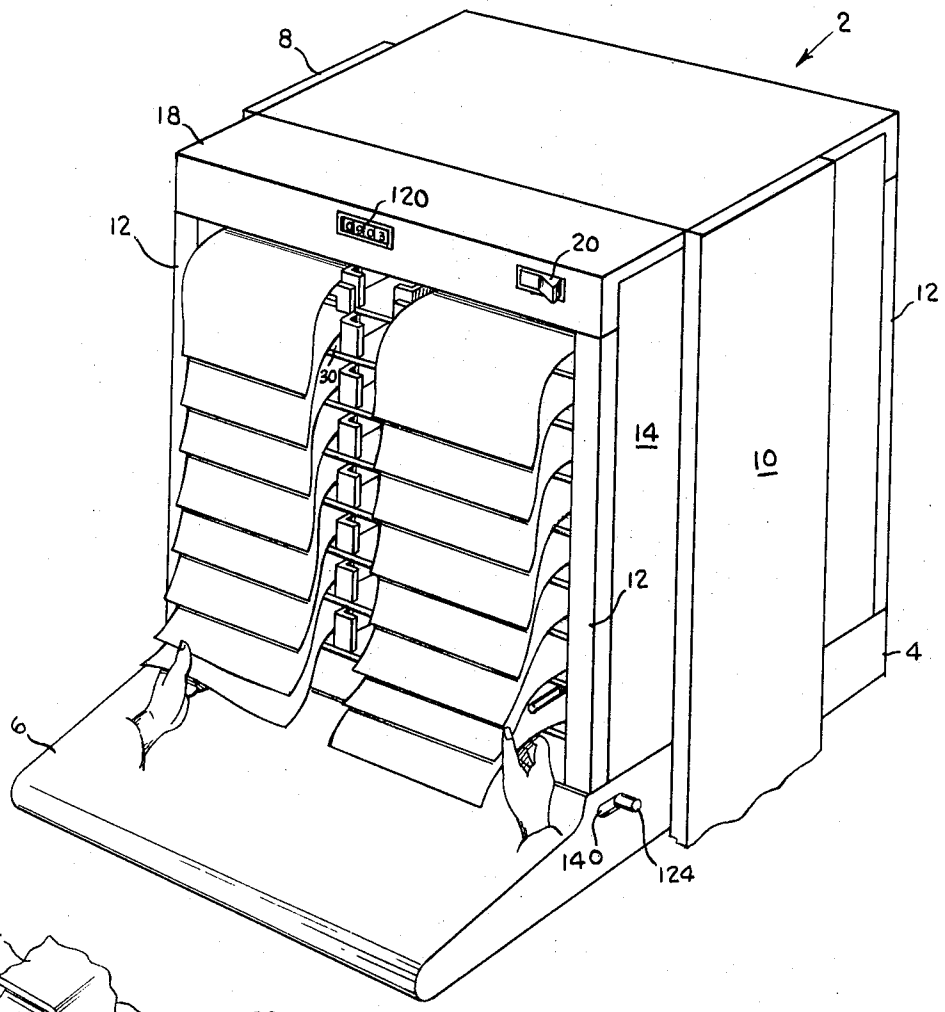
May 23, 1972 P. M. RYLAND 3,664,656

COLLATOR HAVING GATHER ACTUATED CONTROL

Filed Oct. 15, 1970 4 Sheets-Sheet 1

FIG. 1



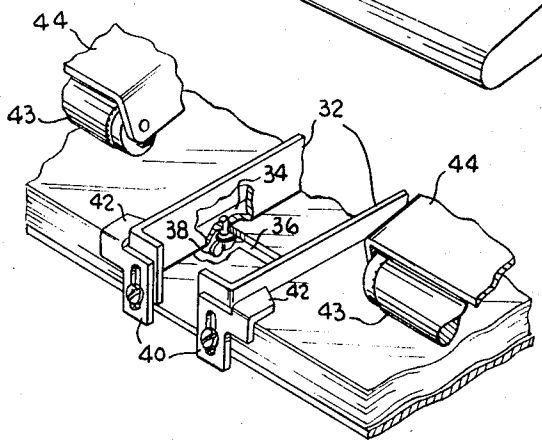


FIG. 4

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COLLATOR HAVING GATHER ACTUATED CONTROL

