

Feb. 5, 1963

R. G. LOWE ET AL
COLLATING MACHINE

3,076,647

Filed Nov. 18, 1960

7 Sheets-Sheet 1

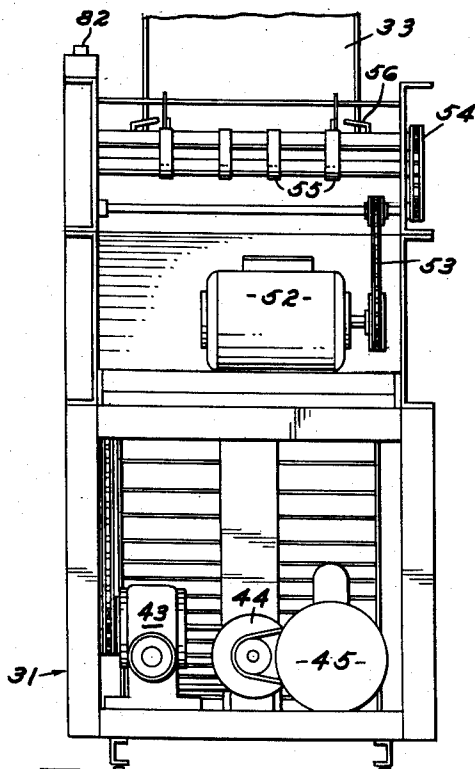
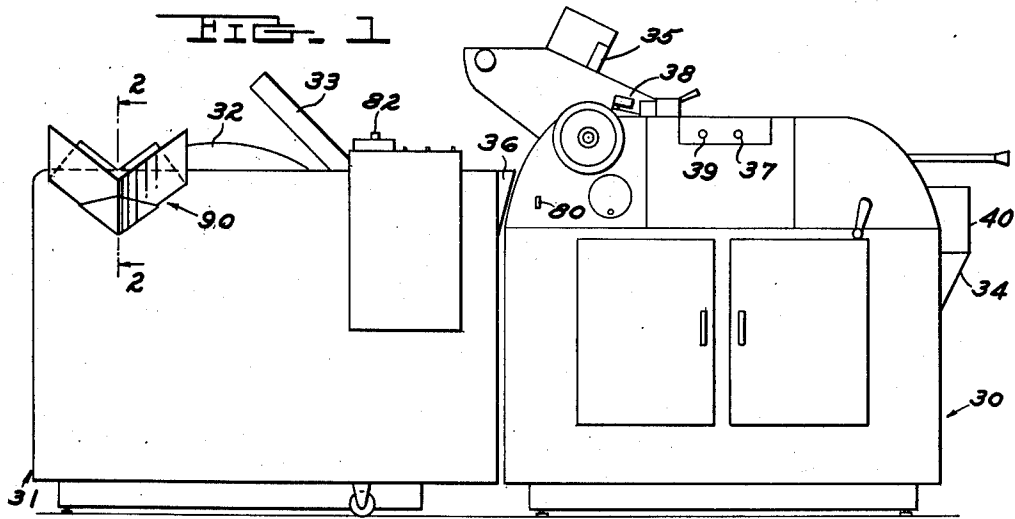


FIG. 2

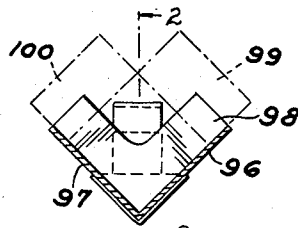
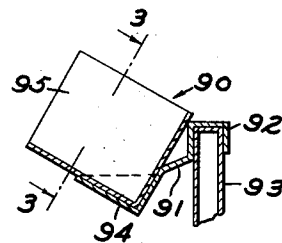


