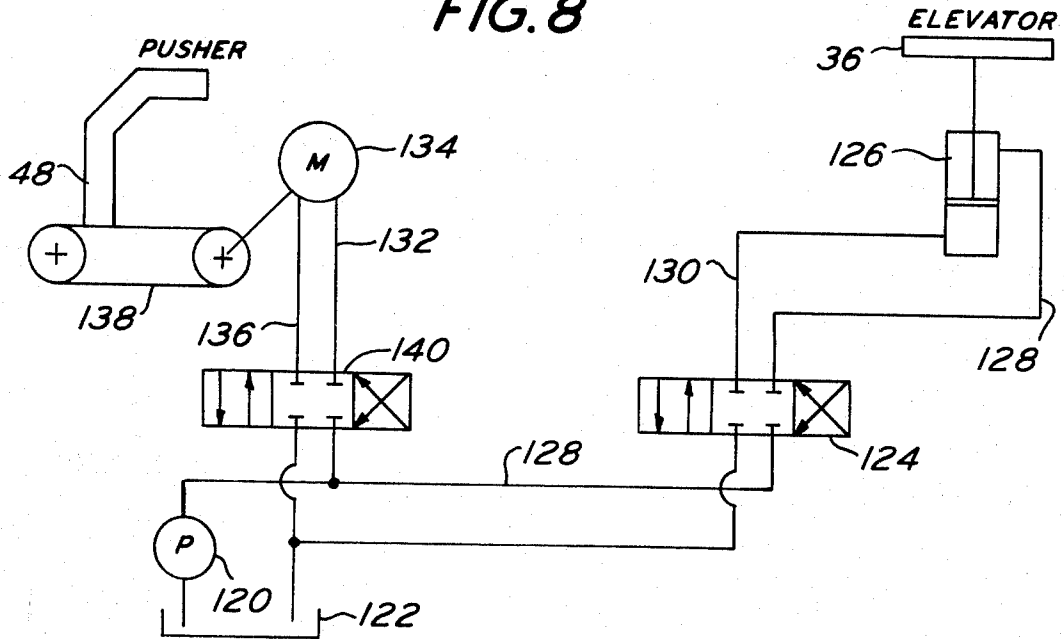


FIG. 8



## COUNTER EJECTOR

This invention is directed to a counter ejector, namely, apparatus which counts the number of sheets of paperboard accumulated in a pile on an elevator, and then ejects the pile while a new pile is accumulating. As a pile is accumulating, it is supported on an elevator which moves downwardly as the height of the accumulated pile increases. Means which is old and well known in the art is utilized to count the number of sheets. As the predetermined number of sheets is attained on the pile, auxiliary means supports the beginning of the new pile while the previous pile is pushed off the elevator onto a conveyor.

The means to push the accumulated pile off the elevator onto the conveyor is preferably in the form of a plurality of interconnected upright pushing members. The sheets of paperboard are preferably folded box blanks whose adjacent edges have been taped, glued, or otherwise joined together. As will be made clear hereinafter, there is a tendency of the first box blank to be supported by the auxiliary means in a manner whereby the joint may loosen allowing the flaps to droop so that the upper end of the pushing members engages the flap on the box blank and causes a jam. Whenever the box blanks become jammed, the entire machine must be stopped and the jam rectified.

In accordance with the present invention, some of the pushing members have an upwardly angled surface at their upper end. This angled surface acts as a camming surface for camming up any downwardly extending flaps which extend below the plane of the auxiliary support means. Hence, as the pushing means moves forward to transfer an accumulated pile of predetermined number of box blanks off the elevator, the angled surface on the pushing members cams up any downwardly extending flaps on the bottom box blank supported by the auxiliary support means.

It is an object of the present invention to provide a novel counter ejector which is less likely to jam as compared with such devices proposed heretofore.

It is another object of the present invention to provide a counter ejector with a pushing means which will cam upwardly any downwardly extending flaps on folded box blanks held by auxiliary support means while the pushing members are transferring an accumulated pile of box blanks from an elevator to a conveyor.

It is another object of the present invention to provide a counter ejector having a novel pushing means for ejecting an accumulated pile of box blanks whereby jams can be avoided in existing machines by merely substituting novel pushing members.

