Sept. 28, 1965 E. T. MARCH 3,208,745

COLLATOR ACCOMMODATING DIFFERENT PAPER SIZES

Filed Oct. 17, 1963 4 Sheets-Sheet 1

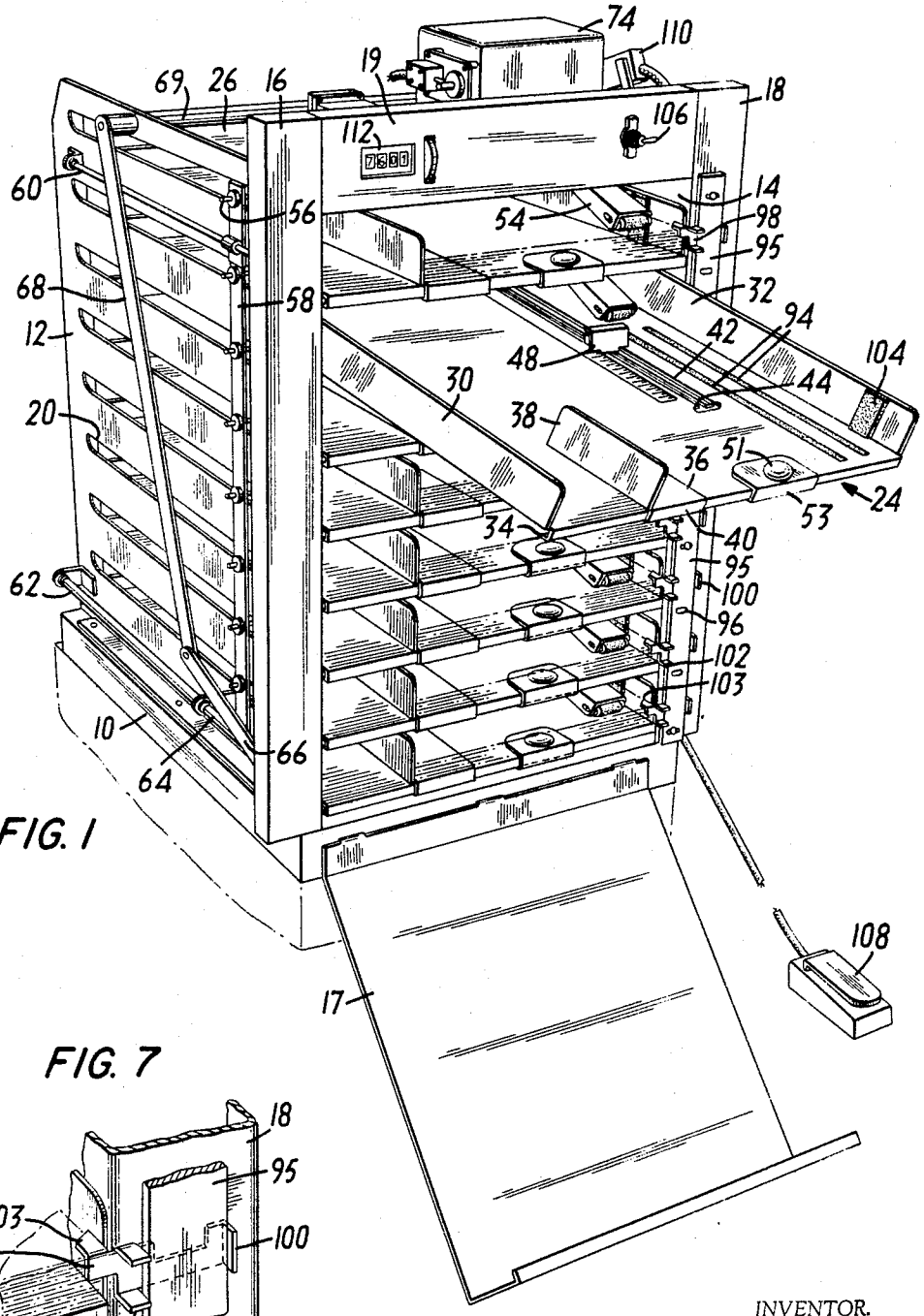

FIG. 1

FIG. 7

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COLLATOR