United States Patent [19]

Blowsky

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[54] **ROTARY COLLATOR WITH SHEET CLAMPING MEANS**

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

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

[58] **Field of Search** 270/58; 271/64

[56] **References Cited**

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[57] **ABSTRACT**

A rotary collator is disclosed having a rotary drum with a plurality of radially extending partitions forming radially extending pockets against which partitions the sheets to be collated are held by clamping means. The clamping means for each pocket has operating means which opens or releases the sheet clamp prior to the position of the pocket where a sheet is to be ejected from the pocket. The clamp operating means closes the clamping means after the pocket has passed sheet ejecting position. The operating means uses a toggle structure and a relatively heavy compression spring to hold the sheets in the pile against the partition when in clamping position. This spring is operating mostly under relatively light tension so that its flexing is reduced considerably thereby and the likelihood of breaking is much reduced. Also breaking of a compression spring is much less likely because pressure is applied by flat ends of the spring abutting the parts engaged.

11 Claims, 7 Drawing Figures

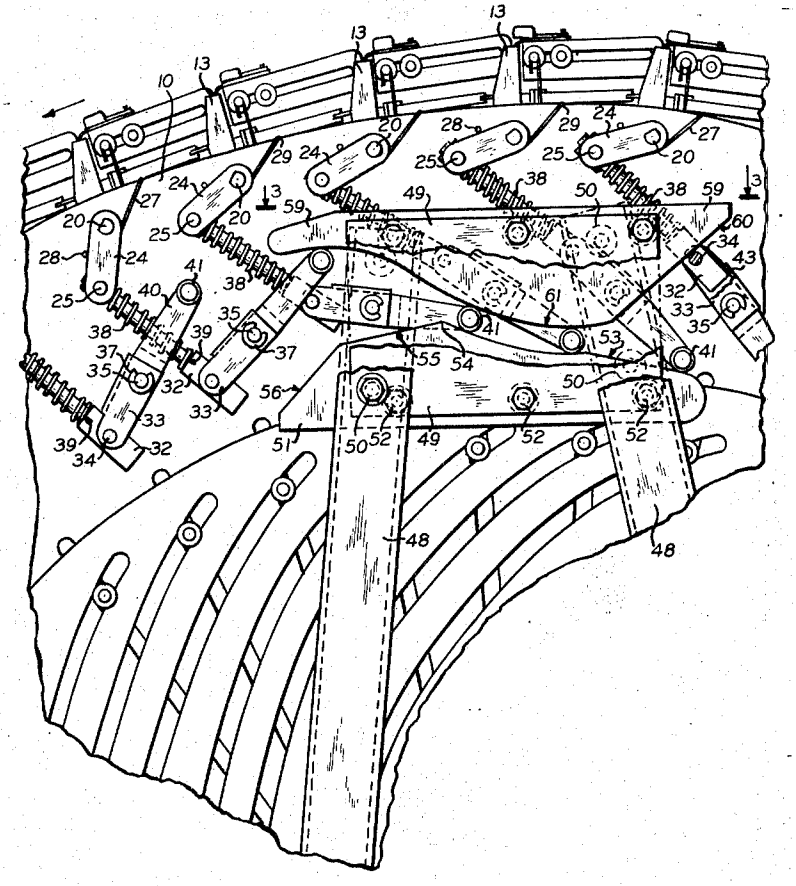


FIG. 2.

