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Ryland

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[54] **COLLATOR WITH REMOVABLE BINS**

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[52] **U.S. Cl.** **270/58;** 270/45

[51] **Int. Cl.** **B65h 39/02**

[58] **Field of Search** 270/58, 52, 12, 45; 271/9, 271/109, 61, 58; 221/124

[56] **References Cited**

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[57] **ABSTRACT**

A collator comprising a frame and a plurality of removable bins. Each bin includes a bottom paper feed roller connected by a shaft to a sprocket or the like. A single motor driven drive chain mounted on the frame is engaged by the sprocket of each bin inserted in the frame. As a result of this construction the number of bins used may be decreased while the capacity of those bins used may be increased and such used bins may be loaded from the rear while the collator is in operation.

10 Claims, 6 Drawing Figures

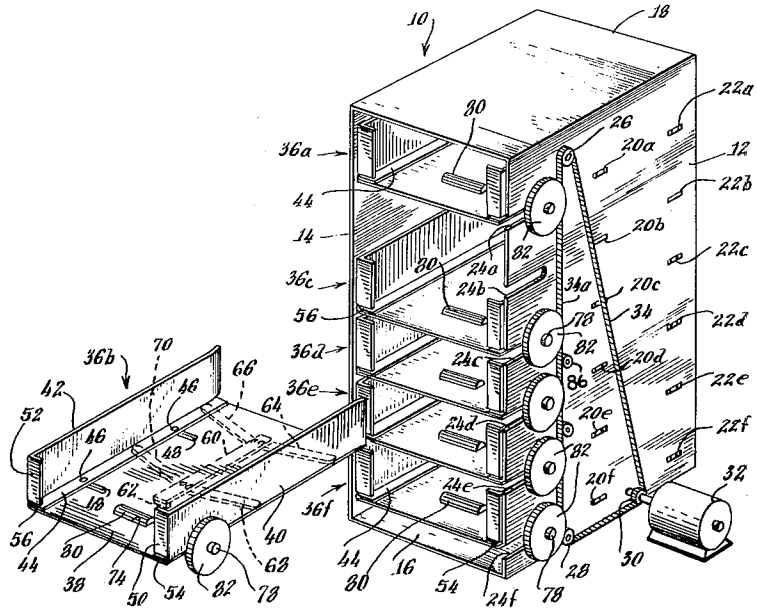


Fig. 1.