It is another object of the present invention to provide a novel counter ejector which avoids jams of box blanks held by auxiliary support means in a manner which is simple, economical and reliable.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a partial perspective view of a counter ejector in accordance with the present invention and the discharge end of a folder-gluer.

FIG. 2 is a sectional view taken along the line 2—2 in FIG. 1.

FIG. 3 is a view similar to FIG. 2, but showing the elevator in its lowermost position and the pushing means in an extended position.

FIG. 4 is a sectional view taken along the line 4—4 in FIG. 3.

FIG. 5 is a partial perspective view of the pushing means.

FIG. 6 is an end view diagrammatically illustrating the manner in which the first box blank is supported by the auxiliary support means.

FIG. 7 is a diagrammatic elevation view showing how the pushing means could cause a jam by contacting the lowermost box blank on the auxiliary support means.

FIG. 8 is a schematic hydraulic diagram for operating the elevator and the pushing means.

FIG. 9 is a schematic pneumatic diagram for operating the auxiliary support.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 a counter ejector in accordance with the present invention designated generally as 10 and positioned to receive folded box blanks from any source such as a folder-gluer designated generally as 12. The box blanks are fed by the folder-gluer 12 in the direction of arrow 14 toward the counter ejector 10.

The portion of the folder-gluer 12 shown in FIG. 1 is the discharge end thereof and includes rollers 16 which support the box blanks being fed. The box blanks are moved across the rollers 16 in the direction of arrow 14 by endless belts 18 and 20.

The folded blanks are fed under ejector roll 26 and under deflector bar 28. Roll 26 and bar 28 are parallel to one another and are above the inclined plane defined by the axes of rotation of the rollers 16. Contact between a box blank and the bar 28 causes the box blank to be deflected downwardly.

As the box blanks move beneath the ejector roll 26, they travel over guide rollers 30 at the discharge end of feeder-gluer 12. Spanker 32 is guided on tracks 35 by means of rollers 33.

The box blanks continue moving until they contact a backstop 34. After contacting the backstop 34, the blanks drop onto a horizontal elevator 36 where they accumulate. The box blanks are held in a collapsed position by pressurized air discharging from the blower 22 which has an actuator 24 for controlling the flow of air. Elevator 36 may assume a wide variety of constructions. Elevator 36 is preferably a plurality of cantilever fingers 38 interconnected at one end by a transverse member 40. Member 40 is provided with rollers 42 at its ends in rolling engagement with a guide track 44.

Conventional counting means are provided for counting the number of box blanks as they accumulate on the elevator 36. After a predetermined number of box blanks has been accumulated on the elevator 36, a pushing or ejecting means transfer the accumulated pile from the elevator 36 onto a conveyor 46. Since the means for counting the box blanks as they accumulate on the elevator 36, as well as the means for causing the elevator 36 to descend as the height of the pile increases, are old and well known in the art, it is deemed not necessary to illustrate or describe the same.

The means for pushing a pile off the elevator 36 onto the conveyor 46 comprises a pushing means designated generally as 48. The pushing means 48 is preferably a plurality of upright pushing members 50 and 50' spaced from one another by a sufficient distance so that

the fingers 38 may extend between adjacent pushing members. At their lower ends, the members 50 and 50' are integral with a transverse bar 52. The number of pushing members 50 exceeds the number of pushing members 50'. Each of the pushing members 50 has an inclined camming surface 56 at its upper end.

Each of the members 50 and 50' is connected to a horizontally disposed and rearwardly extending leg member 58. Each of the members 58 is integral with or connected to a transverse bar 60. The ends of bar 60 are provided with rollers 62 which ride on tracks 64. The ends of bar 52 are provided with rollers 53 which ride on tracks 54.

The tracks 54 and 64 are parallel to one another but at different elevations. Thus, see FIGS. 1 and 3 which illustrate track 64 being at a higher elevation. Each of the tracks 54 and 64 is provided with a safety limit stop. A driving means such as a hydraulic motor is connected to the bar 60 or any other convenient portion of the pushing means 48 to selectively reciprocate the pushing means toward and away from the conveyor 46. Circuitry for effecting movement of the pushing means 48, to be described hereinafter, is synchronized with the counter so that transfer off the elevator 36 onto the conveyor 46 is effected after accumulation of a predetermined number of box blanks.