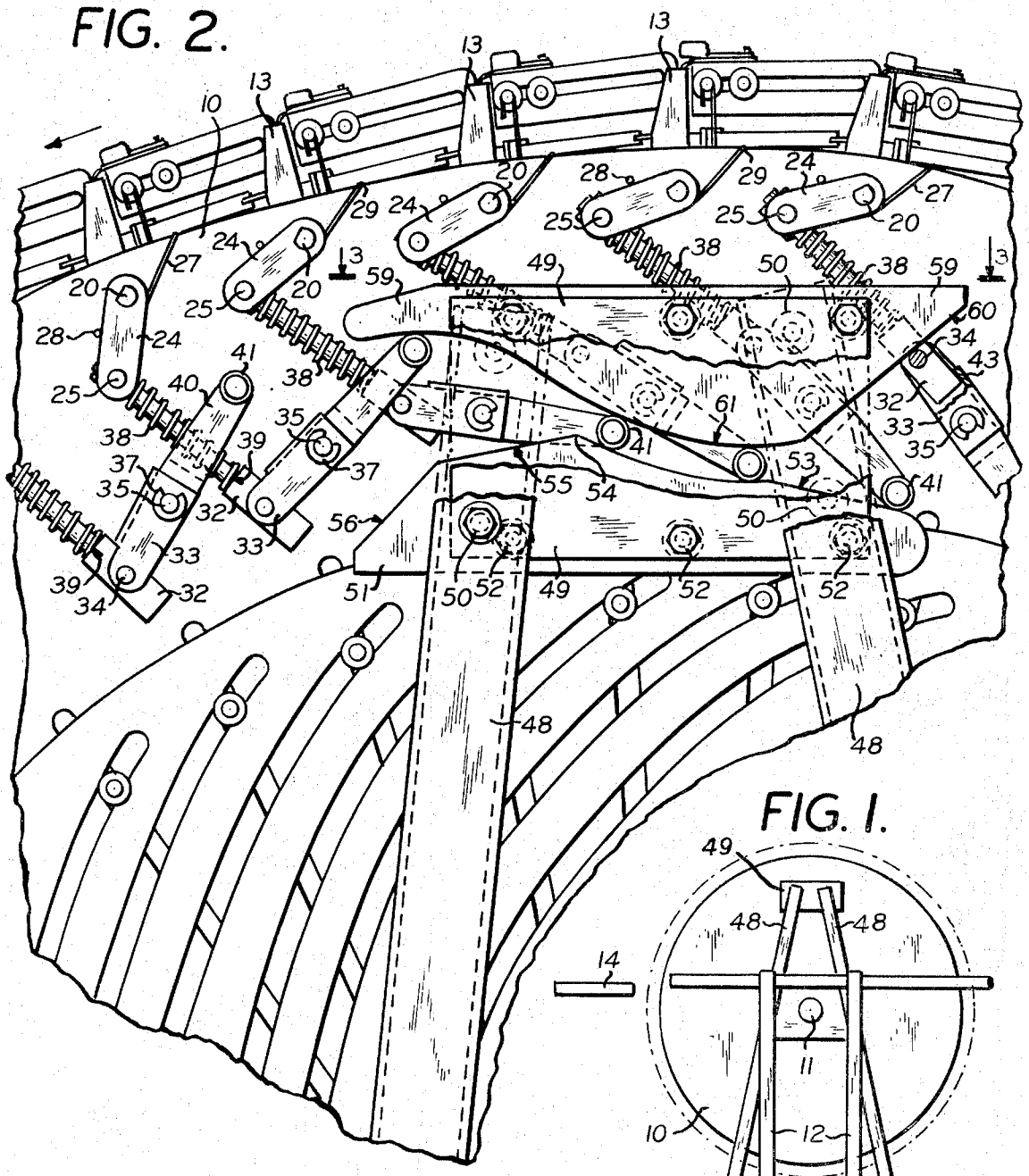


FIG. 1.

FIG. 3.

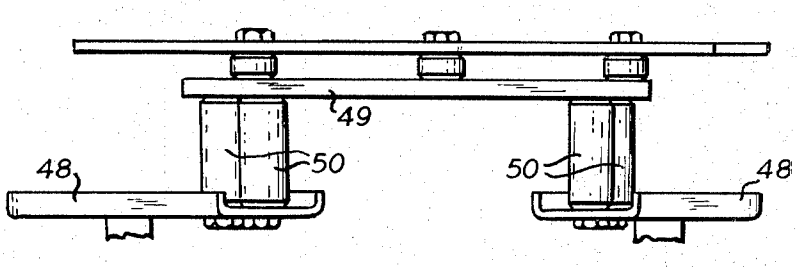


FIG. 4.