ACCOMMODATING DIFFERENT PAPER SIZES

Filed Oct. 17, 1963 4 Sheets-Sheet 2

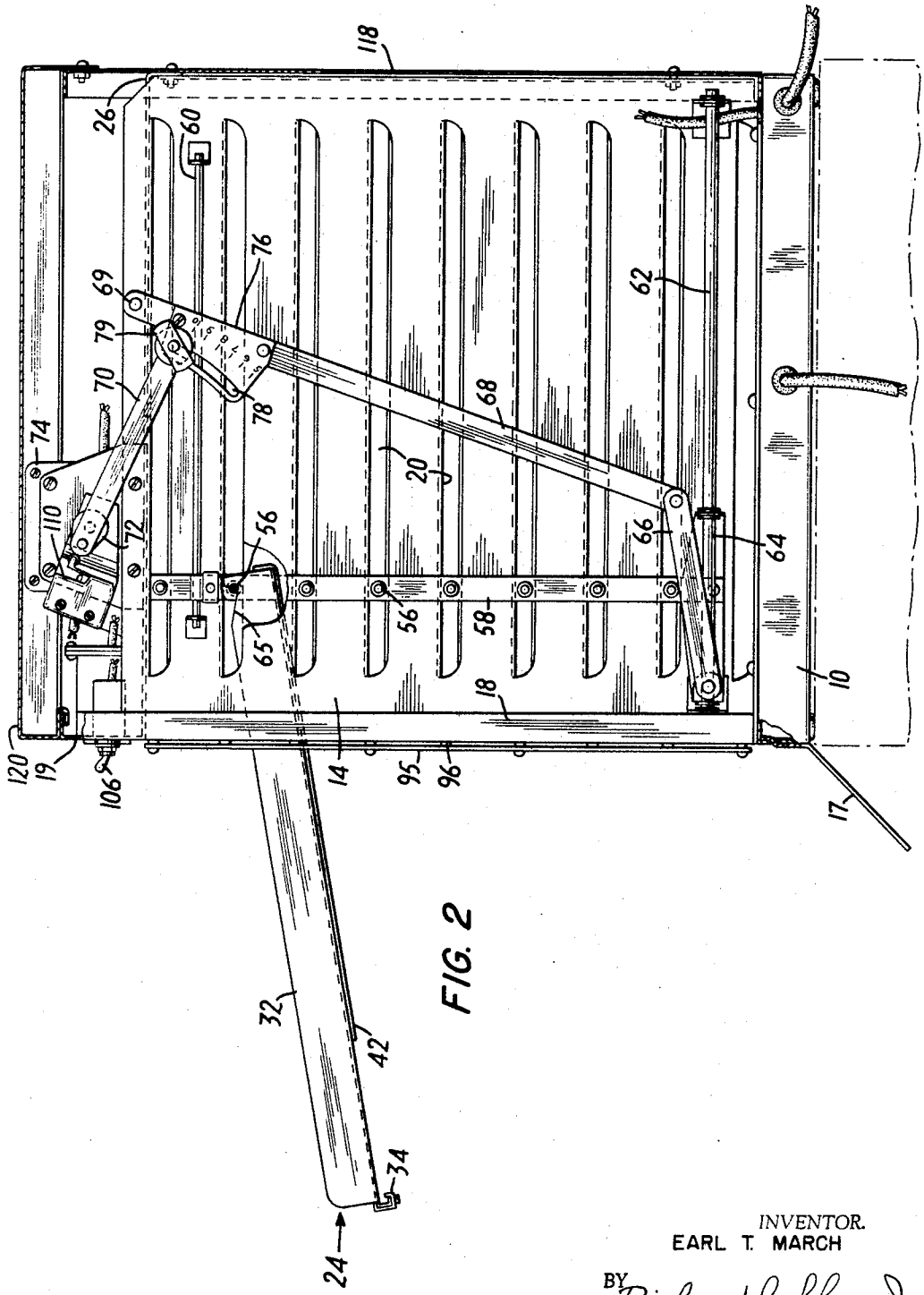

FIG. 2

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COLLATOR ACCOMMODATING DIFFERENT PAPER SIZES

