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[54] **SHEET COLLATING DEVICE**
8 Claims, 12 Drawing Figs.

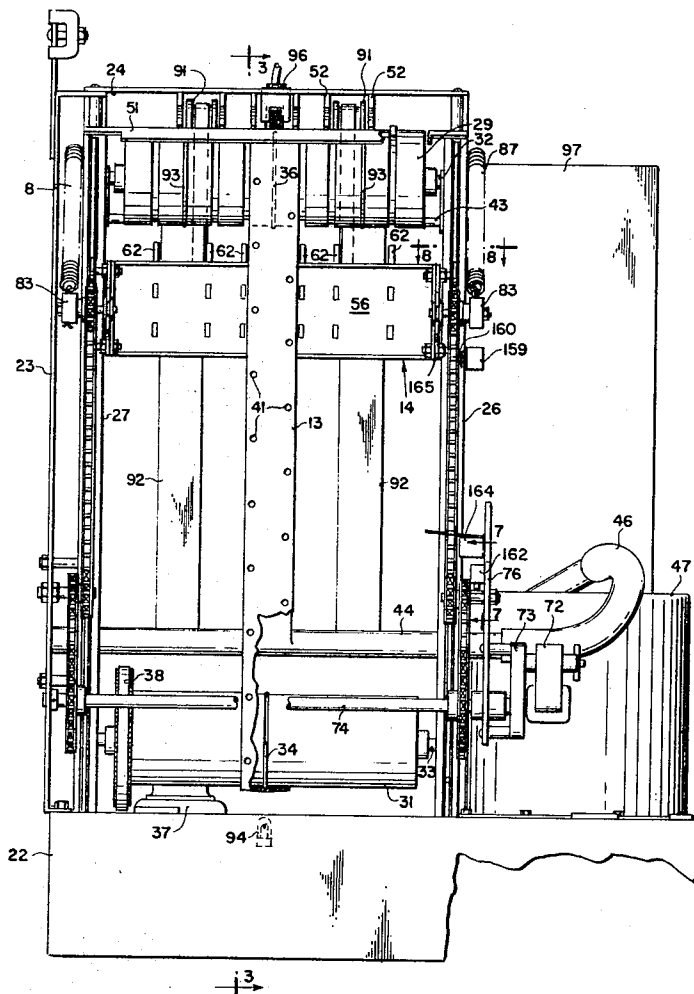
[52] U.S. Cl. 270/58
[51] Int. Cl. B65h 39/02
[50] Field of Search 270/58

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ABSTRACT: A sheet collating device having a collator distributor for receiving sheets and distributing the sheets at preselected vertical positions for reception by a vertical column of bins. The sheet distributor has a perforated tape conveyor system with a vertical course located in front of the column of bins. The conveyor tape passes over a vacuum plenum which serves to hold the sheets to the moving tape until they are deflected. A deflector mechanism is mounted for vertical travel up and down the vertical course of the conveyor with its position being controlled by an electrical control system so as to cycle through a set of preselected vertically spaced positions. Extensible tape members are connected at one end to the deflector so as to move therewith and to overly the moving sheet to aid in retaining the sheet against the conveyor. Stationary vertical backup means are provided in back of the sheet which cooperate with the extensible tapes in maintaining the sheet properly disposed until it reaches the position of deflection. The device may also include bypass conveyor means for moving sheets onto an adjacent collating device placed in tandem. The bin assembly is carried by the same frame and cabinet which mounts the distributor mechanism and is mounted so as to be easily removed from the cabinet. Access is afforded to the shelves from one side of the cabinet to facilitate removal of the collated sheets.