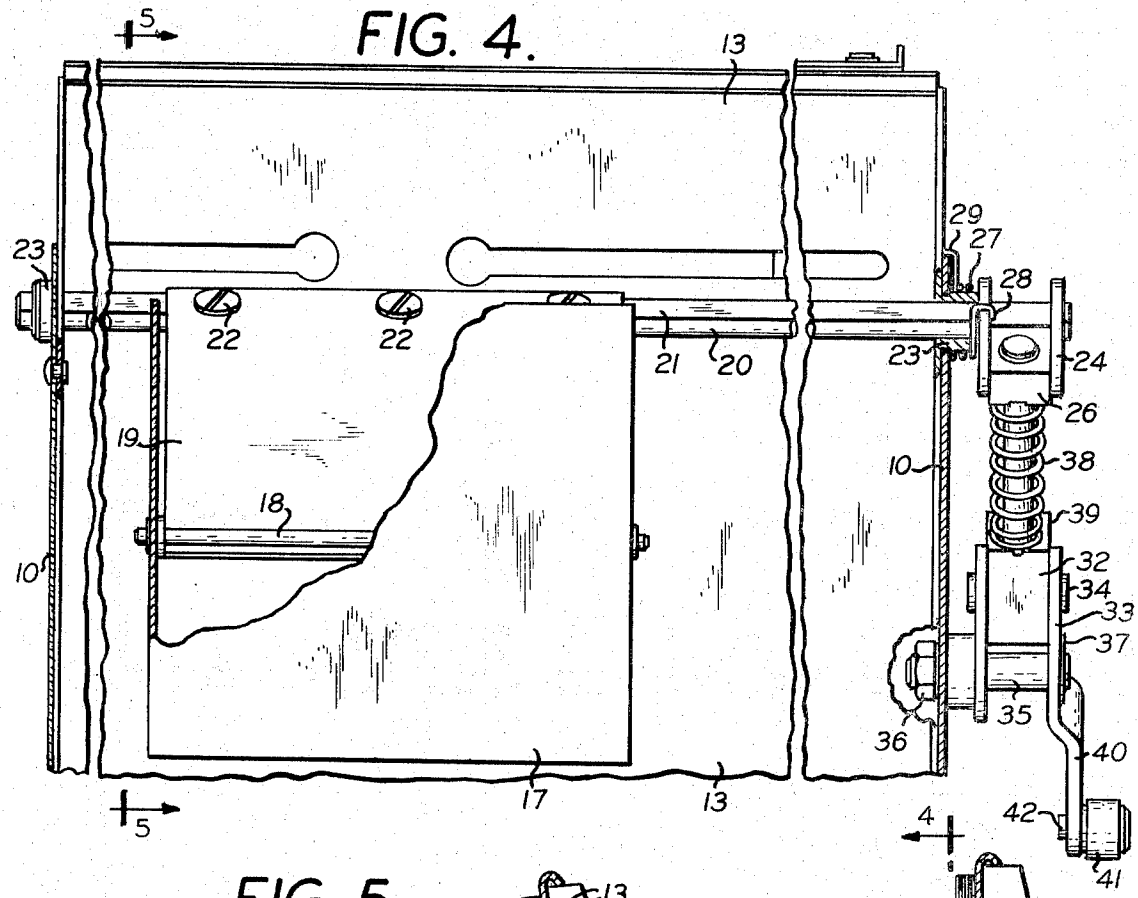

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FIG. 5.