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FIG. 3

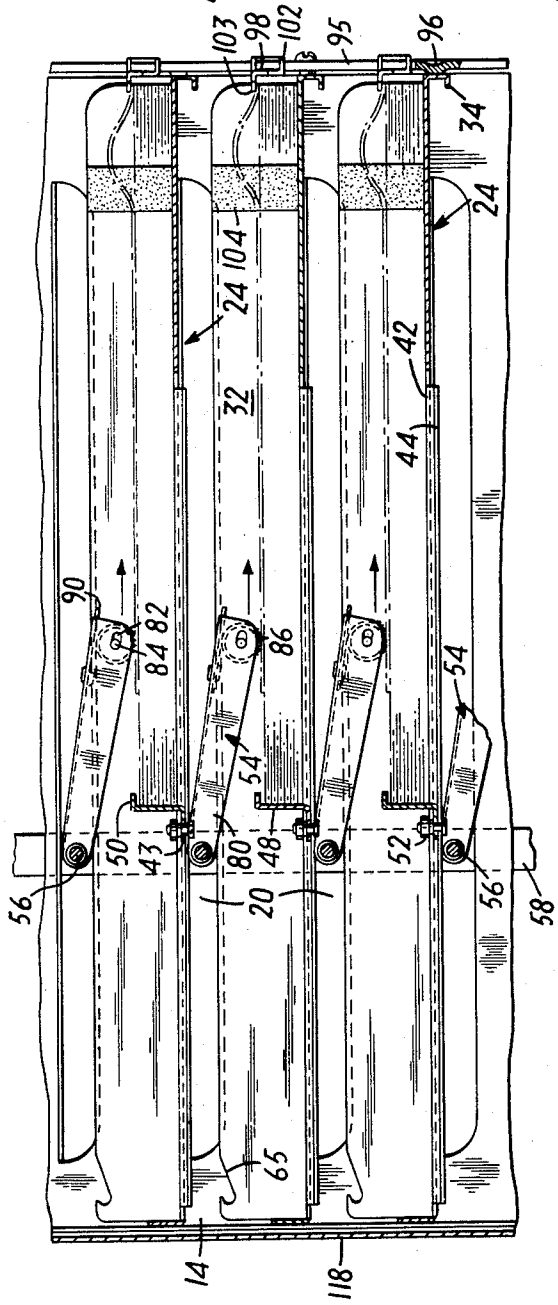


FIG. 5B

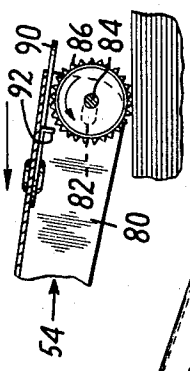


FIG. 5A

FIG. 6

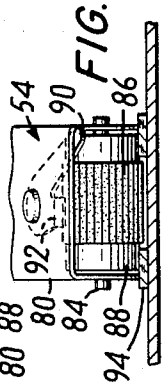
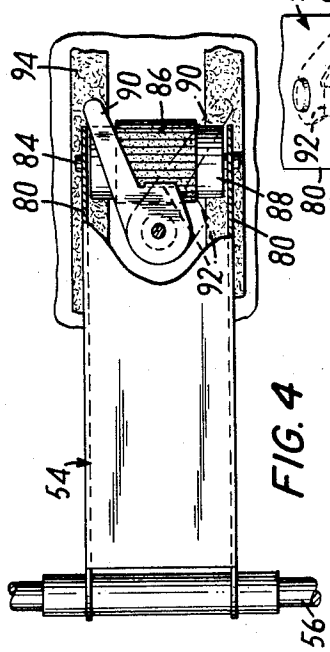