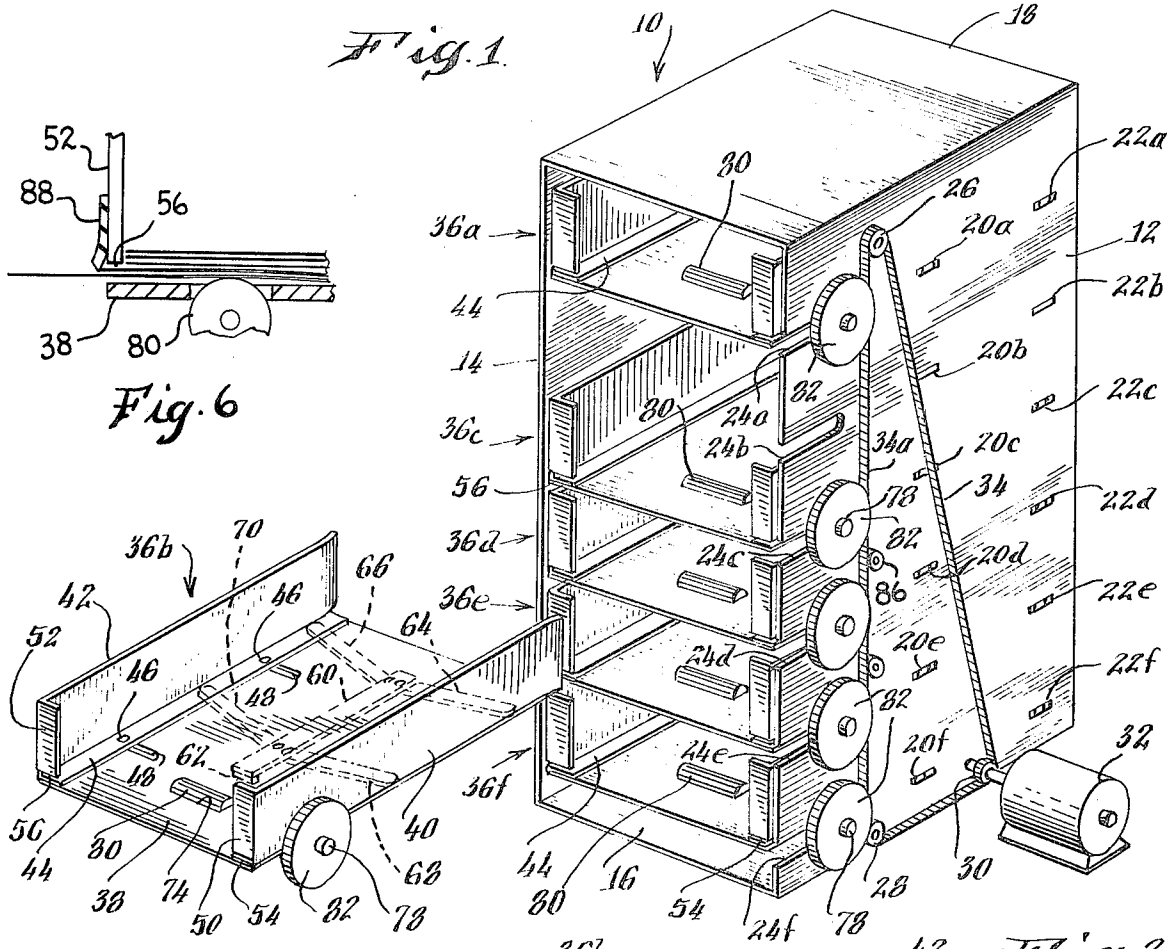


Fig. 6

Fig. 2.

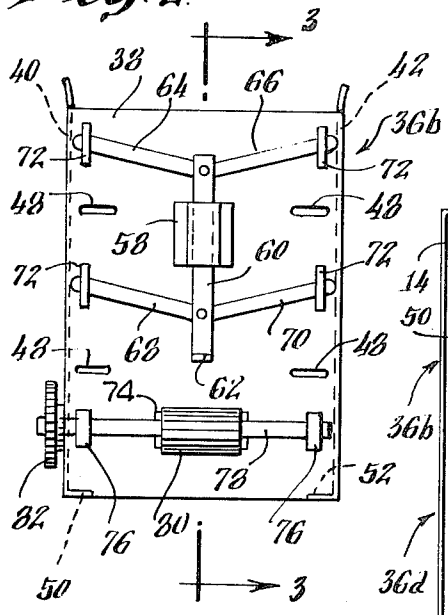


Fig. 3.

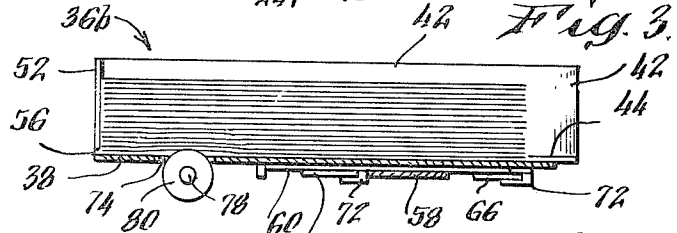


Fig. 4.