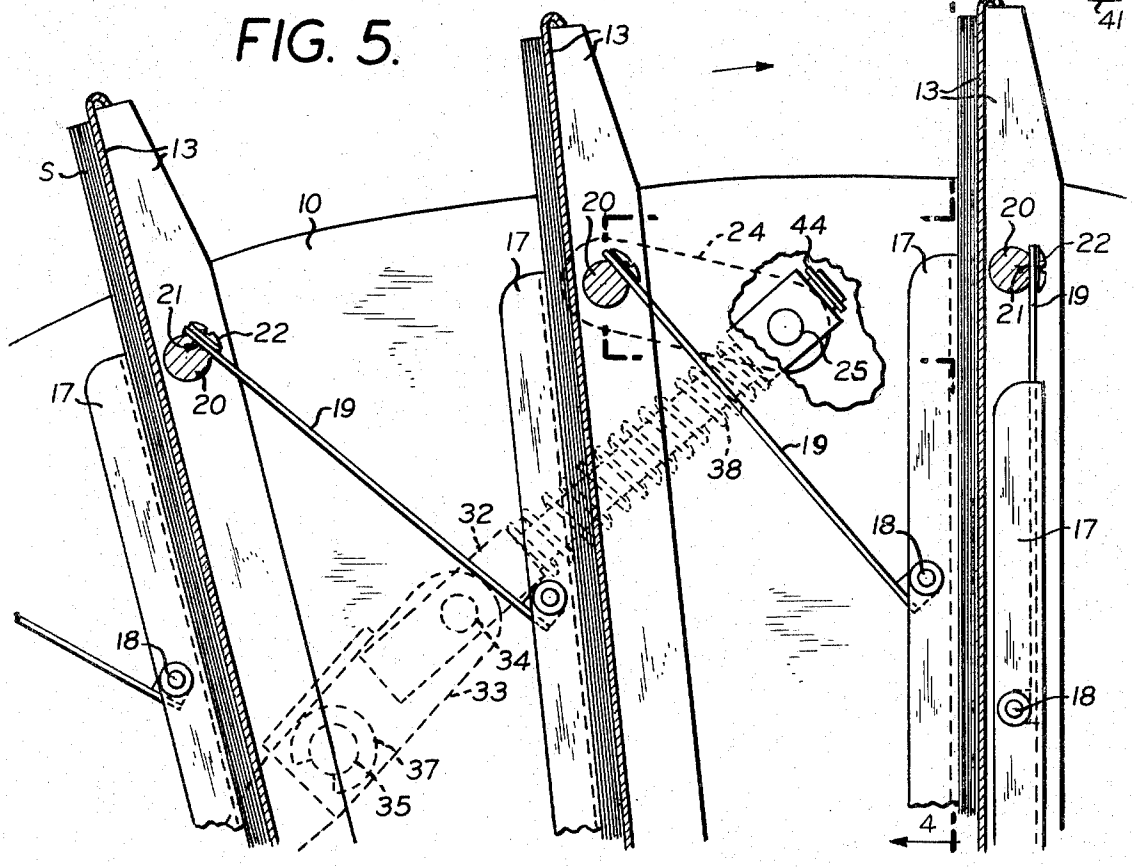