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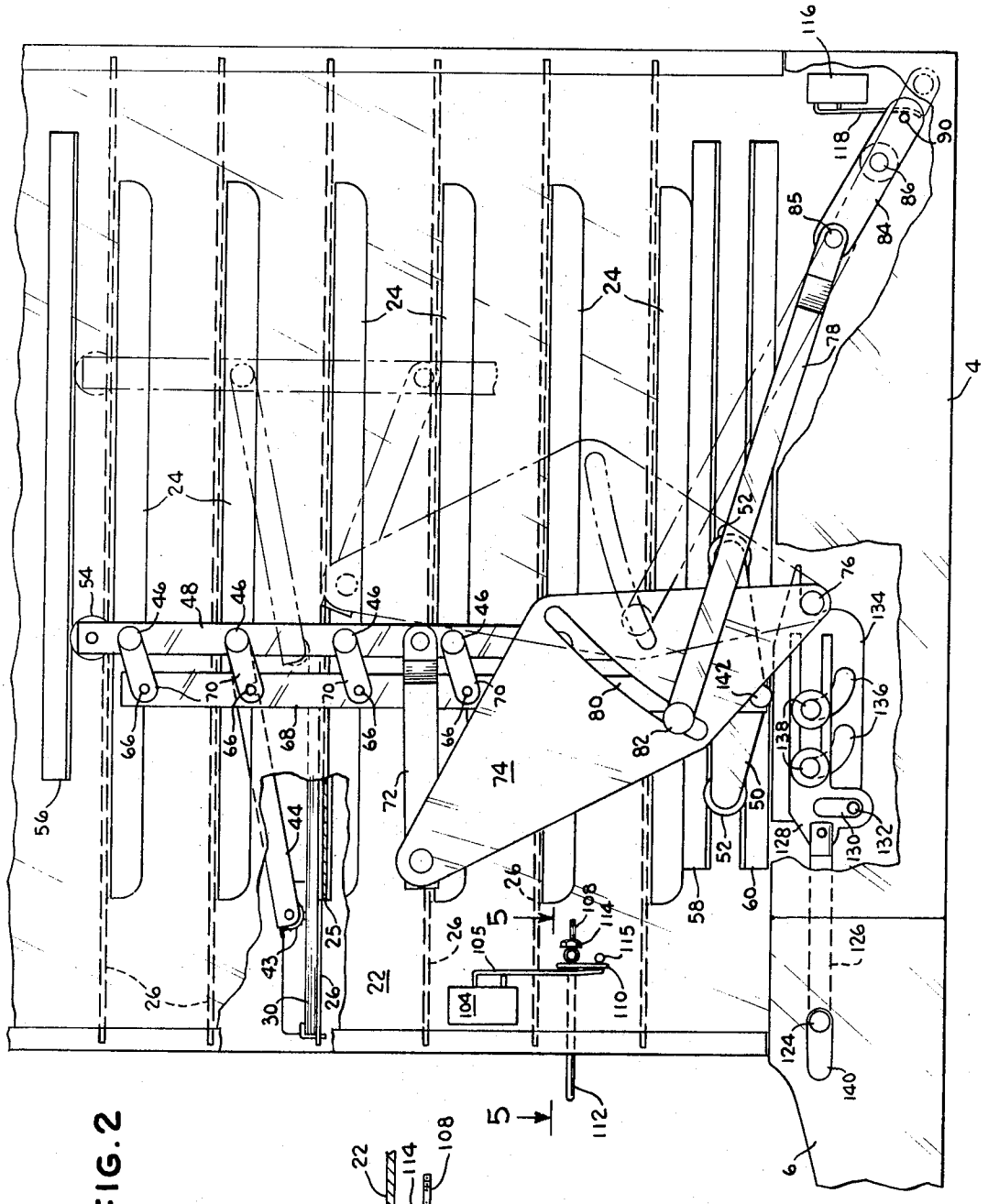

FIG. 2

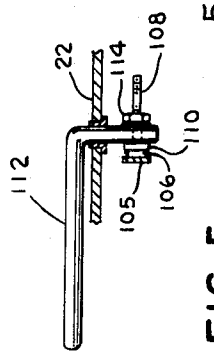

FIG. 5

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COLLATOR HAVING GATHER ACTUATED CONTROL