The backstop 34 is preferably movable toward and away from the ejector roll 26 to accommodate different sized box blanks. Thus, the ends of the backstop 34 are each supported by a carriage designated generally as 66. Each of the carriages 66 is provided with rollers 68 in rolling contact with a track 70. Any suitable adjusting means such as lead screw 72 may be connected to the carriage 66 to facilitate adjustment of the backstop 34.

As shown more clearly in FIGS. 1 and 4, a pair of carriages 74 and 76 are provided between the ejector roll 26 and the backstop 34. Each of the carriages is alike. Accordingly, only carriage 74 will be described in detail.

The carriage 74 is provided with an auxiliary support finger 78 which extends toward the corresponding support finger 80 on carriage 76. The finger 78 supports a side edge of box blanks which are accumulating while an accumulated pile is being transferred off the elevator 36 onto the conveyor 46.

Carriage 74 is adjustable toward and away from the carriage 76 so as to accommodate different sized box blanks. Thus, carriage 74 is provided with rollers 82 which roll on a track on the inner surface of a U-shaped frame 84. The carriage 74 is similarly supported by the frame 84.

Rollers 66 are provided at each end of the frame 84. Rollers 86 are in rolling contact with a track 88 at each end of the frame 84. Any convenient adjusting means such as a lead screw 90 is connected to the frame 84 for adjusting the position of the carriages 74 and 76 toward and away from the longitudinal axis of ejector roll 26. In this manner, the auxiliary support fingers 78 and 80 on the carriages 74 and 76 may be adjusted to accommodate to different lengths and widths of box blanks which are being processed.

The spanker 32 is provided with a plurality of upright slots 92. Rear auxiliary fingers 94 extend through each of the slots 92. Each of the fingers 94 is disposed above one of the pusher members 50'.

Each of the fingers 94 is connected to an extensible member such as the piston rod extending from pneumatic cylinder 95, so that the fingers 94 may be reciprocated to a position wherein they project through the slots 92. A means to be described hereinafter will facilitate pivotable movement of the fingers 94 about shaft 97 from an elevated position as shown in FIG. 2 to a lower position as shown in FIG. 3.

As shown more clearly in FIG. 8, the pushing means 48 is horizontally reciprocated in synchronism with the vertical reciprocation of the elevator 36 by means of a hydraulic circuit. The hydraulic circuit includes a pump 120 having its inlet communicating with a hydraulic liquid in supply tank 122. The output of pump 120 is connected to one end of cylinder 126 which controls vertical movement of the elevator 36. Conduit 128 contains a valve 124 which is solenoid-operated. The other end of cylinder 126 communicates with the tank 122 by way of conduit 130 and valve 124.

A conduit 132 extends between conduit 128 and a reversible hydraulic motor 134. The motor 134 communicates with the tank 122 by way of conduit 136. Flow through the conduits 132 and 136 is controlled by a solenoid-operated valve 140. Motor 134 is connected to the driven roller of a set of rollers around which extends an endless member 138 which has a portion thereof connected to the pushing means. Hence, operation of motor 134 causes the pushing means 48 to reciprocate.

In FIG. 9, there is illustrated pneumatic circuitry for effecting operation of the auxiliary support, namely horizontal reciprocation of the auxiliary support fingers 78 and 80 as well as movement of the rear fingers 94. The pneumatic circuitry includes a source of pressurized air such as air compressor 144.

Pressurized air from air compressor 144 is communicated by way of conduit 146 to one end of cylinder 150. The other end of cylinder 150 is connected by conduit 152 to a muffler 154 having an air discharge. A solenoid-controlled valve 148 extends across conduits 146 and 152 and is biased by a spring or other means to the position shown in FIG. 9. Cylinder 150 controls horizontal reciprocation of fingers 78 toward and away from finger 80.

A conduit 156 extends from conduit 146 to one end of cylinder 160. The other end of cylinder 160 is connected to conduit 152 by means of conduit 162. A valve 158, similar to valve 148, extends across conduits 156 and 162. Cylinder 160 controls horizontal reciprocation of finger 80 toward and away from finger 78.