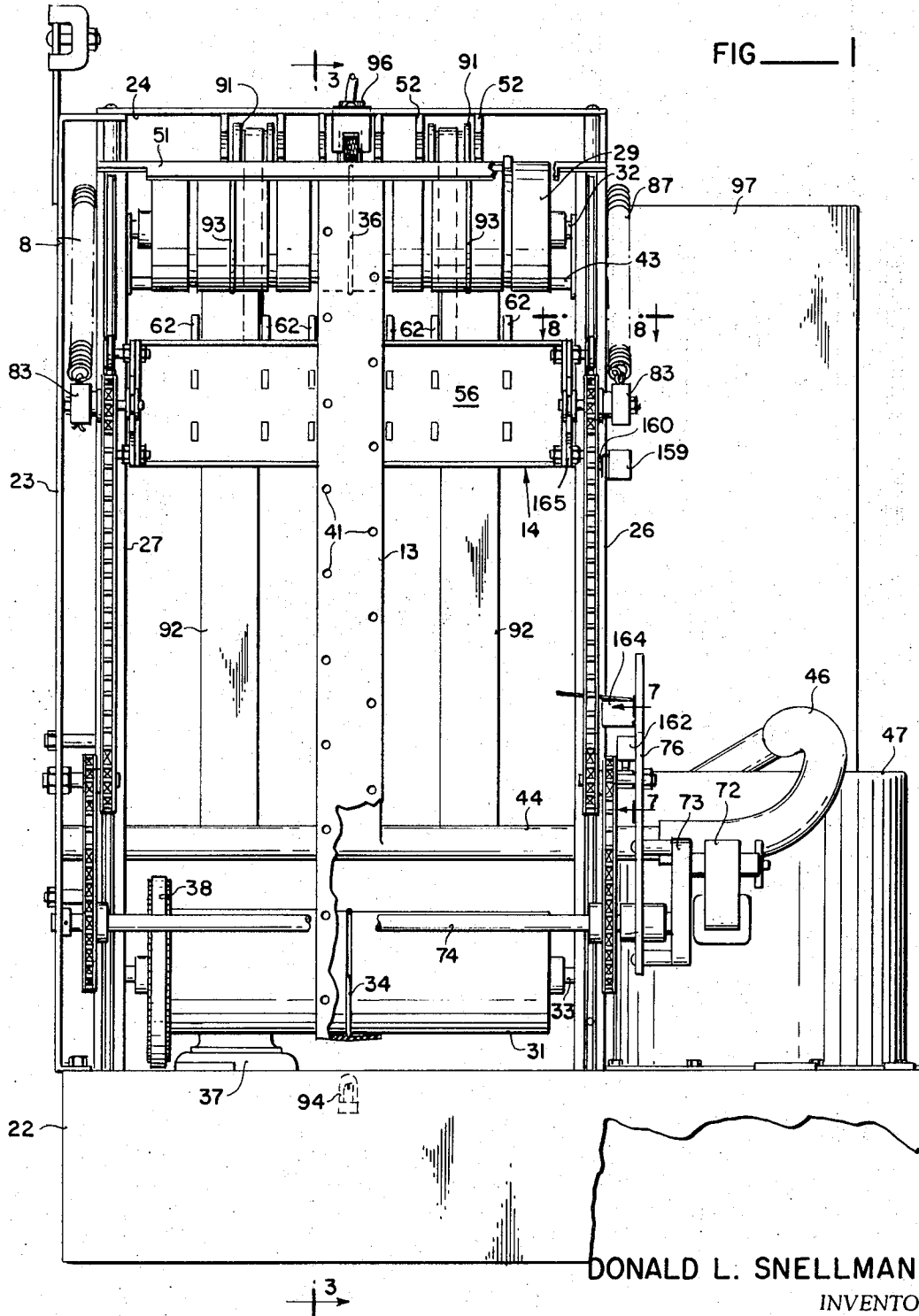


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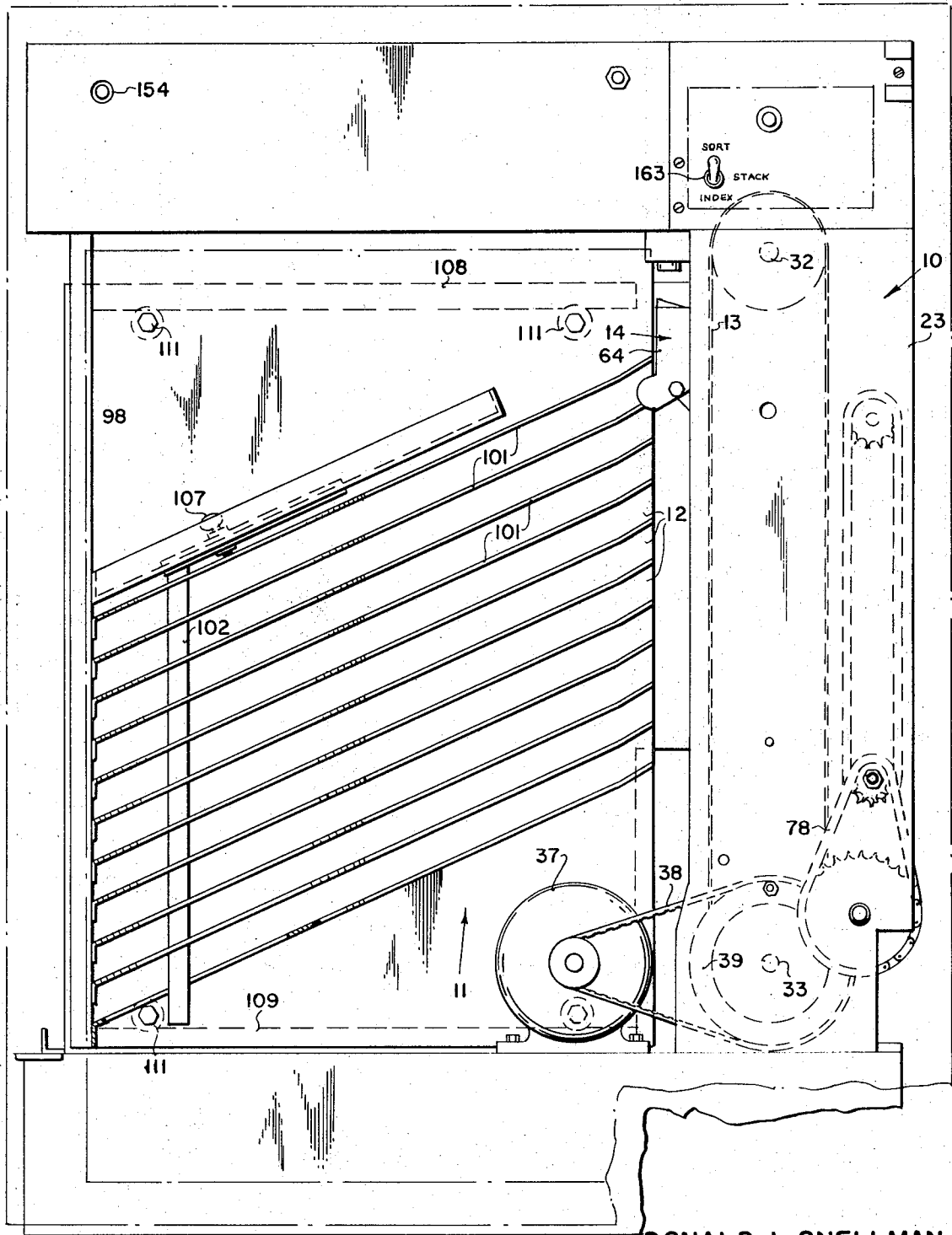
SHEET 1 OF 6

FIG. 1



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FIG. 2

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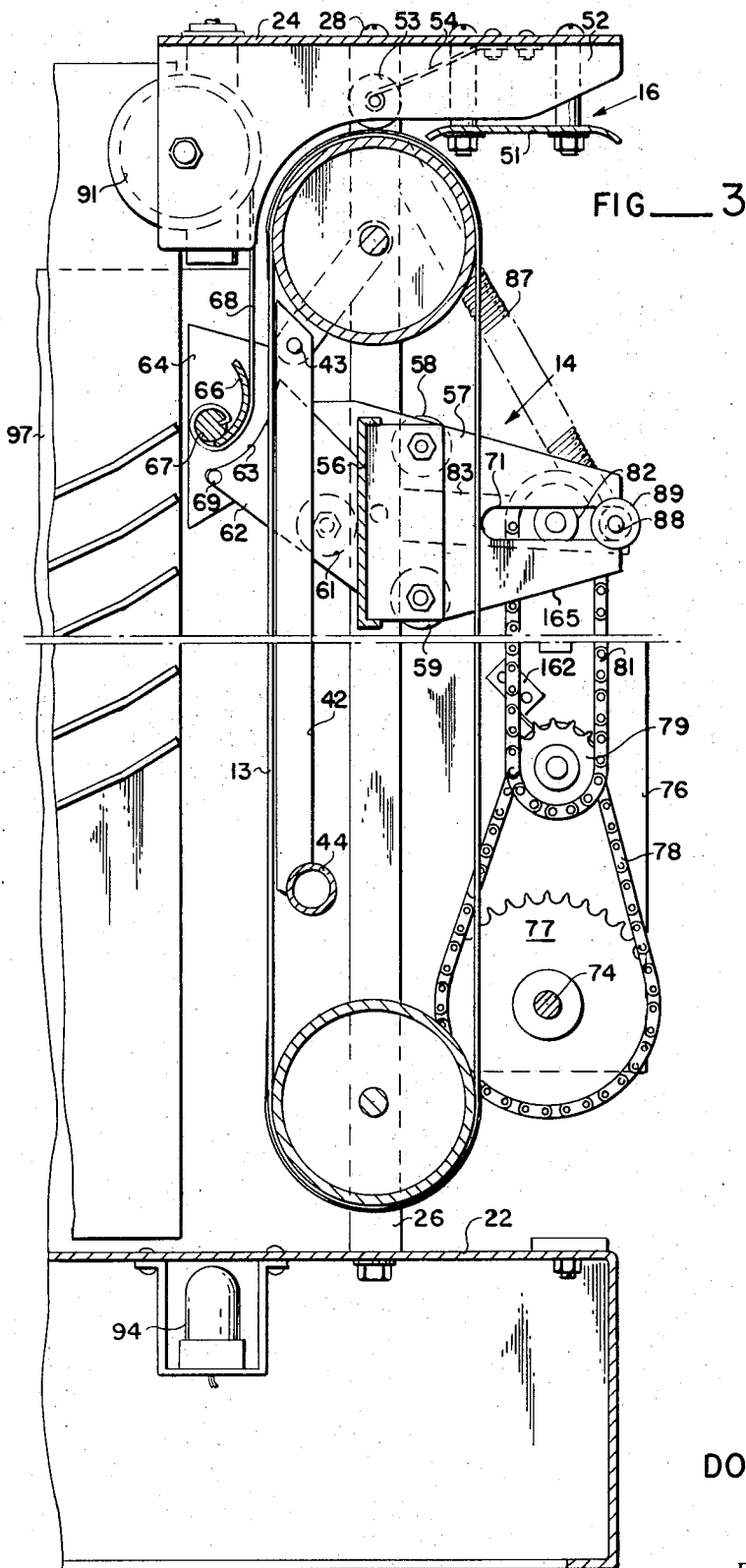