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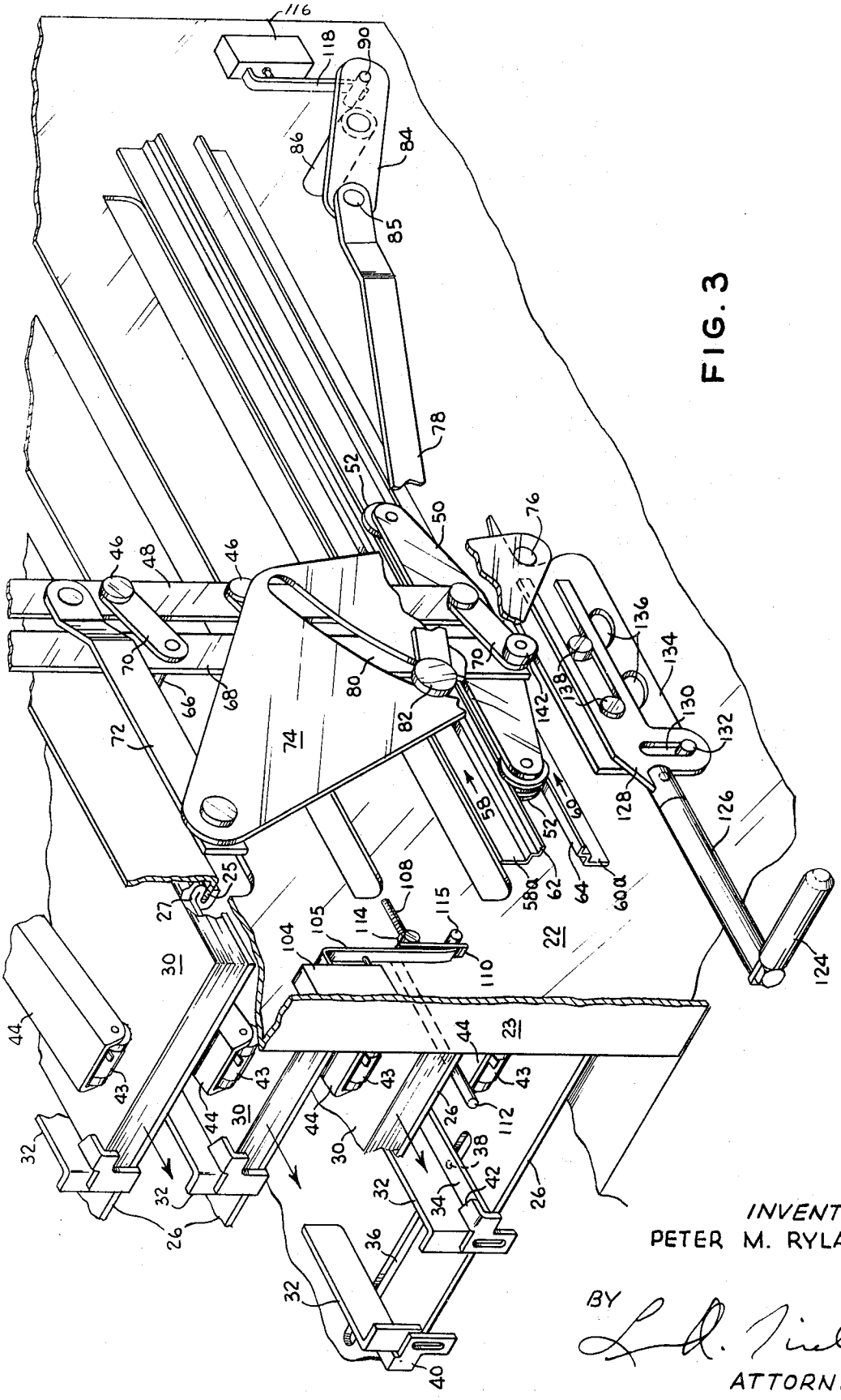

FIG. 3

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COLLATOR HAVING GATHER ACTUATED CONTROL

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FIG. 6

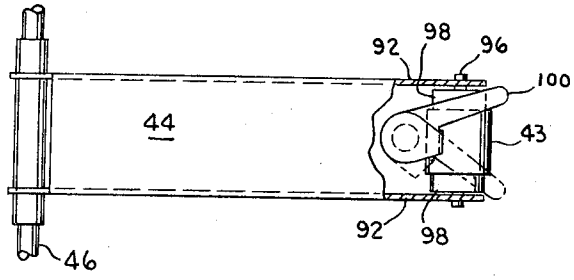
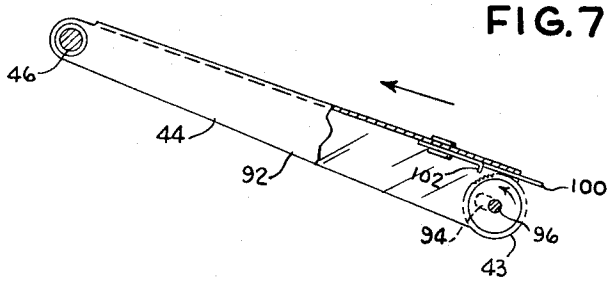