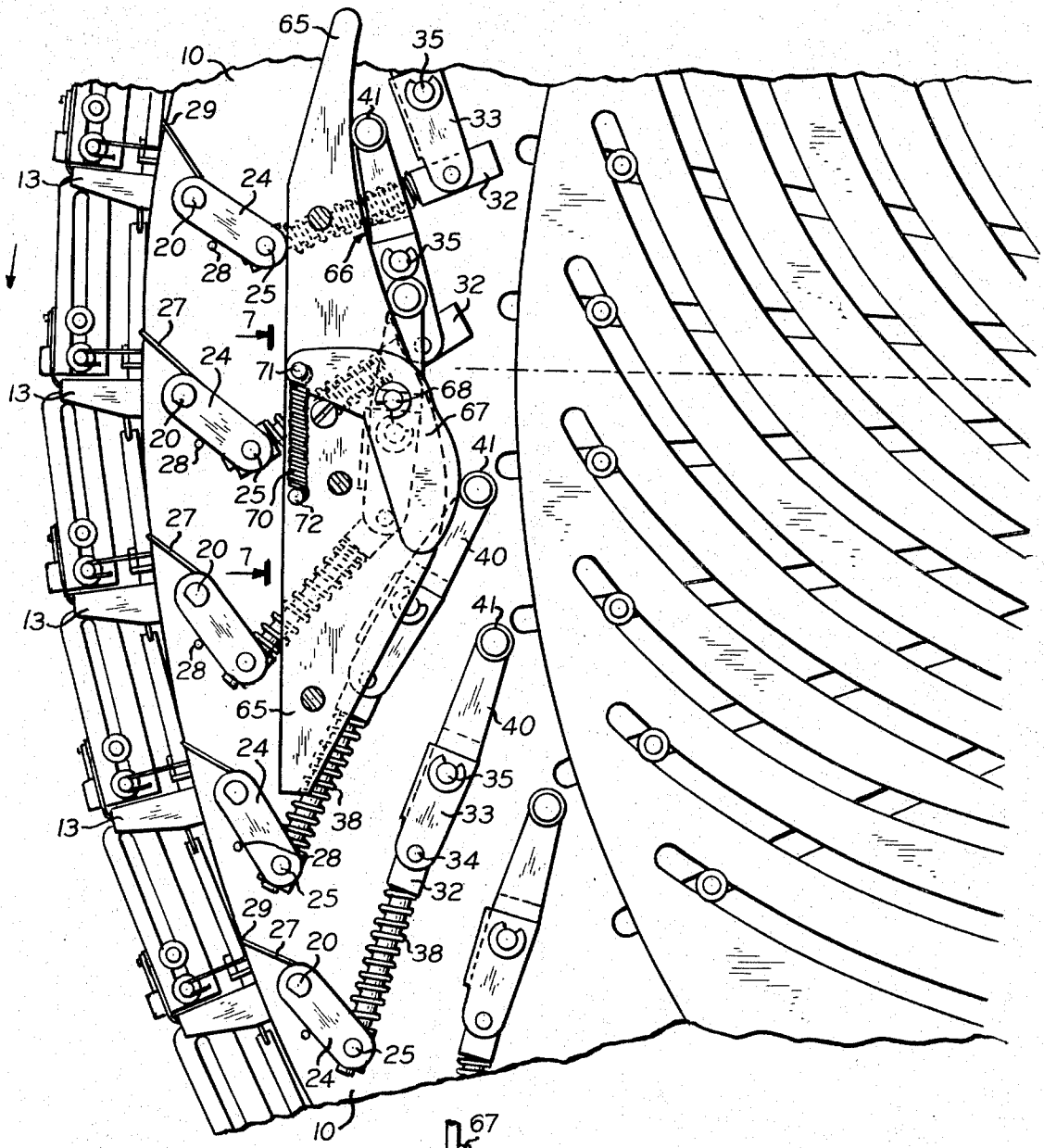