FIG. 4



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COLLATOR ACCOMMODATING DIFFERENT PAPER SIZES

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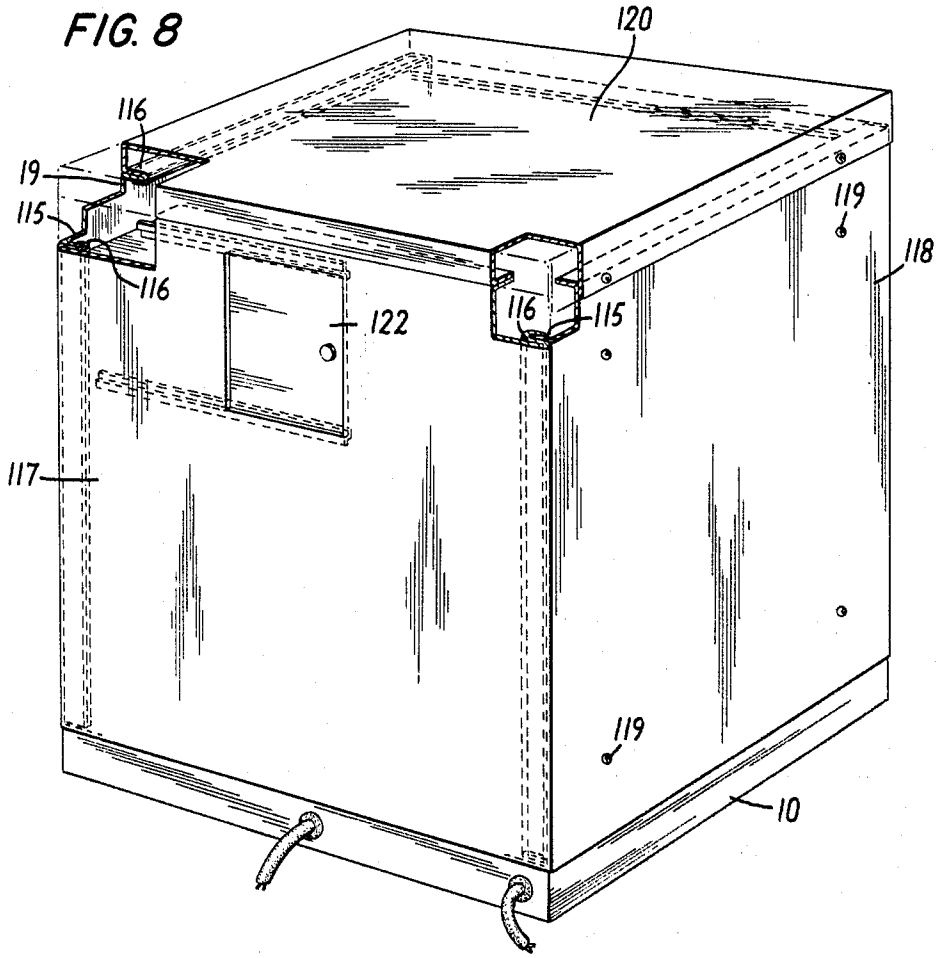
FIG. 8



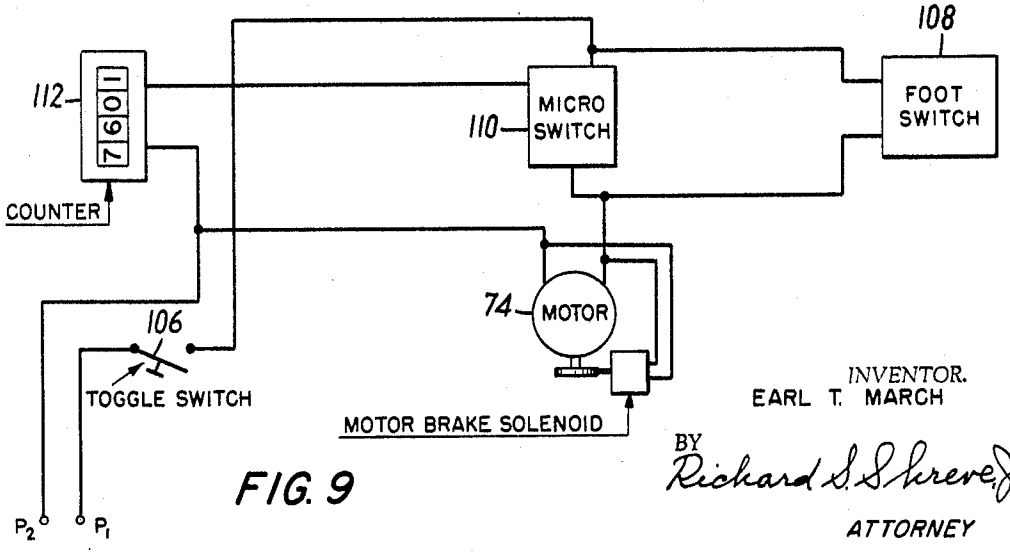


FIG. 9

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3,208,745

COLLATOR ACCOMMODATING DIFFERENT PAPER SIZES

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16 Claims. (Cl. 270—58)

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

The main object of the invention is to provide a small compact table model or desk type collator having all essential features of a floor model.

Other objects are to provide a collator fully adjustable for different sizes of paper, with a variable pusher stroke to accommodate different lengths of paper, and with a corner separator to feed a greater variety of paper with a minimum number of doubles or misses, and to otherwise simplify and improve the construction and operation of collators of this character.