FIG. 7



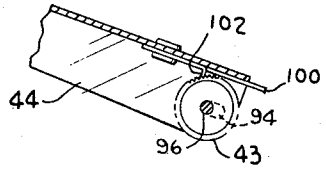


FIG. 8

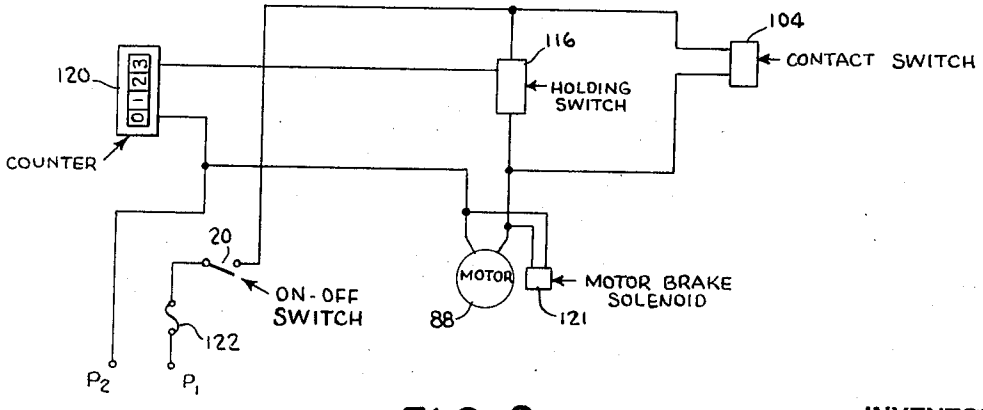


FIG. 9

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United States Patent Office 3,664,656 Patented May 23, 1972

3,664,656

COLLATOR HAVING GATHER ACTUATED CONTROL

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Filed Oct. 15, 1970, Ser. No. 80,904
Int. Cl. B65h 39/02
U.S. Cl. 270—58 5 Claims

ABSTRACT OF THE DISCLOSURE

A collator having trays spaced one above the other in a frame, pusher means associated with each station on the trays and having a common drive means for cyclically pushing a sheet from each stack of sheets at each station to a position where a user can gather the sheets with a continuous hand movement, and actuating means responsive to the movement of the sheets as they are gathered, which actuating means initiates the drive means to repeat the feed cycle so that when the user has finished gathering and stacking the sheets from the collator a next set of sheets are waiting to be gathered.

BACKGROUND OF THE INVENTION

This invention relates to collators, and more particularly to the type comprising superimposed trays, and mechanism for reciprocating pushers longitudinally of the trays.

Semi-automatic collators up to the present time have included an actuating means which is so disposed as to require a separate step in the operation of the collator. For example, it is well-known that in using semi-automatic collators having a foot-pedal or other type of actuating means, the user must first gather the sheets dispensed by the collator, stack the gathered sheets on a pile of previously gathered and cross stacked sheets or on top of a desk, etc. and then by a voluntary dissimilar action engage the actuating means while waiting for the next sheets to be dispensed by the collator before the gathering step can be started.

Thus, it can be seen that there is not only a loss in time for the user experienced between the stacking operation and the beginning of the next gathering operation, for the semi-automatic collator having a separate actuating means apart from the gathering action, but at the same time the separate and non-related-in-thought operation upsets a repetitive rapid motion that would otherwise become a habit or automatic response.

Also, the use of the foot-pedal is tiring to the user who must keep his foot inclined in a position of flexure between each depressing action so as not to cycle the collator inadvertently.

Added to this fatigue problem is the annoying incidence of the foot-pedal moving between uses, and requiring the next user to search for it and position it to his liking.

Further, actuating means are subject to accidental engagement when they are unrelated to the process of gathering sheets fed to a gathering position by the collator and thereby can inadvertently drop sheets from the front of the collator before the user is prepared to gather the sheets. This accidental engagement of the actuating means results in loss of the sheets involved in the mixup and loss of time by the user as he either tries to regather the sheets and manually collate the same or stops to pick up the disoriented sheets to dispose of them.

Where the foot-pedal has been avoided and a switch provided at the gathering station, there has been no way provided short of shutting off the collator, to remove the last set of papers without having an additional set delivered as the switch is tripped during collation.

Another way of avoiding the foot-pedal has been where the collator is given an automatic feed which does away with any actuator and cyclically delivers sheets to the gathering position in accordance with a pre-set timing pattern. The timing pattern is adjustable to the speed of the user. However, the experience with this system has been that the user sets the timing to the slowest speed and at this speed the collator is slower than the normal operating speed of the user and the user operates at a rate which is below that at which he would operate a collator with a non-automatic actuating mechanism.