FIG. 4

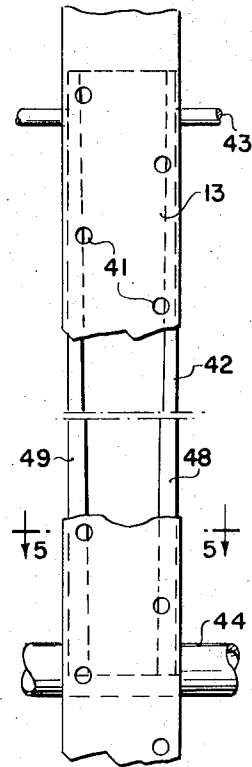
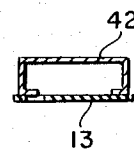


FIG. 5



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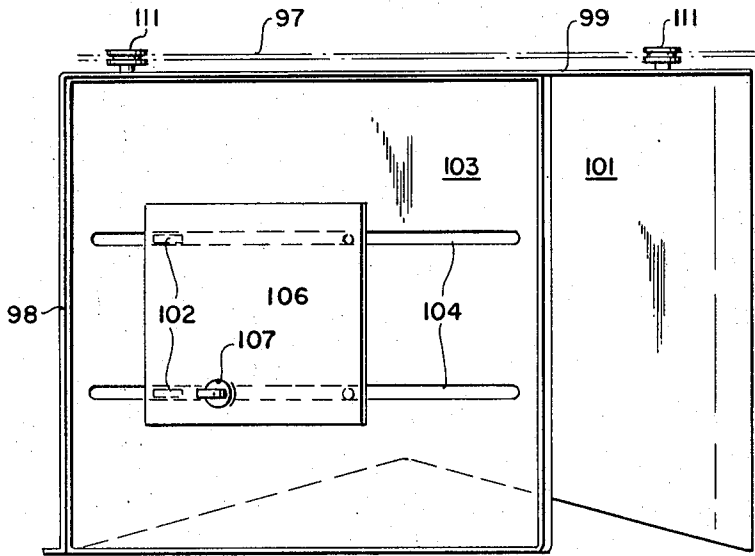


FIG. 6

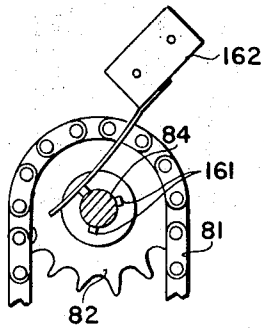


FIG. 7

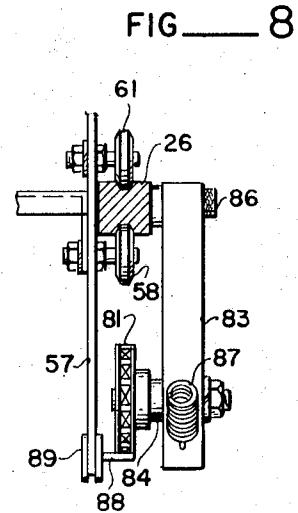


FIG. 8

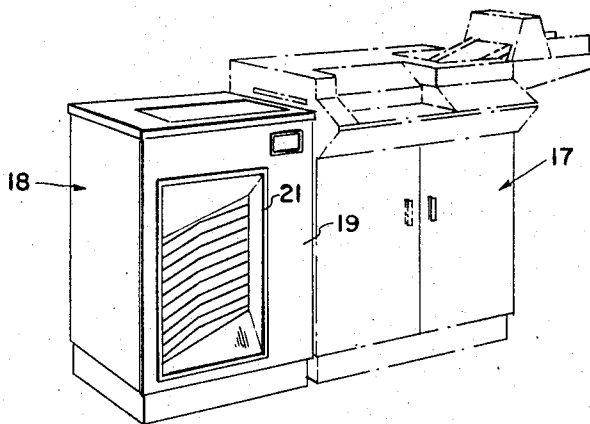


FIG. 9

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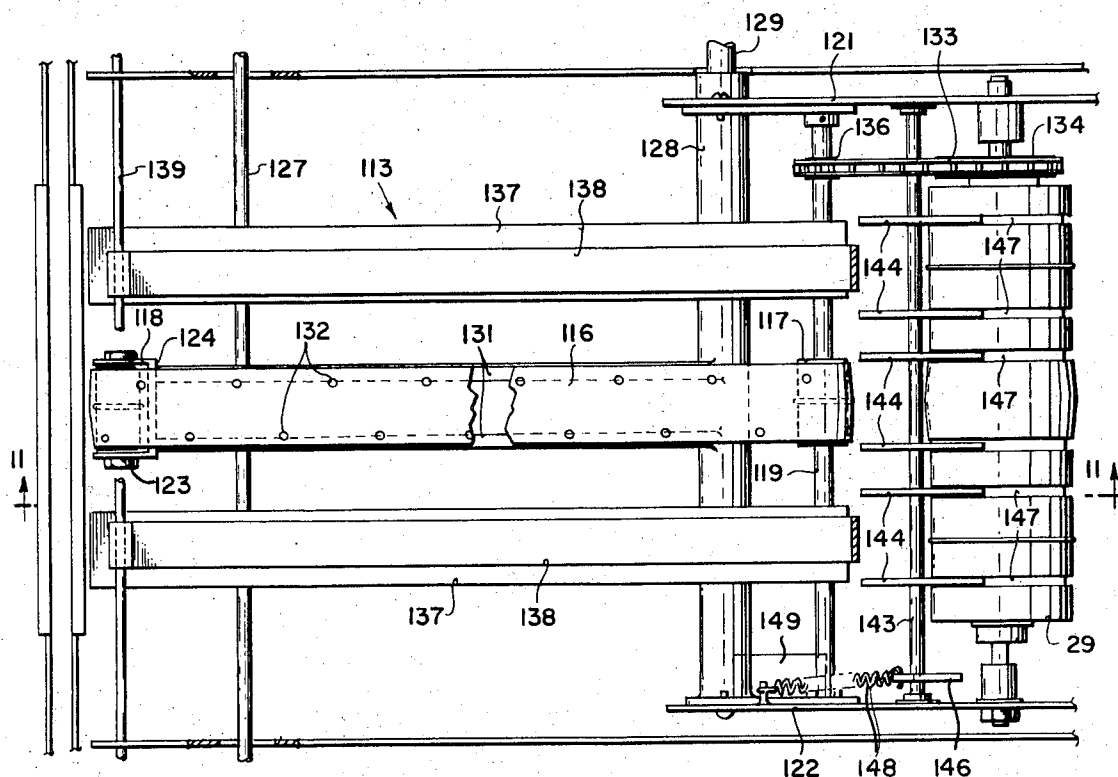