According to the present invention, the collator comprises linkage for reciprocating pusher slides longitudinally of superimposed trays to terminate with the slide in position at the end of a stroke, and means for adjusting the linkage to change the length of the stroke without moving the slide from the terminal position thereof. Preferably the linkage comprises a lever having an arcuate slot in which a pitman is adjustably connected.

The pushers have rollers journaled in slots, and binding elements are provided which are adjustable to decrease or remove the binding engagement thereof. Preferably, each binding element is a downturned flange on a lever on the pusher. The roller preferably comprises a tube of friction material with metal disks at each end thereof, and each tray has a pair of strips of supporting material on which the end disks roll to keep the tube off of the bottom of an empty tray.

The trays are movable forward and downward into loading position, and have hooks at the rear ends thereof to engage the transverse rods which drive the pushers. The trays each have a back stop with a base flange slidable in a depression in the tray, to keep the sheet from going under the back stop. The open front end of the tray has the metal thereof formed into a transverse stiffener, and a side stop and a sheet center raiser each have a front portion bent down over said stiffener and slidable therealong.

The collator is provided with a corner separator which comprises a flanged plate trapped between a vertical guide and a frame surface, and having a lateral extension engaging the front of a pile of sheets on a tray, with a top rearward flange resting on top of the pile of sheets. The pusher is reciprocated at one side near the corner separator, and the adjacent side of the tray has friction material at its forward portion near the separator, so that the sheet being driven from the rear is prevented from buckling at the rear, but instead buckles in front, to snap over the separator.

The collator comprises side panels having cut out portions turned inwardly to leave longitudinal slots for the transverse rods, and to form flanges for supporting the trays. The side panels have front portions flanged to form channel corner posts. A cross panel connects the tops of the corner posts.

A knock down casing is provided for the collator, comprising side panels having pocket flanges receiving flanges of a back plate and the corner posts. A top plate has a front pocket flanges receiving a flange of the cross panel, and a rear flange bent down over the back plate and secured thereto.

The motor for driving the linkage is mounted on a top panel over the side panels and has a crank driving the linkage which also trips a micro switch for a stroke counter in the cross panel. This switch also serves to cut off the power at the end of a forward stroke.

In the drawings:

FIGURE 1 is a perspective view of a collator according to the prefered embodiment of the present invention;

FIGURE 2 is a side elevation of the same, with the side plate of the cover removed to show the pusher drive mechanism;

FIGURE 3 is a vertical cross section showing the operation of the pusher, cover separator, and friction material;

FIGURE 4 is an enlarged plan view of the pusher;

FIGURE *5a* shows the pusher on the forward stroke;

FIGURE *5b* shows the pusher on the return stroke;

FIGURE 6 is a front elevation of the pusher shown in FIGURE 4;

FIGURE 7 is a perspective view showing the corner separator;

FIGURE 8 is a perspective view of the casing for the collator; and

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

The frame comprises a base **10** formed of sheet metal notched and folded into a box like structure. Mounted on the base **10** are two side panels **12** and **14**, the front portions of which are folded into channel like form to provide corner posts **16** and **18**, which are connected by a cross panel **19** also of channel form. A delivery tray **17** is hooked onto the front of the base **10**, by three clips entering slots in the front thereof.

The side panels are lanced horizontally to form parallel slots **20**, and the metal below each slot is struck in to form inward flanges which support superimposed trays **24**. A top panel **26** extends between the side panels **12** and **14**.

Each tray **24** has upstanding side flanges **30** and **32**, and a front flange **34** bent down and back under into a U-shaped stiffener. A side guide **36** flat on top of the tray has at one side an upstanding flange **38**, and a bent down under flange **40** which snaps over the stiffener **34** and is slidably adjustable therealong for different widths of paper. Thus, the paper can be loaded against the opposite flange, and the side flange brought over along the flange **34** against the loaded paper.

The bottom of the tray has a longitudinal channel **42** depressed therein, and a longitudinal slot **44** in the bottom of the channel. The channel **42** receives a central tongue **43** bent back from the bottom of a back stop **48**, which has a top front flange **50**. The slot **44** receives a screw carried by the tongue **43** and having a thumb nut **52**, for adjustment to the length of paper loaded. The depression of channel **42** prevents paper from getting underneath the back stop **48**.