The present invention is directed to an improved means for actuating the drive means in a collator, through which improvement the collator is self-timing and thereby dispenses sheets for gathering at the pace of the user. The collator is thus capable of operating closer to its inherent maximum speed and presents the user with a modus operandi which is continuous and requires simple flowing motion which is not broken by a non-continuous step.

BRIEF SUMMARY OF THE INVENTION

The present invention obviates the foregoing disadvantages of prior art semi-automatic collators by providing a relatively simple yet reliable mechanical device for conditioning the collator to time its sequence of operation in response to the proficiency of the user.

In accordance therewith, the present invention provides for an apparatus which includes a collator which comprises a rigid frame, a plurlity of trays supported in the frame in vertically spaced alignment, for supporting a stack of sheets and ejector means mounted adjacent each tray for feeding a top sheet from the stack to a gathering position in which each top sheet is partially separated from the stack and is accessible for manual gathering of the sheets by movement thereof in a gathering direction. The collator also includes drive means for cyclically operating the pusher means to move the top sheet into the gathering position, and actuating means mounted on the frame adjacent the front end of one of the trays and responsive to the movement of the sheets in the gathering direction for energizing the drive means to initiate a cycle of operation of the ejector means, whereby the top sheets are separated from the stacks and fed to the gathering position in response to the former top sheets being gathered and removed from the trays.

Having briefly described an embodiment of the present invention, it is a principle object thereof to provide a new and improved actuating means for a collator.

It is another object of the present invention to provide an actuating means for a collator which actuating means is self-timing.

It is a further object of the present invention to provide an actuating means for a collator which actuating means is automatic and requires no extra operation.

It is still a further object of the present invention to provide an actuating means mounted on the frame and extending beyond the open face of the frame for movement in a switching direction in response to the urging of the papers being gathered against the actuating means.

It is an added object of the present invention to provide means for positive engagement with the actuating means upon the gathering of the sheets fed from the collator.

It is a further added object of the present invention to provide the means for positive engagement with the actuating means with one end of a rod extending beyond the feed end of a tray and the other end in non-movable contact with a contact arm of the actuating means.

It is a further object of the present invention to provide an actuating mechanism for a collator which is extremely simple in design and construction, is highly reli-

able and accurate in operation and is economical to manufacture.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more readily apparent from an understanding of the following detailed description of one embodiment of the present invention when considered in conjunction with the accompanying drawings in which like reference numerals refer to like elements in the various figures and in which:

FIG. 1 is a perspective view of the collator according to the preferred embodiment of the present invention;

FIG. 2 is a side elevation of the same, with the side plate of the cover removed to show the operation of the drive mechanism and the actuating means;

FIG. 3 is a perspective view of a portion of the same at a different angle to show the pusher means at the zenith of its forward stroke and the drive means holding a holding switch depressed, the fed sheets are not shown for clarity;

FIG. 4 is an enlarged front elevation of the sheet corner separators on a pair of exemplary side-by-side trays;

FIG. 5 is a plan view of the means for maintaining continuous engagement of the actuating means taken along the lines 6—6 of FIG. 2;

FIG. 6 is an enlarged plan view of the pusher means;

FIG. 7 shows the pusher means on the return stroke;

FIG. 8 shows the pusher means on the forward stroke; and

FIG. 9 is a wiring diagram for the drive motor and stroke counter.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The frame **2** shown in FIG. 1 comprises a base **4** formed, for example, of sheet metal notched and folded into a box-like structure and having a cantilevered desk section **6**. The base **4** is supported at desk level by channel supports not shown so that a user can comfortably sit in front of the collator and make use of the desk section **6**. Additional channel covers **8** and **10** extend from the channel supports to which they are connected. Four corners posts **12** rise from the base and are supported at the four corners by known means. These corner posts can also be fabricated as part of interior side panels if desirable. Side panels **14** which are held in place by the base **4** and removably attached to the respective adjacent corner posts **12**.

A cover plate **18** is folded into channel like form and the sides are flanged so that the cover plate fits over the top of the corner posts **12** and the outer side panels **14**. The front leg of the cover plate **18** is slotted to give access to an on-off switch **20** which will be described below in greater detail.

Side panels **22** having front flanges **23**, only one of which are shown, are lanced horizontally to form parallel slots **24** and the metal below each slot is struck in to form inward flanges **25** which slidably support superimposed trays **26** (as best shown in the topmost tray in FIG. 3) having their side edges bent respectively into an "S" (not shown) and a reversed "S" **27**, the lower curves of which are spaced to ride on the inward flanges **25**. The width of the trays **26** are sufficient to provide two stations in a side-by-side relationship each station being capable of supporting stacks of sheets **30** or the like.