A conduit 188 extends from conduit 146 to one end of cylinder 184. The other end of cylinder 184 is connected to conduit 152 by means of conduit 186. A valve 190, similar to valve 148, is coupled across conduits 186 and 188 and controls flow therethrough.

Cylinder 150 and cylinder 160 are connected through link 192 to the piston rod of cylinder 184. Reciprocal movement of the piston in cylinder 184 produces corresponding movement of cylinders 150 and 160 effecting thereby a change of the vertical position or elevation of fingers 78 and 80. Cylinder 184 and link 192 are disposed in and/or supported by frame 84.

A conduit 164 extends from conduit 146 to one end of the cylinder 95. The other end of cylinder 95 is connected to conduit 152 by way of conduit 168. A valve 166, similar to valve 148, is connected across the conduits 164 and 168. As pointed out above, cylinder 95

controls the horizontal reciprocation of the fingers 94 so that they may extend through the slots 92.

As shown more clearly in FIGS. 2 and 9, the fingers 94 and their cylinders 95 are adapted for a limited amount of pivotable movement with respect to shaft 97. Such pivotable movement is effected by means of a link 170 which is pivotably connected to a rotatable disk 172. Diametrically opposite the location where link 170 is pivotably connected to disk 172, said disk is pivotably connected to one end of a piston rod 174 associated with cylinder 176.

One end of cylinder 176 is connected to conduit 146 by means of conduit 178. The other end of cylinder 176 is connected to conduit 152 by conduit 182. A valve 180, similar to valve 148, is connected across conduits 178 and 182.

Electrical circuitry associated with the various solenoids for the valves, relays and limit switches are not shown in the drawing, but are a conventional arrangement obvious to anyone skilled in the art. Accordingly, a detailed description of the same is not deemed necessary.

The present invention is utilized as follows:

Box blanks 98 are fed to the counter ejector 10 by the folder gluer 12. The box blanks contact backstop 34 and settle downwardly onto the fingers 38 of the elevator 36. As the height of the pile 99 of box blanks 98 accumulates on the elevator 36, the elevator 36 slowly descends due to pressurized fluid being evacuated from cylinder 126 via conduit 130.

When the predetermined number of box blanks 98 has accumulated on the pile 99, the following occurs simultaneously. Fingers 78 and 80 are moved toward each other by cylinders 150 and 160 respectively. Fingers 94 are moved forwardly through slot 92 by cylinder 95, but still at their elevated position. Fingers 78, 80 and 94 then descend to the position shown in FIG. 3. Fingers 78 and 80 are lowered by cylinder 184 acting through link 192 connecting cylinders 150 and 160. When fingers 94 attain a position immediately above pusher fingers 50', pusher means 48 is advanced from right to left as shown in FIG. 3 by the endless member 138 of the driving means, transferring thereby the pile 99 onto conveyor 46.

While the pile 99 is being transferred off the elevator 36, the feeding of additional box blanks 98 is not interrupted. The next box blanks 98 are temporarily supported in a pile by the auxiliary support means including the fingers 78 and 80 on opposite sides of the box blanks as well as the rear fingers 94. The first box blank for the next pile to be accumulated is designated as 98' in FIG. 6. The box blank 98' has a tendency to expand from its collapsed folded position to that as illustrated in FIG. 6. In doing so, there is a tendency for the joined edges to separate from one another and for one to project below the plane of the fingers 94. As the pushing members 50 and 50' move from right to left in FIGS. 2 and 3, the upper end of the pushing members could contact the downwardly projecting flap 110 and cause a jam. The camming surfaces 56 on the pushing members 50 will cam upwardly the flap 110 so as to prevent any jam whereby the box blank 98' would be crushed against the backstop 34. It will be noted that each of the members 50' is directly below one of the fingers 94 and therefore does not need a cam surface comparable to surface 56.

After the pusher 48 has delivered a pile of counted boxes onto conveyor 46, the pusher 48 retracts from left to right as shown in FIG. 3 and elevator 38 moves upward by means of admittance of pressurized fluid from conduit 130 to cylinder 126. As soon as the elevator 36 is in its elevated position and pusher 48 is retracted to the position shown in FIG. 2, the fingers 78, 80 and 94 retract to their inoperative positions depositing thereby on elevator 36 the box blanks which had been detained.