The front of the tray is provided with an elevation **51** which serves to raise the center of the front of the sheet, to counteract any tendency of the sheets to rise up at the corners. In the form shown, this elevation is formed by a rounded bump on a slide **53** similar to the slide for the bottom of the side flange **38**.

As shown in FIGURE 3, the sheets on the loaded trays are collated by pushers **54**, which are each pivoted at their rear ends on respective transverse rods **56**. These rods extend through slots **20** in the side panel **12**, and are secured at each end to respective uprights **58**. These uprights are slidably mounted on upper and lower longitudinal giude rods **60** and **62** mounted on the outside of side plates **12** and **14**. The base of each upright **58** has a long bearing **64** slidable along the lower guide rod **62**.

As shown in FIGURE 2 in loading position, the rods

56 are in a forward position, and the side flanges 30 and 32 of the trays each have a rounded notch 65 forming a hook to receive the rod 56 thereabove when the tray is moved outwardly and downwardly into this loading position.

Each slide bearing 64 is connected by a link 66 to a lever 68. The tops of the levers 68 are connected to each other by a torsion rod 69 pivoted in the top of the side panels 12 and 14. An intermediate portion of the lever 68 is connected by a pitman 70 to a crank 72 driven by a motor 74 mounted on the top panel 26.

The pitman rod 70 is connected to the lever 68 by a plate 76 secured to the lever, and having an arcuate slot 78 centered on the crank 72 and receiving a screw on the rod 70 with a wing nut 79 for adjusting the position of the rod along the arcuate slot 78. This adjusts the distance along the lever 68, from the torsion rod 69 to the point at which the thrust of the pitman rod 70 is applied. Therefore this adjusts the lever arm for this thrust, which adjusts the resultant travel of the other arm of the lever 68 constituted by the full length thereof. The link 66 connecting the lower end of the lever 68 to the slide bearing 64 carrying the upright 58 supporting the rods 56 on which the pushers 54 are mounted, thereby transmits this travel adjustment to the stroke of the pushers, which can be made proportional to the length of the sheets on the trays 24.

In the forward or terminal position of the mechanism shown in FIGURE 2, the arcuate slot 78 has a radius equal to the length of pitman rod 70, with its center at the crank pin of crank 72. Therefore the end of pitman rod 70, which engages arcuate slot 78, may be adjusted anywhere along said slot without changing the angular position of lever 68. However, any change in position of pitman rod 70 in slot 78 will change the angular travel of lever 68, when crank 72 revolves, this in turn changing the length of travel of slide 64 away from the foreward or terminal position.

As shown in FIGURE 4, each pusher comprises a channel having depending flanges 80 each having a slot 82 receiving journals of a mandrel 84. A corrugated tube 86 of friction material such as rubber is fitted over the mandrel between end disks 88.

Pivoted on top of the channel is a lever 90 having a depending flange 92, which as shown in FIGURE 5*a* engages the tube 86 to prevent rotation thereof in the pushing stroke. As shown in FIGURE 5*b*, on the return stroke, the slots 82 permit the journals to lag, and the flange 92 to pull away from the tube 86 and permit free rotation thereof.

When the collator is operating with fewer trays than capacity, the lever 90 for each empty tray is turned to the position shown in dotted lines in FIGURE 4, which brings the flange 92 to a lateral position clear of the tube 86, which permits idling of the roller in both directions.

The lever 90 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.

Each tray is provided with parallel strips 94 of cork secured to the top surface of the bottom of the tray, to provide tracks for the disks 88 to ride on for such idling movement of the pusher in an empty tray, to keep the tube 86 from contacting the bottom of the tray.

As shown in FIGURE 7, the corner post 18 has secured thereto a vertical guide strip 95, which has spacer depressions 96 between the trays, and is secured to the corner post by screws in selected depressions. Vertically slidable in the space therebetween is a sheet corner separator having a guide flange 100 and thumb flanges 102. The back of the slide 98 abuts the front of the sheets, and the top of the slide has a tapered rear flange 103 which rests on the top of the sheets.

As shown in FIGURE 3, each tray side flange 32 has secured thereto near the front end thereof a patch 104 of friction material such as sponge rubber which frictionally

engages the edge of the sheet being pushed from the rear, to prevent buckling of the rear of the sheet. Instead, the friction causes buckling in a small area ahead of the patch 104, to cause the front portion of the sheet to snap out from under the tapered flange 103.