A side guide **32** comprising an elongated angle bar, which fits against the interior side of each stack of sheets **30**, is provided for each station and is disposed with one leg **34** flat on top of the tray adjustably movable along a lateral slot **36** in the tray and maintain in position, for example, by a screw fitting through the leg **34** and slot **36** and held by a wing nut **38**. This permits movement of the side guide in the slot **36** when the wing nut **38** is loosened, allowing movement of the side guide **32** to conform to the width of variable sheet sizes. The length

of the slot **36** determines the maximum possible width of the sheets acceptable by the collator to form each stack of sheets **30**. The upstanding member of the side guide **32** is arranged to fit against the edge of each stack of sheets **30** with the leg **34** under the stack of sheets when in position.

In operation, a stack of sheets **30** are loaded against the respective side of the tray **26** and the side guide **32** is adjusted along the slot **36** against the edge of the stack of sheets **30**. An adjustable backstop (not shown) can be provided as is well known, in position on the trays **26** for each station, against which the stack of sheets **30** are loaded. The backstop is adjustable to the length of the paper loaded.

The side guide **32** at each station has a standard vertically slidable sheet corner separator **40** which is positioned to abut the front of the stack of sheets **30** and has a tapered rear flange **42** which rests on the top of the stack of sheets **30**.

As shown in FIGS. 2 and 3, the stacks of sheets **30** at each station are collated by separating a top sheet from each stack of sheets **30** with a corrugated tube **43** fitted at one end of an ejector means such as a pusher means **44**, the latter being each pivoted at their rear ends on respective transverse rods **46**. The pusher means **44** will be described in detail below. The transverse rods **46** extend through slots **24** in the side panel **22**, and are secured at each end to respective uprights **48**. These uprights **48** are slidably mounted for movement in a horizontal direction along the side panel **22** and are mounted at their lower end to a carriage **50** having a pair of flanged wheels **52** and at their upper end have an upper guide wheel **54** rotatably mounted for riding engagement against the bottom of an outstanding leg of a guide angle bar **56** attached at its other leg to the side panel **22**.

The flanged wheels **52** of the carriage **50** are mounted to revolve between the outstanding flanged legs **58** and **60**, of a pair of elongated flanged angle bars having their non-flanged legs **58***a* and **60***a*, respectively attached to the side panel **22** and spaced from each other. The flanged legs **58** and **60** have lips **62** and **64**, respectively, extending from the flanged portions on which the hub (not numbered) of the flanged wheels **52** ride. The inside flanged portions of the flanged wheels **52** are locked behind the flanged legs **58** and **60** and the hub of the flanged wheels **52** are thus prevented from slipping off of the lips **62** and **64**.

Each pusher means **44** has a guide support arm **66** fitted below it which extends through the parallel slots **24** on either side of it and is rotatably supported in mountings in upright supports **68** and in one end of lever arms **70**. The other ends of lever arms **70** are rotatably connected to a corresponding end of the transverse rods **46** which extend beyond the upright **48**.

A drive means (unnumbered) includes a connecting rod **72** which connects the upright **48** to a torsion crank arm **74** which pivots about a fulcrum **76** in response to the urging of a pitman **78** lockably connected at one end, in an arcuate slot **80** by, for example, a machine screw receiving a knurled knob **82** for adjusting the position of the pitman along the arcuate slot **80**. The other end of the pitman **78** is rotatably connected by a wrist pin **85** to one end of a crankarm **84**, fixed at its mid-section to an output shaft **86** of, for example, an electric motor **88** (shown in FIG. 9). A holding bar **90** is attached to the other end of the crank arm **84** and its function will be described below.

Operationally, the drive means when moved through its cycle by actuating means which will be described below, cause the pusher means **44** at their home or extended position near the front end of the collector (shown in full line in FIG. 2) and with the corrugated tube **43** in contact with the top sheet of the stack of sheets **30**, to move rearward to the retracted position.

This is accomplished by roating the output shaft **86** in the clockwise direction (see FIG. 2) and forcing the pitman **78** rearward. The torsion crank arm **74** amplifies this rearward motion at the connecting rod **72** as it pivots about the fulcrum **76**. The upright **48** is propelled between the guide angle bar **56** and the flanged legs **58** and **60**, and carries with it the pusher means **44** having the corrugated tube **43** in the rotatable aspect (which will be described below).