FIG. 10

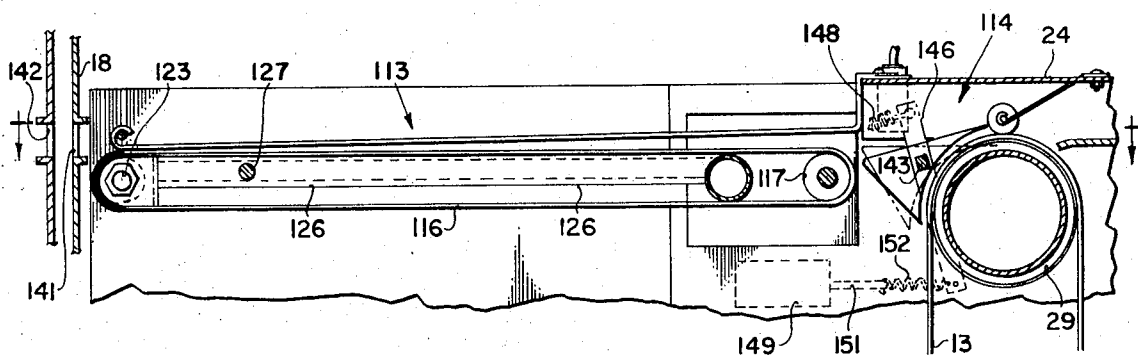
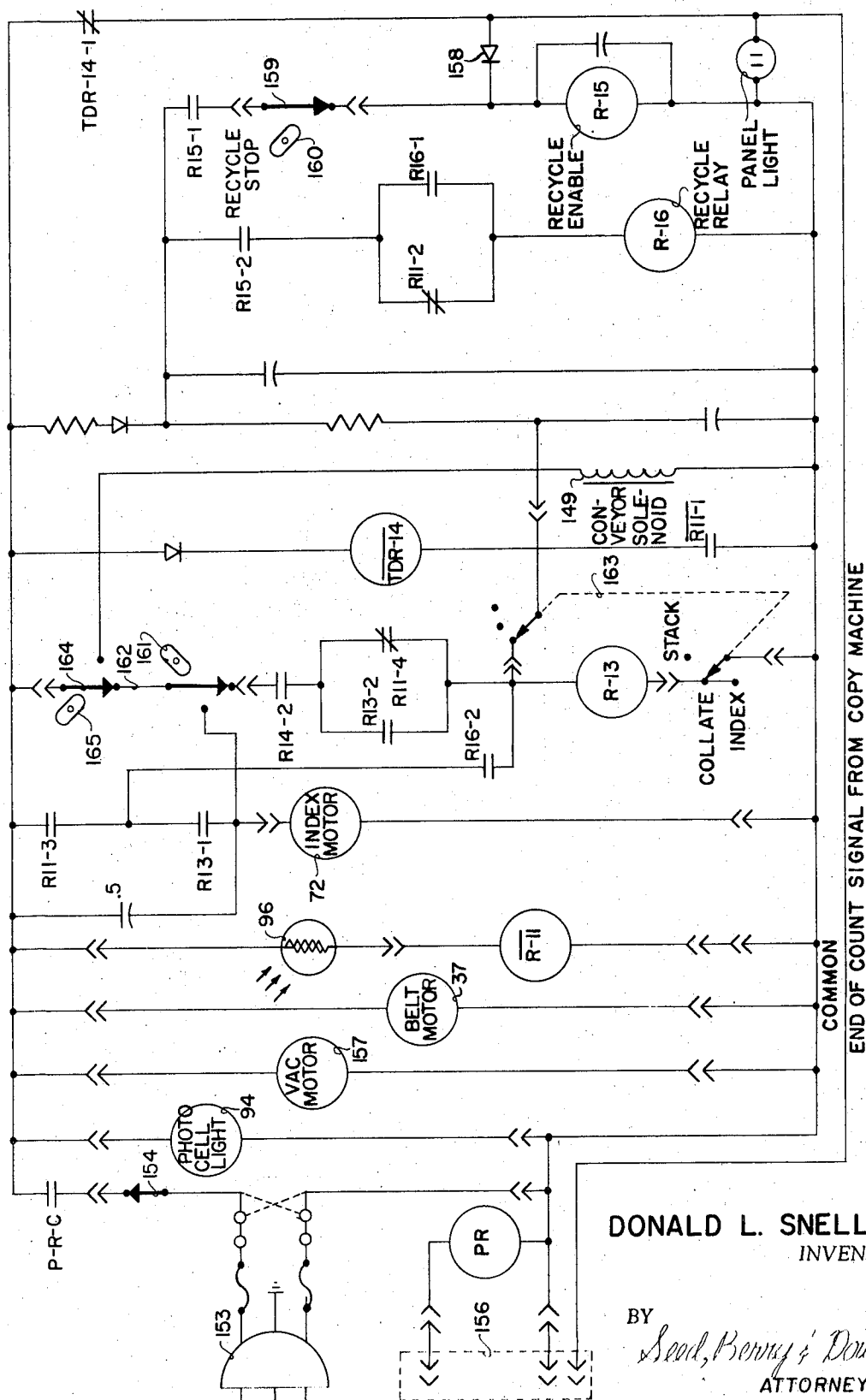


FIG. 11

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SHEET COLLATING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in collator devices of the vertical conveyor, single deflector type which accepts sheets from a printer, processing machine, feeder, copier or by hand, one sheet at a time or as signatures, in multiples of the desired book or other document, and sorts the sheets into multiple copies of the document in the individual bins or receiver trays ready for binding or other hauling. In the prior art, sorting and collating devices, including the general type of sheet collator to which this application pertains, have been relatively large in size and dependent upon complex mechanical components capable of high speed collating with a large number of deflecting stations or receiver bins. A need has arisen in the art for relatively small size, combined distributor and receiver unit capable of use in direct cooperation with copiers and duplicators. For the sake of efficiency, reliability and economy, such a machine must be compact and mechanically less complex than known prior art machines.