As shown in FIGURE 9, the motor 74 receives power from a main line through on-off toggle switch 106. Operation is started by a foot switch 108. Each revolution of the crank 72 trips a micro switch 110, and also actuates a counter 112. The foot switch 108 is only a by-pass for giving a temporary impulse, after which the micro switch 110 takes over. But the motor cam 72 opens the micro switch at the end of each forward stroke. This does not stop the machine while the foot switch 108 is closed, but when the foot switch is opened, the microswitch continues to supply current until the end of the stroke.

As shown in FIGURE 1, the motor 74 and micro switch 110 are mounted on the top panel 26, and the toggle switch 106 and counter 112 are mounted in the cross panel 19.

The collator mechanism is enclosed in a knock down, box like casing as shown in FIGURE 8. The corner posts 16 have vertical rear flanges 115 which fit into front pocket flanges 116 of side plates 117. The back plate 118 has front flanges 115 which fit into rear pocket flanges 116 of side plates 117. Screws 119 passing through back plate 118 into flanges of the side panels 12 hold these flanged cover parts together.

The front of top plate 120 has a pocket flange 116 receiving a top rear flange of cross panel 19, with side and back flanges depending over side plates 117 and back plate 118. Screws securing the back flange to the back plate secure the top plate in position. The side plate 117 has a door 122 sliding in flanged grooves in the side plate for access to the stroke adjustment wing nut 79.

What is claimed is:

1. A collator comprising superimposed trays, a rigid frame supporting said trays, guides extending longitudinally of said trays at each side thereof, slides respectively mounted for reciprocation along said guides, said slides comprising uprights, transverse rods extending between said trays and connecting said uprights, pushers in said trays pivoted at their rear ends respectively on said rods, a pair of levers respectively connected to said slides, a torsion rod journaled in said frame and connecting said levers, a driving crank, a pitman driven by said crank and connected to an arm of one of said levers, and means for adjusting the length of said lever arm connected to said pitman.

2. A collator comprising superimposed trays, transverse rods mounted for reciprocation longitudinally of said trays, pushers in said trays each comprising a rear portion pivoted on a respective rod, and slotted front portions spaced apart, a roller between said front portions and journaled in the slots thereof, a binding element mounted on said pusher in position to be engaged by said roller on the forward stroke, and means for moving said binding element with respect to said pusher to decrease or remove the binding engagement thereof with said roller.

3. A collator comprising superimposed trays, transverse rods mounted for reciprocation longitudinally of said trays, pushers in said trays each comprising a rear portion pivoted on a respective rod and slotted front portions spaced apart, a roller between said front portions and journaled in the slots thereof, a lever pivoted on said pusher having a flange engaging said roller, and movable to swing said flange out of engagement with said roller.

4. A collator comprising superimposed trays, transverse rods mounted for reciprocation longitudinally of said trays, pushers in said trays having rear portions pivoted on said rods and front portions journaling a roller therebetween, said roller having thereon a tube of friction material and metal end disks on each side of said tube a binding element mounted on each pusher in posi-

tion to be engaged by said roller on the forward stroke, means for moving said binding element with respect to said pusher to remove the binding engagement thereof with said roller, and each tray having a pair of spaced apart strips of supporting material on which said end disks roll to keep said tube off of the bottom of said tray when said binding engagement is removed.

5. A collator comprising superimposed trays, transverse rods mounted for reciprocation longitudinally of said trays, pushers in said trays each comprising a rear portion pivoted on a respective rod and slotted front portions spaced apart, a roller between said front portions and journaled in the slots thereof, said roller having thereon a tube friction material and metal end disks on each side of said tube, a binding element mounted on said pusher in position to be engaged by said roller on the forward stroke, and means for moving said binding element with respect to said pusher to remove the binding engagement thereof with said roller, each tray having a pair of strips of supporting material on which said end disks roll to keep said tube off of the bottom of the tray when said binding engagement is removed.

6. A collator comprising superimposed trays, slides mounted for reciprocation longitudinally of said trays, rods connecting said slides, pushers carried by said rods for reciprocation in said trays, said trays being movable forward and then downward with respect to said rods and provided with upstanding side flanges having hooks in their tops at the rear ends thereof to engage said rods at the end of such movement.

7. A collator comprising superimposed trays, a corner post at one side of the front ends of said trays, a vertical guide secured to said corner post, and a corner separator movable along said guide and having a rearwardly tapered flange resting on the top of a pile of sheets on one of said trays.