The torsion crank arm **74** is returned to its home position by the pitman **78** responding to the rotation of the crank arm **84** by the output shaft **86**. In the extending portion of the cycle, the corrugated tube **43** is in its non-rotatable aspect and returns in response to the connecting rod **72** pushing the upright **48** forward from its phantom position to the home position shown in FIG. 2, and in so doing separating a top sheet from the stacks of sheets **30**. The top sheets separated from the stack of sheets **30** are then in a gathering position partially hanging over the front face of the collator.

As shown in FIGS. 6 and 7, each pusher means **44** comprises a channel having depending flanges **92** each having a slot **94** receiving journals of a mandrel **96**. The corrugated tube **43** of friction material, such as rubber, is fitted over the mandrel.

Pivoted on top of the channel is a lever **100** having a depending flange **102**, which as shown in FIG. 8 engages the corrugated tube **43** to prevent rotation thereof in the pushing stroke. As shown in FIG. 7, on the return stroke, the slots **94** permit the journals to lag, the flange **102** to pull away from the corrugated tube **43** and permit free rotation thereof.

When the collator is operating with fewer trays than capacity, the lever **100** for each empty tray is turned to the position shown in dotted lines in FIG. 6, which brings the flange **102** to a lateral position clear of the corrugated tube **43** which permits idling of the roller in both directions.

The lever **100** may be turned to intermediate positions to cause a variable drag on the roller on the rearward stroke, to return any top sheet which may have advanced by friction with the preceding sheet.

The actuating means having the inventive feature therein, includes a contact switch **104**, for example a micro-switch having an extended contact arm **105** which is cantilevered over and beyond the contact button of the micro-switch and is mounted to one of the front flanges **23**. The head **106** of a machine screw **108** is attached to the contact arm near the cantilevered end by welding or otherwise. An elongate plate **110** is fitted on the machine screw **108** next to the head **106** and the remaining portion of the cantilevered portion of the contact arm **105** is bent obliquely toward the elongate plate **110** so that the end of the contact arm **105** touches the elongate plate **110** which extends beyond the control arm **105**. The shorter leg of a rod **112** formed into a right angle is secured adjacent the elongate plate **110**, on the machine screw **108** by a nut **114**. The rod **112** can be drilled, for example, to fit over the screw with the axes of the longer leg and the drilled hole being parallel. In this manner, the longer leg extends beyond the feed end of the trays **26** to provide the means for positive engagement of the actuating means when the sheets are collected in a gathering direction (see FIG. 1) i.e. with an upward sweep of the hands, thereby urging the longer leg to rotate up and in toward the trays **26**. This causes the elongate plate **110** to rotate toward the touching end of the contact arm **105** and to thereby depress the contact button, closing the contacts of the micro-switch. A stop **115** prevents the rod **112** from pivoting downward.

However, when a user wishes to stop the operation he merely gathers the last group of sheets from the top to the bottommost sheet, thereby avoiding tripping the contact switch **104** since the user's hands bring the papers down against the rod **112** and not in a tripping direction. Thus, the user can leave the collator appearing neat without sheets dangling down its front face.

As can be seen in FIG. 9, the motor **88** receives power from a main line P1–P2 through the single pole, single throw, on-off switch **20**. Operation is initiated by pressing the contact switch **104** into the on condition. Each revolution of the crank arm **84** trips a holding switch **116**, for example, a single pole, single throw, normally closed micro-switch mounted to the side panel **22** so that its cantilevered actuating arm **118** is maintained against the contact button at the beginning and end of the drive means cycle. The holding switch is thereby maintained in open circuit arrangement, preventing the flow of current therethrough until the crank arm **84** is rotated slightly, beginning the drive means cycle. When the contact switch **104** closes, the holding bar **90** releases the actuating arm **118** and the drive means cycle is maintained by the normally-closed holding switch **116**, providing a closed electrical path from the main line P1–P2 to the motor **88**, and can also actuate a counter **120**. The contact switch **104** is normally open and is only closed momentarily by the tripping of the contact button during the gathering operation. This provides the motor **88**, having a motor brake solenoid **121** for rapid stopping, with a temporary impulse from the main line P1–P2 after which the holding switch **116** provides a closed circuit to the motor **88** from the main line P1–P2. The crank arm **84** open circuits the holding switch **116** at the end of each drive means cycle.

As shown in FIG. 1, the on-off switch **20** and the counter **120** are mounted to show through slots fitted in the front leg of the top panel **18**. A fuse **122** is usually provided in the main line, to prevent damage from a short circuit.