The present invention has the object therefore of providing a sheet collating device of the vertical conveyor, single deflector type of a simplified and compact structure which is economical to manufacture and yet efficient and durable so as to meet high performance standards.

Another object of the present invention is to provide a sheet collating device wherein the sheet conveyor portion of the distributor is greatly simplified and provides a positive means for retaining the sheets in position on the vertical course of a single tape conveyor until it reaches a position at which it is positively deflected from the conveyor and into a preselected bin or receiver station.

Another object of the present invention is to provide an improved conveyor system for a sheet collator device of the character described which is adapted to receive sheets or signatures directly from the outfeed station of a copy machine and to guide them directly to a vertical section of a sheet conveyor for distribution.

Another object of the present invention is to provide a sheet collating device wherein the sheets may be directed to a bypass conveyor and into an adjacent sheet collator device, whereby several collator devices may be placed in tandem to cooperate with a single copy machine.

A further object of the present invention is to provide a sheet collator device wherein the collator distributor mechanism and the receiver, which includes the vertical column of bins or receiver shelves, are mounted as a unit in the same cabinet and frame, with the mounting means for the receiver section providing for easy removal of the receiver bin for ready access to the distributor mechanism; the shelves of the receiver being accessible from the side to facilitate removal of collated sheets.

Other objects and advantages will appear and be understood from the following description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

FIG. 1 is an elevational view of the front or infeed side of the distributor with the cabinet removed;

FIG. 2 is a side elevational view of the distributor and receiver illustrating the side access to the receiver bins for unloading;

FIG. 3 is a cross-sectional view taken along lines 3-3 of FIG. 1;

FIG. 4 is an elevational detail showing the construction of the vacuum plenum and the single tape conveyor;

FIG. 5 is a cross-sectional view taken along lines 5-5 of FIG. 4;

FIG. 6 is a top elevational view of the removable bin receiver section of the device;

FIG. 7 is a cross-sectional detail taken along lines 7-7 of FIG. 1;

FIG. 8 is a cross-sectional detail taken along lines 8-8 of FIG. 1;

FIG. 9 is a perspective view showing the collator device in position against a copying machine;

FIG. 10 is a top plan view of a modified form of the collating device which includes a transfer or bypass conveyor system and bypass deflectors to guide sheets to an adjacent collator device placed in tandem;

FIG. 11 is a cross-sectional view taken along lines 11-11 of FIG. 10;

FIG. 12 is a schematic illustration of the electrical control system for the device.

Referring now to the drawings wherein like reference numerals indicate identical parts in the various views, and with reference to FIG. 2, the sheet collating device of the present invention consists of a distributor indicated generally at 10 which delivers sheets of paper or other material to a receiver 11 located at the rear of the distributor and having a vertical column of receiver bins 12 for reception of sheets delivered thereto in proper order by the distributor. The distributor section 10 includes generally a single tape conveyor 13 and a vertically movable deflector assembly indicated generally at 14 which moves vertically along the conveyor tape or belt 13 and in front of the bins 12. As shown most clearly in FIG. 3, sheets or signatures are fed into the machine through an infeed opening 16 and then travel downwardly onto the vertical course of the conveyor tape 13. FIG. 9 illustrates the manner in which the collating device of the present invention may be utilized in conjunction with a copy machine 17 of any commercial variety, with the copy outfeed opening of the machine 17 (not shown) being matched with the infeed opening 16 of the collator. The distributor 10 and the receiver 11 will be housed in a cabinet 18 provided with a door 19 having an access opening 21 so as to expose one side of the column of bins 12 for easy removal of collated sheets. The copier 17 may also have a delivery station for expelling the original document being copied, depending on the type of copier involved.

The general support frame and cabinet 18 includes a sheet metal base 22 which supports an upright frame panel 23, a top panel 24 and two vertical guide posts 26 and 27 on opposite sides of the machine. The vertical panel members 23 and the posts 26 and 27 are all supported on the base member 22 with the top ends of the posts being connected by suitable screw means 28 to the top horizontal 24 so as to provide a rigid frame structure. Upper and lower rolls or drums 29 and 31 respectively, have their shafts 32 and 33 respectively, journaled for free rotation in suitable bearings in a conventional manner in the upright posts 26 and 27. The conveyor tape or narrow belt 13 is trained about the drums 29 and 31 with rubber O-rings 34 and 36 being provided in suitable grooves on the respective drums for tracking the belt 13 and enhancing the friction drive. The lower drum 31 is driven by an electrical motor 37 through a cleared drive belt 38 which engages a pulley 39 on the drum. The control of the electrical motor 37 will be described presently in connection with the electrical schematic of FIG. 12. The upper drum 29 is driven by the conveyor belt 13.

The belt 13 may be a rubber or plastic impregnated fabric belt or any suitable conventional belting and, as seen most clearly in FIGS. 1 and 4, is provided with longitudinally staggered or offset perforations along each lateral edge. The belt, on its vertical course adjacent the bins 12 passes over a vacuum plenum in the form of a hollow rectangular chamber 42 closed at its top and backside but open at its front to the backside of the belt 13. The chamber 42 may be supported at its upper end by means of a cross-shaft 43 which is connected by link means to cross-shaft 32. The lower end of the chamber 42 is connected to a vacuum conduit 44 which is supported at one end by the panel 23 and is connected to a vacuum hose 46 leading from the vacuum pump 47. As will be noted in FIG. 4, the lateral edge flanges 48 and 49 of the vacuum chamber 42 are tapered so as to be wider at the bottom end than at the top end of the chamber for the purpose of obtaining an even dis-

tribution of vacuum pressure along the length of the chamber. The perforations 41 in the belt are uniformly spaced from the edge of the belt, and hence the vacuum orifice provided by each perforation decreases in cross section as the belt moves downwardly. Since the vacuum is greater at the bottom end of the chamber 42 than it is at the top, the graduation in the size of the orifices provided by the perforations produces a more even distribution of the vacuum pressure to hold a sheet against the moving conveyor tape.

The sheets entering the infeed section 16 are guided by a guide plate 51 suspended by bolts and spacers from the horizontal panel 24 as shown in FIGS. 1 and 3 transversely-spaced vertically-disposed curved guide members 52 serve to initially direct the incoming sheets downwardly onto the vertical course of the conveyor tape 13. The plates 53 may be connected by any suitable means to the member 24. A knurled wheel 53 is pressured against the moving sheet by a leaf spring 54 to aid in tracking the sheet over the drum 29.