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FIG. 6.


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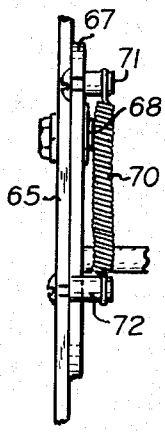

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FIG. 7.

ROTARY COLLATOR WITH SHEET CLAMPING MEANS

Rotary collators use a rotating drum with radially extending partitions which divide the drum into radially extending pockets. Sheets are placed on a plurality or all of the partitions and as the drum rotates the pile of sheets in each pocket is retained against its partition by clamping means except at ejecting position or a region thereof when the pile of sheets must be released or unclamped so that the top sheet can be withdrawn from each pocket. After each pocket passes ejecting position, the clamping means is operated to clamping position and retained in this position by the operating means which uses a toggle structure. Heretofore, the spring used to clamp the pile of sheets on the partition was an extension spring which was stretched to its maximum extension during the period when the clamp was released or opened which is a factor in the breaking of extension springs. Also the ends of such springs are attached to the clamping structure by bending each end into a hook which is a more expensive spring and the breaking usually occured at the hooked ends.

An object of the invention is to construct clamping means for a rotary collator in which the clamping means is held in closed or clamping position by toggle structure and a compression spring so that it functions in the range of no or minimum pressure or extension when the clamp is released.

Another object is to construct operating means for a clamping means in which the clamping means spring is not subject to breaking.

Another object is to construct a clamp and clamp mounting means which takes up a minimum of space in open position to allow more space for the pile of sheets and thereby enable more pockets to be included without enlarging the drum;

A still further object is to construct a clamping means for a pile of sheets in a rotary collator which applies increasing pressure on the pile of sheets when the pile has greater thickness and weight.

Other objects of the invention will be more apparent from the following description when taken in connection with the accompanying drawings illustrating a preferred embodiment thereof in which;

FIG. 1 is diagrammatic view of a rotary collator;

FIG. 2 is a partial view of a collator drum and the operating means and camming means for the clamping means;

FIG. 3 is a top view of cam means for opening the clamps as viewed from line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 5 including a section through a clamp shaft bearing;

FIG. 5 is an enlarged view of the clamp operating means in closed or clamping position;

FIG. 6 is a view of the closing cam means for the clamping means; and,

FIG. 7 is an edge view of the cam means for closing the clamping means as viewed from line 7—7 of FIG. 6.

A rotary collator includes basically a drum having spaced side plates **10** which drum is mounted for rotation on an axle or shaft **11** carried by a suitable frame **12.** The drum is divided into a plurality of pockets by a plurality of spaced radially or substantially radially extending partitions **13** which are suitably secured to the drum plates, such as by rivets or the like. Each partition forms a pocket for a pile of sheets. The top sheet

is ejected from the pile of sheets in each pocket by suitable ejecting means, not shown, and delivered to a receiving or transfer table **14** which marks the ejecting position or region for each pocket. In a rotary collator the pile of sheets pass from a position resting on its partition in generally horizontal and horizontal position as it passes through the sheet ejecting region. As the drum turns the partitions become vertical at the bottom of the drum, are upside down when the partitions are in horizontal position on the side opposite from ejecting position and then move to a vertical position at the top of the drum. Clamping means are provided to retain the pile of sheets against its partition through the major portion of the rotation of the drum except for at least the sheet ejecting region and preferably shortly thereafter as will be further described hereinafter.

The clamping means includes a clamp **17,** FIGS. **4** and **5,** which is pivotally mounted at or approximately at the center thereof by a pin **18** to a mounting means shown as a mounting plate **19.** This plate is secured to a clamp shaft **20** such as by a flat surface **21** on this shaft and screws **22.** The shaft is pivotally mounted on the drum plates by means of bushings **23** secured to the drum plates. This clamp plate mounting means and the clamp occupy a minimum of space in the pocket. A clamp arm **24,** FIG. **2,** is secured to the clamp shaft, such as by brazing, which arm has a connecting pivot **25** for pivotally mounting a slide or slide bearing **26** thereon. The clamp **17** is propelled to open position by a spiral spring **27** one end **28** of which engages the clamp arm and the other end **29** rests over the edge of the drum plate.

Operating means propels the clamp to closed or clamping position and retains the same in clamping position which means includes a toggle link **32** which is received by the slide bearing **26** and is pivotally connected to a toggle arm **33** by a connecting pivot **34.** The toggle arm is pivotally mounted on the drum on a pivot **35** which is secured to the drum plate such as by a nut **36.** A snap-on retaining washer **37** may be used to retain the toggle arm on the pivot. A clamp closing or clamping spring **38** is located between a shoulder **39** on the toggle link and an end of the slide. This mounting may be reversed namely, the slide may be on the pivot **34** and the toggle link may be carried by pivot **25.** The closing spring is a compression spring with flat ends abutting their respective surface. The toggle arm has an extension **40** which carries a cam follower **41** rotatably mounted on a pin **42** secured to the toggle arm and spaced from the pivot **35.** The spring **38** has a length such that its pressure on the clamp arm **33** ceases or is light when the toggle is fully open so that the clamp opening spring **27** is free to open the clamp to full open position without being opposed by the clamp closing spring. When the clamp is closed on a pile of sheets or against the partition, the toggle link and the toggle arm are in locked position with the pivot **34** past a line between the centers of the pivots **26** and **35.** A suitable toggle stop is provided, FIG. **2,** such as the link engaging the back **43** of the toggle arm. When a thick pile of sheets is in a pocket the compression clamp closing spring is its maximum compression and since usually the pile is half or less of capacity, this means that most of the time this spring is operating in its area of lesser or minimum compression. The clamping spring is strong enough to hold the pile of sheets against its partition in all positions of the latter. The clamp closing