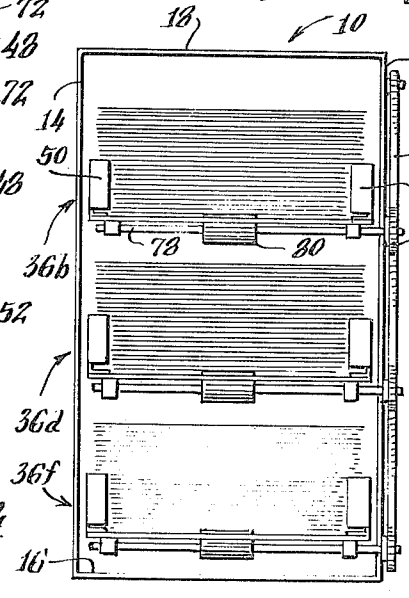
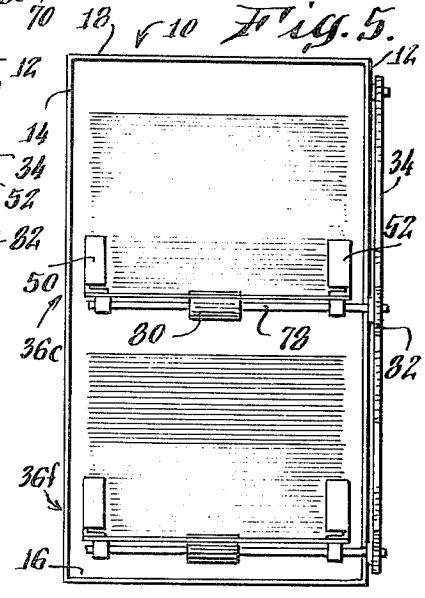


Fig. 5.



COLLATOR WITH REMOVABLE BINS

BACKGROUND OF THE INVENTION

Conventional collators have a fixed number of bins for receiving paper. Paper is normally fed from the top of the bins. As a result, the collator must be shut down in order to replenish the paper supply in the bins. Furthermore, the paper capacity of each bin is generally fixed. It would be highly desirable to have a collator whose capacity per bin could be increased when use of fewer than the maximum number of bins is required, while of course insuring that the paper feed mechanisms always operate in synchronism. Accordingly, it is a primary object of the present invention to provide a collator wherein the bins and their respectively associated sheet feed mechanism are removable so that the number of bins used may be reduced and the capacity of the remaining bins increased. Another object is to provide a collator construction wherein the bins may be loaded while the collator is in operation. Another object is to provide a collator arrangement wherein the paper feed from each bin is synchronized with that from other bins. Other objects, features, and advantages will become apparent from the following description and appended claims.

SUMMARY OF THE INVENTION

The present invention includes a collator which comprises a support frame and a plurality of paper supply bins individually and removably mountable on the frame. A paper drive shaft is provided on each bin and a paper drive roller is mounted on said shaft to engage the bottom sheet of a sheet stack. A paper drive sprocket is also mounted on each of the paper drive shafts so as to be engaged by a common drive chain when the respective paper supply bins are operatively mounted in the frame. Means are provided for driving the common drive chain to simultaneously actuate the paper drive rollers of all bins mounted in the frame.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a collator in accordance with this invention showing one bin removed therefrom;

FIG. 2 is a bottom view of one bin of the collator of this invention;

FIG. 3 is a cross sectional view taken substantially along section line of 3—3 of FIG. 2;

FIG. 4 is a front view of the instant collator and shows three bins installed on the machine frame;

FIG. 5 is a front view of the instant collator and shows two bins installed on the machine frame; and

FIG. 6 is a fragmentary elevational view in partial section and shows the details of the sheet separator slot arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference to FIG. 1 of the drawing, there is illustrated a collator including a frame **10** comprising a right sidewall **12**, a left sidewall **14**, a bottom **16**, and a top **18**. Both the front and the back of frame **10** are substantially open. The sidewall **12** of the frame defines a plurality of pairs of bin support openings, each pair including a front opening **20***a–f* and a back opening **22***a–f* respectively. Similar corresponding pairs of openings (not shown) are provided in sidewall