8. A collator comprising a frame supporting superimposed trays, said frame having a vertical surface at one side of the front ends of said trays, a vertical guide secured to said vertical surface and spaced therefrom, and a corner separator trapped between said guide and said surface and having a lateral extension engaging the front of a pile of sheets on one of said trays, said lateral extension having a top rear flange resting on top of said pile of sheets.

9. A collator comprising a frame supporting superimposed trays, said frame having a vertical surface at one side of the front ends of said trays, a vertical guide secured to said vertical surface and spaced therefrom, and a corner separator trapped between said guide and said surface and having a vertical flange on the outer side of said guide, horizontal flanges on the inner side of said guide, a lateral extension engaging the front of a pile of sheets on one of said trays, said lateral extension having a top rearwardly tapered flange resting on top of said pile of sheets.

10. A collator comprising superimposed trays, a pusher mounted for reciprocation in each of said trays adjacent one side flange thereof, each tray having a longitudinal channel depression with a longitudinal slot therein between the path of said pusher and said adjacent one side flange, a back stop having a bottom flange bent rearwardly and sliding in said channel, and a screw slidable in said slot for securing said flange in any selected longitudinal position along said channel.

11. A collator comprising superimposed trays, a pusher mounted for reciprocation in each of said trays adjacent one side flange thereof, a sheet corner separator mounted at one side of the front of said one side flange and resting on the top of the adjacent corner of the sheets on said tray, and a patch of friction material on the inside of said one side flange near the front end thereof.

12. A collator comprising superimposed trays, side panels having portions turned inwardly to leave longitudinal slots and to form flanges for supporting said trays, said side panel having front portions forming channel corner posts, means in said slots for reciprocating pushers longitudinally of said trays, a flanged back plate, side plates having flanges interlocking with the flanges of said corner posts and said back plate, said back plate being secured to the rear of said side panel by the only screws required to hold said side plates together with said corner posts.

13. A collator comprising superimposed trays, a frame supporting said trays, a slide mounted for reciprocation longitudinally of said trays, said slide comprising uprights, transverse rods connecting said uprights, pushers in said trays carried by said transverse rods, linkage for reciprocating said slide for a stroke to bring said pushers to a position at the forward end of said trays, comprising a lever having one end rotatably mounted on a pivot in said frame, means connecting the other end of said lever to said slide, means for driving said linkage comprising a pitman engaging said lever at a point intermediate the ends thereof at a distance from said pivot to form arm for said lever, and means for adjusting the distance of said point from said fixed stationary axis to change the length of said stroke while said slide remains stationary.

14. A collator comprising superimposed trays, a frame supporting said trays, a slide mounted for reciprocation longitudinally of said trays, said slide comprising uprights, transverse rods connecting said uprights, pushers in said trays carried by said transverse rods, linkage for reciprocating said slide for a stroke to bring said pushers to a position at the forward end of said trays, a lever having one end pivoted in said frame, means connecting the other end of said lever to said slide, a crank for driving said linkage, a pitman engaging said lever at a point intermediate the ends thereof at a distance from said pivot to form a drive arm for said lever, a motor for driving said crank, a foot switch for starting said motor, a microswitch actuated by said crank for stopping said motor at the end of a forward stroke after said foot switch has been opened, and means for adjusting the distance of said point from said fixed stationary axis to change the length of said stroke while said slide remains stationary.

15. A collator comprising superimposed trays, a frame supporting said trays, a slide mounted for reciprocation longitudinally of said trays, said slide comprising uprights, transverse rods connecting said uprights, pushers in said trays carried by said transverse rods, linkage for reciprocating said slide for a stroke to bring said pushers to a position at the forward end of said trays, comprising a lever pivoted in said frame and means connecting said lever to said slide, a pitman connecting said lever to a crank, said lever having an arcuate slot in which said pitman is adjustably connected to adjust the length of stroke of said slide while said lever remains stationary.

16. A collator comprising superimposed trays, a pusher mounted for reciprocation in each of said trays adjacent one side flange thereof, each tray having an open front end with the metal formed into a transverse stiffener, and a central elevator slide having a rearwardly extending flange with a smooth raised portion to raise the center of the front of the sheet, and a front portion bent down over said stiffener for slidable adjustment therealong toward said one side flange.

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