The deflector assembly 14 is mounted for vertical movement on the guide posts 26 and 27 and includes a transversely extending carriage beam 56 which is connected between two vertical end plates 57, only one of which will be described in detail since the plates are identical. The plates 57 are provided with two vertically spaced rollers 58 and 59 which engage a groove in the associated vertical post 26 or 27 on the infeed side of the distributor. The plate 57 also mounts a third roller 61 which contacts the vertical post on the opposite side with the post acting as a guide rail for the vertical movement of the deflector carriage. The backside of the carriage beam 56 i.e. the side adjacent the receiver, is provided with outwardly extending fins 62 which are six in number and all of which include a curved outer edge 63 which intersects the vertical plane of travel of the sheet and of the conveyor tape 13. The surfaces 63 serve to deflect the sheet into one of the bins 12 as the sheet contacts the surfaces in its downward course. In addition, each end plate 57 is provided with a rearward extension 64 with a curved shield 66 extending between the end plates. A transverse rod 67 also extends between the plates 64 for the purpose of attaching extendible sheet-retaining tapes 68 which will be presently described. The outer ends of the fins 62 may be connected to a transverse rod 69. The end plates 57 are provided with horizontal slots 71 which cooperate with drive means for positioning the deflector assembly as will be presently described.

The drive for the vertical movement of the deflector assembly 14 is provided by an electrical motor 74 through a gear reduction 73 and a power shaft 74. The drive shaft 74 may be journaled at one end in the vertical frame panel 23 and at the other end in a sectional panel 76 rigidly connected to the upright post member 26 as shown. Each end of the shaft 74 is provided with a drive sprocket 77 and a drive chain 78 for driving a sprocket 79 on a suitable stub shaft. The sprockets 79 drive the chains 81 as illustrated most clearly in FIG. 3. The chains 81 are passed about sprockets 82 mounted on pivoted arms 83 by means of stub shafts 84. The arms 83 are pivoted at their opposite ends to the upright posts 26 and 27 respectively by means of pivot bolts 86 as shown most clearly in FIG. 8. Tension springs 87 are connected between the outer ends of the pivoted arms 83 and the vertical posts 26 and 27 for the purpose of maintaining proper tension on the chains 81. In addition, each chain 81 has an inwardly extending stub shaft or drive pin 88 provided with a roller or cam 89 which is engaged in the slot 71 of the associated end plate 57. As may be appreciated, the deflector assembly is moved vertically as the pins 88 on the chains 81 move on their vertical runs with the slots 71 in the end plates 57 allowing the cam rollers 89 to travel transversely between their vertical runs. The various contact switches utilized in completing a cycle of stations or vertical positions of the deflector assembly will be described in connection with the electrical schematic of FIG. 12.

As previously mentioned, flexible spring tapes 68 which are extendable and retractable and which have one end connected to the rod 67 on the deflector assembly so as to be extended

and retracted as the assembly is moved vertically, are provided for holding the sheet against the conveyor tape. Two of these tapes 68 are utilized in the present embodiment and are wound on conventional spring winding means 91 which may be similar to standard spring wound measuring tapes. The winding means 91 are located adjacent the upper drum or roller 29, as can be seen in FIG. 3. Stationary vertical backup members 92 are located in face-to-face proximity with the spring tape 68 on each side of the vertical section of the conveyor and serve to provide a backing for the sheet as it moves downwardly and cooperate with the spring tapes to keep the sheets in a vertical plane. These members 92 extend between the vacuum conduit 44 at the bottom and transverse rod 43 at the top.

Additional o-rings 93 may be utilized on the upper roller 29 to aid in moving the sheet and avoiding any hangup of the sheet on the roller 29. A light beam provided by the lamp 94 at the base of the vertical conveyor 13 is used in conjunction with a photo cell 96 positioned above the roller 29 to provide a signal for indexing the deflector assembly through a cycle of stations as will be presently described.

The cabinet indicated generally at 18 may be of any desired design so as to be removable from the base 22 and framing structure previously described. The door 19 provides lateral access to the receiver bins as mentioned. In addition to the internal frame already described, a vertical L-shaped sheet metal panel 97 is mounted on the base 22 for the purpose of supporting the receiver 11 as a removable unit. The receiver 11 may be in the form of a sheet metal structure having a rear wall 98 and a sidewall 99 with the plurality of inclined shelves 101 being secured between these two walls. Each shelf 101 is provided with longitudinally extending slots which receive the vertically extending paper stops bars 102 which are also used to adjust the shelves for variation in sheet sizes. To this end, a traylike structure 103 is mounted above the top shelf 101 and is also provided with parallel slots 104 which are aligned with the slots in the shelves to permit movement of the bars 102. The bars 102 are connected to a slidable tray 106 which may be clamped into position on the tray 103 by means of a conventional thumbscrew clamp 107. The vertical wall or panel 97 is provided with horizontally-extending angle flanges 108 and 109 at the top and bottom, respectively, which act as guides and supports for the four rollers 111. On the backside of the sidewall 99, as shown most clearly in FIGS. 2 and 6, the bottom two rollers 111 engage the top edge of the flange 109 and the upper rollers 111 engage the bottom edge of the flange 108 in order to mount the entire receiver in position adjacent the collator distributor as shown in FIGS. 2 and 6. With this arrangement, the cabinet or cover may be removed and the entire receiver section 11 dismounted from the flanges 108 and 109 so as to provide free access to the rear side of the distributor 10.

The structure described thus far constitutes a complete device suitable for ten station collating, i.e. the deflector assembly 14 would be indexed through ten vertical stations corresponding to the ten shelves 101 of the receiver. The exact number of stations, of course, may be varied without departing from the scope of the invention. As an alternative arrangement, several of these single units may be arranged in tandem in order to provide a larger capacity. FIGS. 10 and 11 show an embodiment or arrangement for directing the incoming sheets in a course so as to bypass the vertical run of the belt conveyor 13 and to move onto a transfer conveyor belt so as to be fed into a second collator unit placed to the one shown.

Referring to FIGS. 10 and 11, wherein certain elements such as the extensible tapes have been removed in order to enable a more clear showing, the embodiment shown utilizes a transfer conveyor apparatus indicated generally at 113. The transfer conveyor extends substantially horizontally and is located near the top end of the conveyor 13 of the distributor 10 which may be identical with that previously described except for the additions presently to be described. A bypass deflector unit 114 is located between the transfer conveyor