When stacks of sheets or papers **30** are to be first loaded on the stations, the trays **26** are pulled forward to expose the stations and a handle **124** (FIG. 2) is pulled by the user in the same direction, i.e. away from the pitman **78**. It shall be understood that for reloading, it is not necessary to pull forward the trays. The handle **124** is connected to a pull rod **126** (FIGS. 2 and 3) which is pivotally pinned to a bifurcated plate **128** having a slot **130** in which rides a pin **132**. The pin **132** is part of a lifting plate **134** having two identical side-by-side arcuate slots **136** in which ride two studs **138** which are affixed to the side panel **22**. Thus, when the handle **124** is pulled forward in the handle slot **140**, it carries the bifurcated plate **128** and the lifting plate **134** through the pin **132** in the slot **130**. However, the lifting plate **134** rides on the two studs **138** so that it moves upward as it moves horizontally, carrying the pin **132** to the top of the slot **130**. A wheel **142** which is rotatably connected to the upright supports **68**, rests on the top edge of the lifting plate **134**. The upright support **68** is thus lifted on the lifting plate **134** and in so doing raises all of the pusher means **44** with the guide support arms **66** which support respective pusher means **44** in the raised position.

After the stacks of papers **30** are loaded at all the desired stations, the handle **124** is returned to the position shown in the FIG. 2, lowering the upright supports **68** and with it all the pusher means **44**. A drive means cycle can then be initiated by manually pivoting the rod **112** in an upward direction.

The lifting plate **134** is provided with a pronged portion which rests on the fulcrum **76**. The top edge of the pronged portion is inclined to avoid an abrupt stop to the mechanism if a user inadvertently cycles the collator without lowering the pusher means **44**. The incline provides for a gradual stop to the collator and avoids the possible ensuing damage an abrupt stop would precipitate. The user would be immediately reminded of the error when the collator stops and remember to push the handle **124** to its proper position, lowering the pusher means thereby.

It should be obvious that the torsion crank arm **74** on the side of the collator not shown could be made similarly adjustable, if desirable. However, because it would appear to make it more difficult for a user to make two similar adjustments, it is normally desirable to make only one side carry the adjustment feature and the other side to correspond to the motion of the adjusted torsion crank arm **74**. Also, the contact switch **104** can be placed anywhere on the front panel, so long as it is responsive to a gathering motion by the user.

It is thus apparent from the foregoing that there has been provided an actuating mechanism which achieves the foregoing objects and advantages of the present invention. The ejector means can be pusher means as shown or a wheel which intermittently rotates to separate the top sheet from the stack of sheets and feed it forward, as is well known. It is to be understood, however, that the invention is not to be considered as limited to the specific embodiment described above and shown in the accompanying drawings, which embodiment is merely illustrative of the best mode presently preferred for carrying out the invention and is susceptible to change in form, size, detail and arrangement of parts, but rather the invention is intended to cover all such variations, modifications and equivalents thereof as may be deemed to be within the scope of the claims depended hereto.

I claim:

1. A collator comprising:

(a) a rigid frame;

(b) a plurality of trays supported in said frame in vertically spaced alignment for supporting a stack of sheets;

(c) ejector means mounted adjacent each said tray for feeding a top sheet from each said stack to a gathering position in which each said top sheet is partially separated from said stock and is accessible for manual gathering of said sheets by movement thereof in a gathering direction;

(d) drive means for cyclically operating said ejector means to move said top sheet into said gathering position; and

(e) actuating means mounted on said frame adjacent the front end of one of said trays and responsive to said movement of said sheets in said gathering direction for energizing said drive means to initiate a cycle of operation of said ejector means,

whereby said top sheets are separated from said stacks and fed to said gathering position in response to the former top sheets being gathered and removed from said trays.

2. A collator according to claim **1**, wherein said actuating means includes control means carried by said actuating means in position to be responsive to said movement of said sheets in said gathering direction for controlling the operation of said actuating means.

3. A collator according to claim **2**, wherein said actuating means further includes a contact switch mounted on said frame and having a contact arm connected to said control means, said control means comprising a rod mounted on said frame for movement in response to said movement of said sheets in said gathering direction and extending beyond said front end of said trays.

4. A collator according to claim **3**, wherein said control means further includes an elongate plate mounted on said control rod in position to engage and move said contact arm upon movement of said control rod.

5. A collator according to claim **1**, wherein said actuating means comprises:

(a) a switch mounted on said frame for controlling energization of said drive means and having a contact arm having a free end;

(b) a control rod pivotally mounted on said frame for pivotal movement in response to said movement of said sheets in said gathering direction said control rod having a portion thereon disposed adjacent said free end of said control arm, and

(c) an elongate plate carried by said portion of said control rod and disposed in contiguous relationship with said free end of said contact arm for engaging and moving said contact arm in response to said movement of said contact arm.

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