While the angle of surface 56 may be varied as desired, we prefer to use an angle of between 20° and 30°. Due to the fact that certain components such as cylinders are movable, flexible conduits are used where needed. Conventional counting means is used to initiate closing of a relay to control operation of the solenoids for the valves in FIGS. 9 and 10. It will be appreciated that the pushing means 48 has separate sales value as a replacement part for existing pushers in the field in addition to its sales value as an integrated part of a new machine.

It will be apparent to those skilled in the art that various modifications may be made within the spirit of this invention. Thus, if desired two separate backstops may be used in place of the single backstop disclosed above. In that event, one backstop and the spanker 32 would be located upstream from the ejector roll 26 at which location the blanks would temporarily accumulate to permit the glue to set. Backstop 34 would still be retained as disclosed herein for receiving the blanks which had been accumulated upstream therefrom. Also, the rear fingers 94 need not extend through slots such as slots 92. Instead, rear fingers 94 may be disposed at an elevation below the elevation of a plate or wall located at the position of spanker 32 as illustrated herein.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

We claim:

1. Apparatus for collecting and ejecting a pile of a predetermined number of sheets comprising an elevator on which sheets are to be accumulated, conveyor means for transporting sheets to the elevator and depositing them in a downward direction onto the elevator, pushing means adjacent the elevator for pushing a pile of a predetermined number of sheets off the elevator, said pushing means including a plurality of upright pushing members, some of said pushing members having a camming surface at their upper end, said camming surfaces being inclined upwardly and away from said elevator, with the remainder of said pushing members having a pushing surface which extends to an elevation which is above the elevation of the lower end of said camming surfaces, and means supporting said pushing members for reciprocation in a direction across the elevator.

2. Apparatus in accordance with claim 1 wherein said elevator includes a plurality of horizontally disposed cantilevered fingers extendable between adjacent pushing members over the elevator.

3. Apparatus in accordance with claim 1 wherein said pushing means is supported by parallel tracks at different elevations.



4. Apparatus in accordance with claim 1 including a spanker, means defining slots in the spanker, rear auxiliary fingers extensible to a position through the slot for supporting a rear portion of a sheet, each rear auxiliary finger being disposed above one of the pushing members which lacks a camming surface.

5. Apparatus in accordance with claim 1 including a conveyor for receiving ejected piles of sheets from the elevator and disposed on one side of the elevator, the discharge end of a folder-gluer being disposed on the side of the elevator opposite said conveyor, the discharge end of the folder-gluer including said conveyor means for delivering box blanks to the elevator, and a backstop against which box blanks may contact under the momentum imparted thereto by said conveyor means.

6. Apparatus in accordance with claim 1 including a backstop, means supporting the backstop for adjustment toward and away from a vertical plane containing the pushing members, the backstop being supported by carriages riding on tracks above the elevation of the backstop.

7. Apparatus in accordance with claim 1 including auxiliary support means above the elevation of the elevator for selectively supporting a new pile while the pushing means is transferring an accumulated pile off the elevator.

8. Apparatus in accordance with claim 7 wherein said auxiliary support means includes rear fingers extensible for supporting sheets, each of said rear fingers being

disposed above one of the pushing members which lacks a camming surface.

9. Apparatus in accordance with claim 1 including discrete hydraulic motive means for said pushing means and for said elevator, each coupled to valved circuitry which includes a pump.

10. Apparatus in accordance with claim 12 wherein said pushing members have a generally horizontal leg member extending from their upper end in a direction away from the elevator so as to be L-shaped, said camming surfaces being at the intersection of said leg member and the upright pushing members.

11. Apparatus in accordance with claim 1 including a track for reciprocally supporting said leg members.

12. An article of manufacture comprising a pushing means for pushing a pile of sheets off an elevator, said pushing means including a plurality of spaced upright pushing members arranged in a row, a first group of said pushing members having a pushing surface, said pushing surfaces lying in an upright plane, a second group of said pushing members having a camming surface at their upper end, each camming surface being inclined upwardly and away from said plane, said pushing surfaces on said first group extending to an elevation above the elevation of the lower end of said camming surfaces.

13. An article in accordance with claim 1 wherein the number of said members having a camming surface exceeds the number of said remainder.

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