14 which are aligned with said openings **20***a–f* and **22***a–f*. Sidewall **12** also includes six slots **24***a–f*, which extend rearwardly from the front edge of sidewall **12.**

Mounted on the sidewall **12** are an upper idler sprocket **26,** a lower idler sprocket **28** and a drive sprocket **30,** the latter being adopted to be driven by a suitable motor **32.** A drive chain **34** encircles the sprockets **26, 28, 30** so that a vertical portion **34***a* of the chain is disposed adjacent the ends of each of said slots **24***a–f.*

Mounted within the frame **10** are a plurality of paper supply bins **36***a–f.* These bins are identical and only bin **36***b*, shown removed from the frame, will be described in detail. Each of the bins **36** comprises a bottom tray **38** with right and left side guides **40, 42** secured thereto. Each side guide includes a mounting flange **44** for laterally adjustably mounting the side guide on the tray by means of flat headed screws **46** having wing nuts operable at the lower ends thereof and adjusting slots **48** in the tray. At the rear end of each bin, the side guides **40, 42** are slightly flared outwardly as shown to facilitate loading while at the front end of each bin the side guides are bent inwardly to form right and left separator tabs **50, 52** respectively which paper feed together with the spaced upper surface of tray **38** effectively define very narrow slots **54, 56** at their lower edges.

The mechanism for removably mounting the bins within the frame is shown in detail in FIG. 2 and comprises a substantially rectangular slide housing **58** mounted to the bottom of tray **38** and slidably retaining a slide bar **60** bent over at its forward end to provide a finger grip **62.** Pivotally secured at their inner ends to the slide bar **60** are four latching bars **64, 66, 68, 70;** the respective ends of said latching bars extending through suitable slots formed in the tabs **72** respectively carried along the side edges of the bin. These tabs are positioned so as to be respectively aligned with the said opening pairs **20***a–f*, **22***a–f* formed in said frame.

The tray **38** of each bin is formed with a small rectangular cutout **74** near its forward edge. Mounted on the bottom of said tray **36** and laterally aligned with said cut out are a pair of bearing supports **76,** FIG. **2.** Supported in these bearing supports is a paper drive shaft **78** which carries a serrated rubber cylindrical paper feed roller **80,** a peripheral portion of which extends through the said cut out **74.** Secured to the paper drive shaft **78** outwardly of the sideguide **40** is a paper drive sprocket **82.**

To mount the paper bin **36***b* in the frame **10,** it is longitudinally inserted into the space between the bins **36***a*, **36***c*, with the laterally extending portion of shaft **78** passing through the slot **24***b*. The bin is then positioned so that the tabs **72** on the bottom of the bin are aligned with the openings **20***b*, **22***b*. The slide bar **60** is then moved rearwardly by use of the finger grip **62** so as to cause the latching bars **64, 66, 68, 70** to pivot and move outwardly so that their respective outer ends move through the openings **20***b*, **22***b* formed in the sidewall **12** and the corresponding openings in the sidewall **14** thereby locking the bin in operative position. At the same time, the sprocket **82** carried by bin **36***b* has engaged with the vertical portion **34***a* of the chain **34,** the latter being similarly engaged with the sprockets of the other bins. Suitable idler sprockets such as **86** may be provided where needed on the sidewall **12** to maintain the said vertical portion **34***a* of the chain **34**

in operative engagement with the drive sprockets **82** of the various bins.

Paper may be loaded into the bins either before or after mounting of the bins on the frame **10.** It will be apparent, however, that as the motor **32** is caused to step by any suitable conventional means, the sprockets **82** and rollers **80** will be caused to rotate simultaneously and in synchronism to remove a sheet of paper from the bottom of each sheet stack in the respective lines and force it outwardly through the narrow paper feed slots **54, 56** for collation. As illustrated in FIG. **6** each separator tab **50, 52** may be provided with a depending high friction flexible finger **88** which functions to prevent feeding of more than one sheet at a time.