spring also accomodates for the varying thickness of the pile of sheets. A spring washer **44** is received in a groove in the end of the link so as to prevent the latter from slipping through the slide. Preferably too the closing spring is long enough to have some compression in open clamp position.

Cam means, FIGS. **2** and **3,** opens the clamp and the operating means from locked position as the pocket approaches sheet ejecting position in the last quadrant of the drum rotation. This cam means is located adjacent to the top of the drum and is carried by frame members **48.** A cam mounting plate **49,** forming a part of the frame, is secured to the frame members by bolts **50.** An opening cam **51** is attached to the cam mounting plate by bolts **52.** This cam has a rising surface **53** part of which may be arcuate and which is engaged by each cam follower **41** as the drum rotates and opens the operating means toggle. This rising surface comes to a peak **54** after which the cam surface **55** drops away in a first angular portion **55** and at an increased angle for a second portion **56.** When the cam follower reaches the peak **54** the toggle link has been broken from locked position so that the compression spring takes over to continue the opening of the toggle until the spring has reached an expansion of reduced compression such that the clamp opening spring **27** takes over to open the clamp. The angle portions **55** and **56** of the opening cam is provided to cam the cam follower past the cam if the drum is reverse rotated by hand.

The clamping spring is strong enough to hold a pile of sheets against its partition consequently upon breaking of the toggle from locked position this spring would snap the operating means to open position. This could be noisy as well as putting an unnecessary strain on the parts. For this reason a restraining cam means **59** is provided adjacent to the opening cam. A sharply angled clamp closing portion **60** is provided as a first part of the cam surface so that if a clamping means is open for any reason the cam follower engages this portion and closes the clamping means. The restraining cam means then has a restraining portion **61** parallel to and spaced from the opening cam surface **50** by the diameter of the cam follower to the peak **54** after which the restraining cam surface continues gradually outwardly to restrain any rapid opening of the clamping means. Finally the restraining cam curve levels out as the clamping means approaches full open position with the compression of the closing spring **38** largely or perhaps entirely dissipated. The clamp is in full open position at least as the pocket nears ejection position. Open position is shown in FIG. **5** although actually full open is at a later position of this partition rather than when it is vertical as illustrated as will be pointed out more fully hereinafter.

After the partition or pocket has passed sheet ejecting position and a sheet has been ejected and withdrawn from the pocket, closing cam means are engaged by the cam follower to close the clamp. Preferably the clamp is closed a short distance after passing ejection position so that if the second sheet has been partially projected outwardly it can be pushed back before the clamp is fully closed. The clamp closing cam means, FIGS. **6** and **7,** is located about on a horizontal line through the center of the drum. The clamp closing cam **65** begins with a surface **66** gradually curving inwardly until the clamping means is practically closed. At this point a spring pressed cam **67** completes the closing of the cam if it has not close already and moves the toggle to locked position. Cam **67** is pivoted on the closing cam on a pivot **68** and has a curved surface **69** extending inwardly to engage the cam followers **41** and complete the closing of the toggle to locked position. Cam **67** is propelled radially inwardly by a spring **70** one end of which is fixed to a pin **71** on the cam and the other end is fixed to a pin **72.** The spring pressed cam provides assurance that the toggle is closed and a safety protection. Should the clamp be jammed for any reason the clamping spring **38** would yield and if the toggle arm should jam, the cam **67** would yield and in this manner protect the clamp and the operating means from being damaged. The closing arm surface beyond the cam **67** continues radially outwardly so that it engages the cam follower in the event that the drum is turned backward by hand.