113 and the upper drum 29 of the distributor conveyor. The transfer conveyor system involves a continuous perforated belt 116 trained about the hubs or rollers 117 and 118 with the hub 117 being fixed on the shaft 119 which may be journaled in suitable bearing mounts at its opposite ends to the frame members 121 and 122 respectively. The roller 118 is mounted for free rotation of an axle 123 which extends between the arms of the yoke 124 fixed to the end of a horizontally extending channel member 126, the purpose of which will be presently described. The channel member 126 is supported at one end of the transverse support rod 127 which may be fixed to the general frame structure in any manner desired and is supported at the opposite end by the transversely extending vacuum conduit 128. The conduit 128 may be supported by the frame members 121 and 122 and will be connected to a suitable vacuum source by means of the conduit 129. As described with relation to the conveyor belt 13, the rollers or drums about which the belt 116 is trained may be provided with o-ring inserts for the purpose of centering the belt and providing a positive drive. The channel 126 which is in open communication with the vacuum conduit 128, has a closed bottom and an open top wall with tapered flanges 131 which decrease in lateral width in a direction away from the conduit 128. The belt 116 is provided with staggered perforations or holes 132 which are longitudinally aligned on each edge of the belt 116 so that the orifice provided for the application of vacuum pressure increases in the direction away from the vacuum conduit 128 as the belt moves. The vacuum pressure is thus equalized along the length of the belt as described with relation to the belt 13. The shaft 119 which drives the belt 116 may be powered by means of the drive chain 133 which is trained about a sprocket 134 connected to rotate with the upper roller 29 and a sprocket 136 on the shaft 119. Thus the conveyor belt 116 is driven simultaneously with the belt 13 of the collator distributor. The rod 127 and the vacuum pipe of conduit 128 are also used to support the stationary guide plates 137 on each side of the conveyor belt which are located in substantially the same horizontal plane with the top run of the belt 116. To aid in retaining the sheet against the conveyor belt 116, a second pair of stationary guides 138 are located slightly above the guides 137 in face-to-face relationship. The guides 138 are supported at one end by a transverse support rod 139 and at the other end by the transverse frame member or panel 24 previously described. The end wall of the cabinet 18 will be provided with an outfeed opening 141 which is matched to the infeed opening 142 of an adjacent collator unit in tandem. In this manner, a sheet entering the infeed section of the collator unit shown may be directed by the bypass deflector assembly 114 (in a manner presently to be described) onto the transfer conveyor belt 116 and fed to the infeed opening 142 of an adjacent collator unit.

The bypass deflector assembly comprises a transversely extending rotatable shaft 143, the ends of which are suitably mounted for rotation in the frame members 121 and 122. The shaft has a plurality of deflector fins 144 fixed thereon, and a crank arm 146 located adjacent one end and fixed thereto. The deflector fins 144 are generally triangular in shape with one edge thereof adjacent to the roller or drum 29 being curved. Each fin 144 is aligned with a groove 147 in the drum which allows the deflector members to be rotated to the dotted line position shown in FIG. 11 wherein the top edge of each of the fins is substantially horizontal and positioned slightly below a horizontal tangent to the upper surface of the roller. The ends of the fins will extend slightly into the grooves 147. When the deflector fins are in the dotted line position shown in FIG. 11, a sheet entering the infeed section of the collator distributor will be directed across the fins and onto the transfer conveyor belt 116.

The shaft 143 is operated by the crank arm 146, the upper of which is connected to a tension spring 148 for normally holding the fins in the solid line position as shown in FIG. 11 during normal operation of the collator distributor. When it is desired to deflect the incoming sheets onto the transfer con-

veyor, a solenoid 149 is energized so as to reflect the operator 151 connected to the lower end of the arm 146 by means of a second spring 152. The electrical control circuit for accomplishing the actuation of the bypass deflector means will be presently described.

FIG. 12 is a electrical schematic showing the control system for the present embodiment of the invention. The collator device may have its own connections for applying operating power from any convenient outlet but, as shown in FIG. 12, the control system may be designed such that the operating power is not actually applied until a self-contained relay is closed through an umbilical connection to a parent machine such as a copier. The collator device may thus be operated in step or coordination with the functions of the copy machine. Referring to FIG. 12, the collator circuit is connected to a suitable current source by means of a standard connector 153 with an interlock switch 154, operated by closing the door 19, being located in series such that the circuit is broken when the door is opened. Power is not applied to the various components of the system however, until the umbilical connection 156 is made with the copy machine. Referring to FIG. 12, a power relay PR is energized by this connection when the copier is operating, thus closing the contact P-R-C of the power relay to complete the power circuit for the collator. When the circuit is complete, the photo cell light 94 is energized as well as the vacuum motor 157 and the motor 37 which drives the conveyor belt 13. When the light beam from the light 94 strikes the photo cell 96, the relay R-11 will be energized and, in turn, will energize the time delay relay TDR-14 through its contacts R11-1. Note that the two relays just mentioned are inverted relays, as indicated by the bar over the symbol, meaning that these relays remain energized while the power is on.

When the power is first applied to the circuits shown, or when it has been interrupted and then reapplied, the deflector carriage will recycle, i.e. return to the top bin or bin No. 1 ready to begin a new cycle. The circuit functions as follows in performing this recycle action: the photocell light 94 being incandescent, requires a time interval to come to brilliance. This delays the energizing of the relays R-11 and TDR-14 which is energized through the contact R11-1. During this time current is applied to the recycle enable relay R-15 through the normally closed contact TDR-14-1 and a rectifying diode 158. The relay R-15 immediately latches through its own contacts R15-1. Power is then applied to the recycle relay R-16 through the contact R15-2 and the normally closed contacts R11-2. R-16 is latched through its own contacts R16-1. R-16, being energized and latched, forms a circuit through its own contacts R16-2 to the index relay R-13. On being energized, through application of light to the photo cell 96, the relay R-11 forms a circuit through contacts R11-3. Since R-13 is now energized by R-16, which is latched, a circuit is then completed through R11-3 and R13-1, energizing the index motor 72. With the motor 72 energized, the drive chains 81 are moved thus driving the deflector assembly 62 as previously described. The deflector will continue to move until it reaches the top bin or bins No. 1 at which time the recycle stop switch 159 is contacted and opened by a suitable contact member 160 on the chain 81 as shown in FIG. 1. Opening of the recycle stop switch 159 releases the recycle relay R-15 which, in turn, releases the recycle relay R-16 which, in turn, releases the index relay R-13 so as to halt the application of power to the index motor 72. The deflector assembly will remain at this station until such time as the light beam from the source 94 is interrupted either by breaking the power circuit or by the passage of a sheet.

The identical sequence of recycling also takes place when the time-delay relay TDR-14 is deenergized due to a sheet jam or when an end-of-count signal is received from the copy machine through the umbilical connection 156. In the case of an end-of-count signal, the signal latches recycle enable relay R-15 and the final sheet of paper must break the light beam in order to latch the recycle relay R-16 and clear the light beam by entering the bin to allow the index motor to operate. In the

case of a sheet jam, the relay TDR-14, which is an inverted time-delay relay, drops out very slowly. As long as paper is handled and passed at a normal speed, TDR-14 will remain energized due to the holding characteristics of the circuit. Should a paper jam, power failure, etc. interrupt the light beam for a period substantially longer than normal, TDR-14 will then drop out. When this happens, two things occur: the circuit of R-13, the indexing relay, is interrupted by R14-2, and an end of count signal is applied through TDR14-1 to R-15 and to the copy machine, thus resetting both machines to the first position.