As will be apparent as the paper is fed from the bottom of each bin the bins may be readily loaded by adding more paper to the top of each stack from the rear. If fewer than six pages are to be collated, the capacity of the collator may be considerably increased, for example, by removing bins **36***a*, **36***c* and **36***e*, as illustrated in FIG. **4** which represents a doubling of the capacity of the collator as respects a three-page collation to be made. If only two sheets are to be collated, all bins except for **36***c* and **36***f* may be removed, illustrated in FIG. **5,** which results in a tripling of the capacity of the collator as respects a two-page collation. If desired the various bins may be shaped and/or arranged to minimize the stack weight on the bottom sheet of each bin as is well known in the art.

It will be apparent to those skilled in the art that a number of variations and modifications may be made in this invention without departing from its spirit and scope. For example, various arrangements may be employed to removably mount the bins within the frame. Also, while a chain and sprocket drive has been described and illustrated, it would also be possible to employ alternative means, such as a belt and pulley. As used in the appended claims, the terms "sprocket" and "chain" are to be construed as including "pulley" and "belt" or the like. Accordingly, the foregoing description is to be construed as illustrative rather than limiting and the invention is limited only by the scope of the following claims.

I claim:

1. A collator which comprises: a support frame; a plurality of paper supply bins individually removably mountable in said frame; a drive shaft on each of said bins; a paper drive roller on each of said bins, mounted on said drive shaft and positioned to engage the bottom paper sheet therein; a drive sprocket on each of said drive shafts; a common drive chain carried by said frame and positioned to drivingly engage each of said drive sprockets when its related paper supply bin is mounted in said frame; and means for driving said common drive chain to substantially simultaneously actuate the paper drive rollers of all bins mounted in said frame.

2. The collator of claim **1** wherein each of said bins comprises: a bottom tray; and left and right side paper guides extending upwardly therefrom.

3. The collator of claim **2** wherein at least one of said paper guides is adjustable relative to said bottom tray.

4. the collator of claim **1** wherein said support frame comprises spaced first and second sidewalls, one of said sidewalls including a first idler sprocket positioned at the top thereof and a second idler sprocket positioned at the bottom thereof, said drive chain engaging said first and second idler sprockets and extending substantially vertically therebetween.

5. A collator which comprises: a support frame including spaced first and second sidewalls; a first idler sprocket positioned at the top of one of said sidewalls; a second idler sprocket positioned at the bottom of said one sidewall; a drive chain engaging said first and second idler sprockets; means for driving said drive chain; a plurality of paper supply bins removably mountable between said sidewalls in spaced vertical relationship; a paper drive shaft on each of said bins; a paper drive roller on each of said bins, mounted on said paper drive shaft and positioned to engage the bottom paper sheet therein and at least partially eject it therefrom; and a paper drive sprocket mounted on each said paper drive shafts and positioned to engage said drive chain upon mounting of the associated bins between said sidewalls.

6. The collator of claim **5** wherein said one sidewall defines a plurality of slots extending rearwardly from the front edge thereof, each positioned to receive the paper drive shaft of a bin mounted in said support frame; and wherein said drive chain is disposed in a substantially vertical plane.

7. The collator of claim **6** wherein each of said bins comprises: a bottom tray; and left and right side paper guides extending upwardly therefrom.

8. The collator of claim **7** wherein at least one of said paper guides is adjustable relative to said bottom tray.

9. The collator of claim **8** wherein each of said paper supply bins includes means for latching said bin between said sidewalls.

10. A collator arrangement: comprising

a frame;

a plurality of individual sheet stack containing bins each having a sheet dispensing means mounted thereon and each being adapted to dispense individual sheets from one end thereof and to be loaded with sheets from the other end thereof;

means for selectively removably mounting said bins on said frame, each bin having an increased sheet capacity when the adjacent bin is removed; and

a common drive means adapted to drive the sheet dispensing means carried by each of said bins.

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