Preferably the clamp is opened about **5** or **6** pockets before ejection position so the pockets can be loaded with sheets in this quadrant of drum rotation when the clamps are open. A sheet backstop provided in the pockets will retain the sheets undisturbed in its pocket and on its partition.

This invention is presented to fill a need for improvements in a Rotary Collator with Toggle Sheet Clamping Means. It is understood that various modifications in structure, as well as changes in mode of operation, assembly, and manner of use, may and often do occur to those skilled in the art, especially after benefitting from the teachings of an invention. This disclosure illustrates the preferred means of embodying the invention in useful form.

What is claimed is:

1. A rotary collator having a sheet ejecting position comprising a frame, a drum, radially extending partitions carried by the drum forming a plurality of radially extending pockets open at the periphery, means mounting the drum for rotation, a sheet clamp for each pocket having an open position and a clamping position; mounting means for each clamp including a clamp pivot means attaching the clamp to the mounting means, a clamp shaft pivotally mounted on the drum adjacent to a partition and secured to the mounting means, and a clamp arm secured to the clamp shaft and having a connecting pivot spaced from the clamp shaft; operating means to move the clamp towards and away from clamping position including a toggle arm having a connecting pivot, a toggle arm pivot pivotally mounting the toggle arm on the drum, a toggle link pivotally attached to the connecting pivot of one arm, a slide connection slidably receiving the toggle link and carried by the connecting pivot of the other arm, opening spring means connected with the mounting means and propelling the clamp to open position, closing spring means between the toggle link and the slide connection to press the clamp to clamping position, a cam follower carried by the toggle arm, a toggle stop, and the connecting pivots being located so that the toggle arm and toggle link are in locked toggle position against the toggle stop with the clamp in clamping position; and cam means carried by the frame and engaged by each cam follower to open its clamp prior to reaching ejecting position and closing the clamp after passing ejecting position.

2. A rotary collator as in claim **1** in which the cam means includes a clamp opening cam located adjacent to the top of the drum to open each clamp several

pockets before sheet ejecting position and includes a clamp closing cam located to close each clamp after its pocket passes sheet ejecting position.

3. A rotary collator as in claim **2** in which the clamp opening has a closing portion inclined radially inwardly at the rear end thereof to engage the cam follower and close the clamp on any reverse rotation of the drum.

4. A rotary collator as in claim **1** in which the cam means includes a clamp opening cam and a restraining means spaced radially outwardly from the opening cam to gradually open the clamp against the pressure of the closing spring means.

5. A rotary collator as in claim **4** including a clamp closing portion carried by the restraining means and located ahead of the latter to close any clamp which may be open.

6. A rotary collator as in claim **1** in which the cam means includes a closing cam located to engage each cam follower with its clamp in open position and close the clamp after passing sheet ejecting position.

7. A rotary collator as in claim **6** in which the closing cam has a cam peak including a spring pressed auxiliary cam located at the closing cam peak and projecting inwardly with respect to the cam peak.

8. A rotary collator as in claim **4** in which the cam means includes a closing cam located to engage each cam follower with its clamp in open position and close the clamp after passing sheet ejecting position.

9. A rotary collator as in claim **8** in which the closing cam has a cam peak including a spring pressed auxiliary cam located at the closing cam peak and projecting inwardly with respect to the cam peak.

10. A rotary collator as in claim **9** in which the opening cam means has a closing portion inclined radially inwardly at the rear end thereof to engage the cam follower and close the clamp on any reverse rotation of the drum.

11. A rotary collator asin claim **1** in which the clamp pivot means is a pivot pin located centrally of and crosswise of the clamp and the mounting means is a mounting plate receiving said pivot pin at an end thereof.

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