Assuming that the deflector assembly has recycled and is sitting at bin 1 or position No. 1 with the index motor deenergized as previously described, the deflector will be indexed through its series of positions by the passage of the successive sheets of paper from the deflector into the bin such that the light beam is broken. Since R-11 is normally energized as long as there is power on the circuit and no paper is passing, the index motor 72 does not operate because no circuit can be established through the index relay R-13 because no circuit exists through the contacts R11-4. When a sheet of paper breaks the light beam, R-11 relaxes closing a circuit through the contacts R11-4 and thus energizing the index relay R-13 and latching this relay through its own contacts, R13-2. This, of course, also forms a circuit through R-13 contacts R13-1, so that when the paper enters the bin, R-11 contacts, R11-3, complete the circuit through the index motor.

Referring to FIG. 7, the shaft 84 is provided with the cam lobes 161 which operate the index switch 162 when the deflector assembly is moved from one station to the other. Following the sequence of events, one the index motor is energized, and the shaft 84 rotates, the cam lobe allows the switch 162 to open, thus allowing the index relay R-13 to unlatch, but maintaining power to the index motor through the second position of the index switch itself until one of the cam lobes 161 moves the switch 162 back to its original position. During this time, the deflector assembly has moved one position and come to a stop ready for the passage of another sheet.

In order to selectively index the deflector from one station to the other, the panel switch 163 which is a double-pole three-throw switch having the positions of Collate, Index and Stack, is placed in the "Index" position. In this position, a momentary depression of the switch discharges the condenser shown through R-13 with just enough energy to move the deflector assembly one bin. In the stack position the deflector assembly is not indexed.

In order to provide for a bypass of sheets entering the collator to subsequent collators in tandem, a limit switch 164, illustrated in FIGS. 1 and 12, is utilized. After the last bin in the collator is fed, a portion 165 on one of the plates 57 contacts the switch arm of the switch 164 so as to open the switch and break the circuit through the index switch 162. The second position of the switch 164 completes a circuit through the solenoid 149 for operating the deflector fins 144 as previously described. As long as the solenoid 149 is energized, paper entering the collator will be moved across the collator by the transfer conveyor means 113 to the next collator in tandem. This condition will continue through any number of machines until an end of count signal is received so as to recycle the deflector assembly as previously described. As soon as the deflector assembly is moved, the switch 164 is allowed to close and the deflector fins 144 are returned to the full line position shown in FIG. 11 by the spring means described.

It is believed that the invention will be clearly understood from the foregoing detailed description of the preferred embodiment illustrated. Changes in the details of construction will suggest themselves and may be resorted to without departing from the spirit and scope of the invention. Accordingly, it is intended that no limitation be implied and that the hereto annexed claims be given a scope fully commensurate with the broadest interpretation to which the employed language fairly admits.

I claim:

1. In a sheet collator device having a collator distributor for receiving and distributing sheets at preselected vertical positions for reception by a vertical column of bins, a sheet conveyor system comprising; an endless distributor conveyor tape having a substantially vertical run opposite said vertical column of bins, means for driving said distributor conveyor tape, stationary vertical sheet backup members located on opposite sides of said distributor conveyor tape for contacting the surface of a sheet conveyed thereby, a vertically movable sheet deflector assembly for deflecting moving sheets from said distributor conveyor tape into selected ones of said bins, retractable tape members having their ends fixed relative to said distributor conveyor tape and the opposite ends thereof connected to said deflector assembly, said retractable tapes being in face-to-face proximity with respective stationary backup members, and said distributor conveyor tape comprising the sole conveyor tape means for moving sheets along said vertical run whereby moving sheets are retained against the surfaces of said distributor conveyor tape and said backup members for movement to the position of said deflector assembly, and means for applying a vacuum pressure to the surface of the distributor conveyor tape to aid in retaining the moving sheet thereagainst for movement thereby.

2. The device according to claim 1 wherein; said distributor conveyor tape passes about vertically spaced upper and lower rotatable tracking members one of which is driven by motor means, infeed guide means positioned to direct sheets in a generally horizontal path tangent to the upper tracking member, and sheet deflector means having curved surfaces positioned to direct an incoming sheet from a horizontal path to the substantially vertical course of said distributor conveyor tape opposite said column of bins.

3. A device according to claim 2 wherein said distributor conveyor tape is provided with longitudinally spaced perforations along each lateral edge thereof, and said means for applying a vacuum pressure to the surface of the distributor conveyor tape comprising an elongated vacuum plenum extending along the backside of the vertical run of said distributor conveyor tape adjacent the bins, and means to apply the vacuum pressure to said plenum, the wall of said plenum in contact with said tape being open to said tape and in communication with said perforations to apply vacuum pressure through the perforations to a sheet carried by the moving distributor conveyor tape, the open wall of said plenum in contact with said distributor conveyor tape is provided with inwardly extending flanges having tapered edges in the path of movement of the perforations and arranged to cover a portion of the area of the perforation to control the effective size of the orifice provided thereby, the taper on said edges being arranged to diverge in a direction away from the point of application of vacuum pressure to the plenum, thereby serving to decrease the area of each orifice as it approaches the source of vacuum pressure to aid in equalizing the vacuum pressure along the length of the distributor conveyor tape.

4. The device according to claim 2 wherein said collator distributor and said vertical column of bins are mounted in a common housing, said housing having a sheet infeed opening on one wall adjacent said infeed guide means and an outfeed opening on the opposite wall, transfer conveyor means extending between said upper tracking member on said outfeed opening for transferring incoming sheets directly from the infeed guide means to said outfeed opening, and said sheet deflector means having a first position wherein the curved surfaces thereof direct an incoming sheet to the vertical run of the distributor conveyor tape and a second position wherein a second set of surfaces directs the incoming sheet onto said transfer conveyor, whereby a plurality of said sheet collator devices may be placed for operation in tandem.

5. The device according to claim 4 wherein said common housing includes support means, mounting means for mounting said column of bins on said support means for fore-and-aft

movement toward and away from the deflector assembly, and the sidewall of said common housing providing an opening for lateral access to the individual bins for removal of collated sheets.

6. The device according to claim 2 including; an electrical control system, said control system including indexing means for indexing the deflector assembly between a predetermined series of positions to deflect sheets to different ones of said bins responsive to a sheet moving over the deflector assembly, and signal means responsive to the delivery of a sheet to the last bin in a preselected series to energize said sheet deflector means to move said deflector means to said second position.

7. The device according to claim 6 where; said transfer conveyor comprises an endless transfer conveyor tape having a substantially horizontal upper run extending between said in-feed guide means and said outfeed opening, means for driving said transfer conveyor tape, and stationary guide means located on opposite sides of said tape for maintaining the lateral edge portions of a traveling sheet in the substantially horizontal plane of said transfer conveyor tape.

8. The device according to claim 7 including means for applying a vacuum pressure to the surface of the transfer conveyor tape to aid in retaining the moving sheet thereagainst.

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