FIG. 3

FIG. 4

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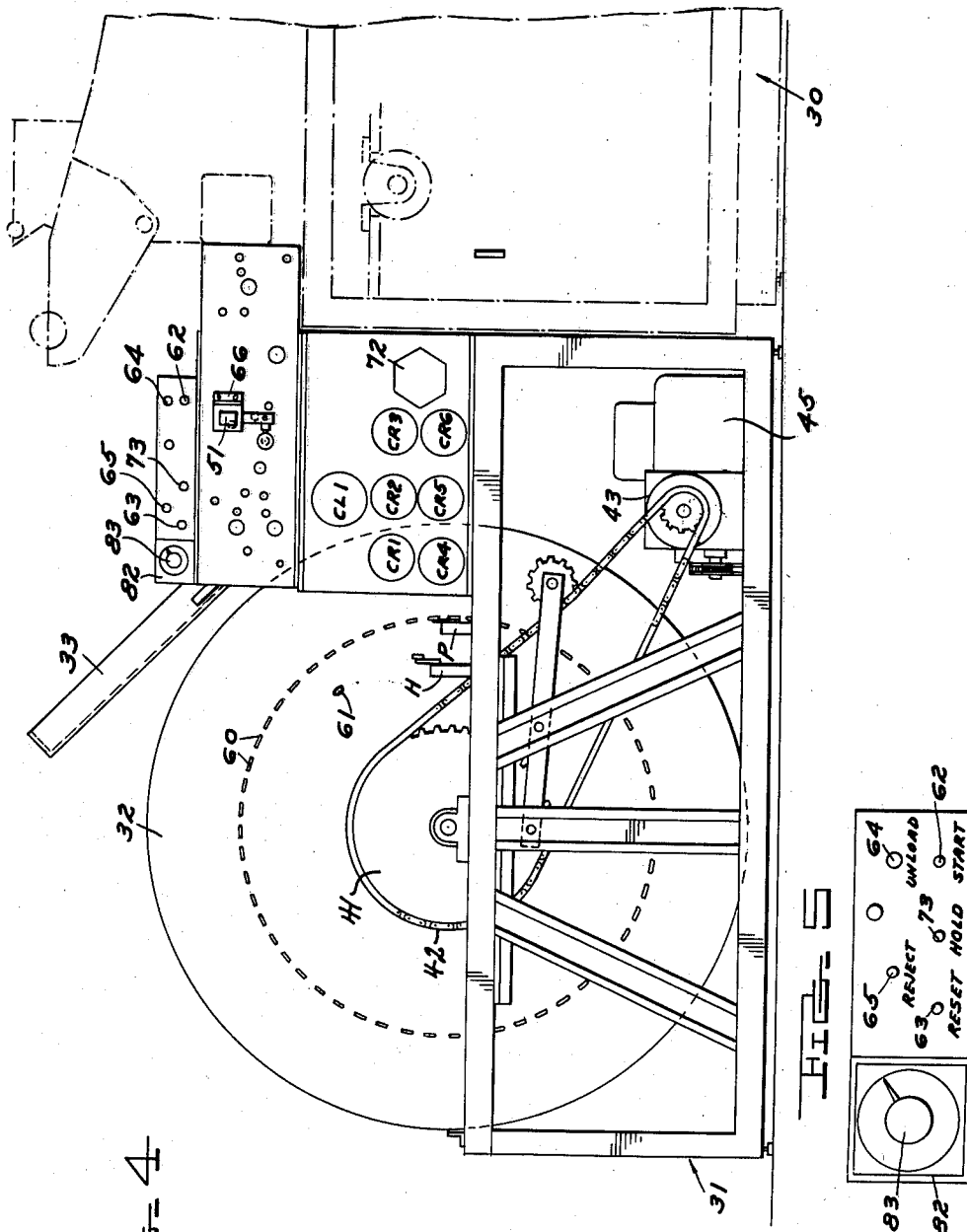
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7 Sheets-Sheet 2



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FIG. 7

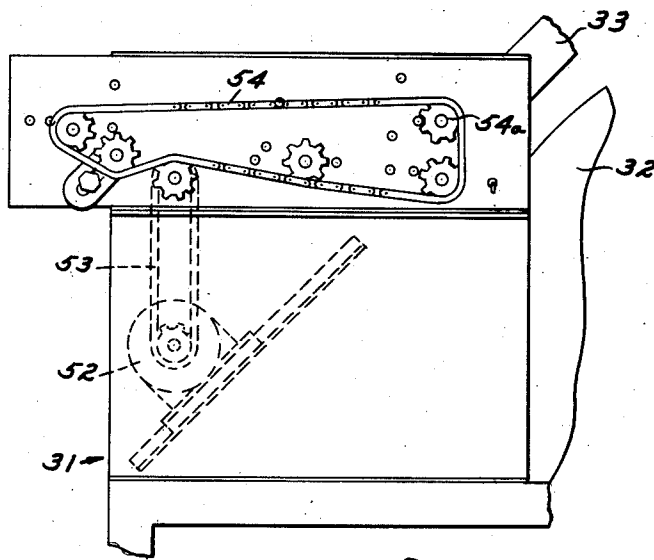


FIG. 8

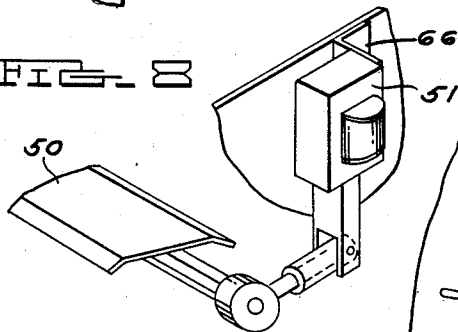
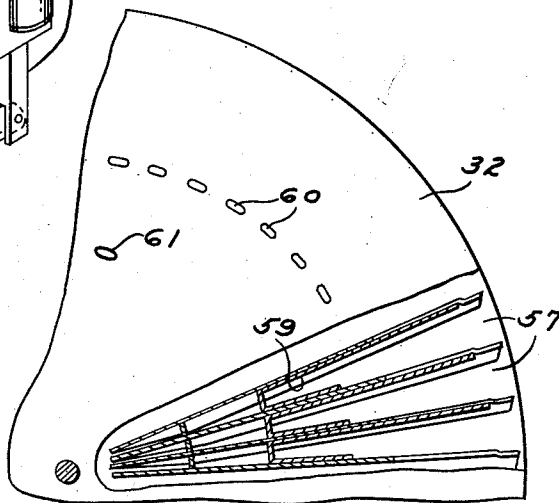


FIG. 9



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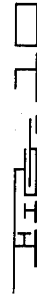
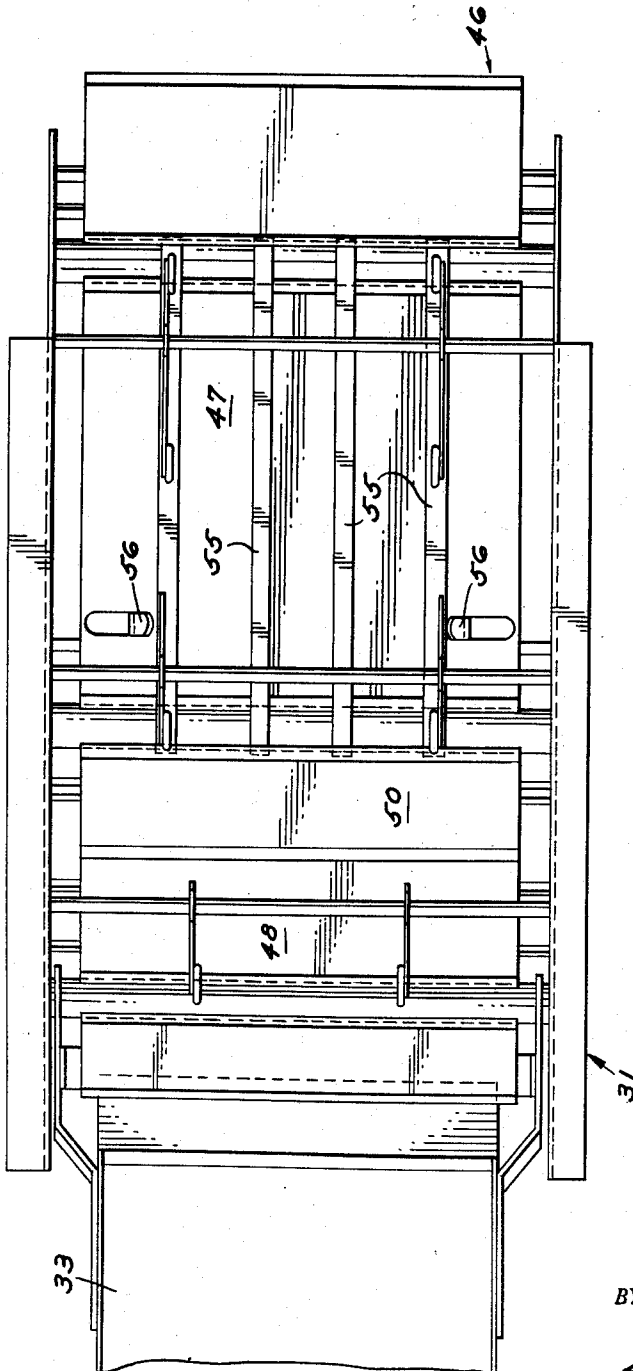
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7 Sheets-Sheet 4



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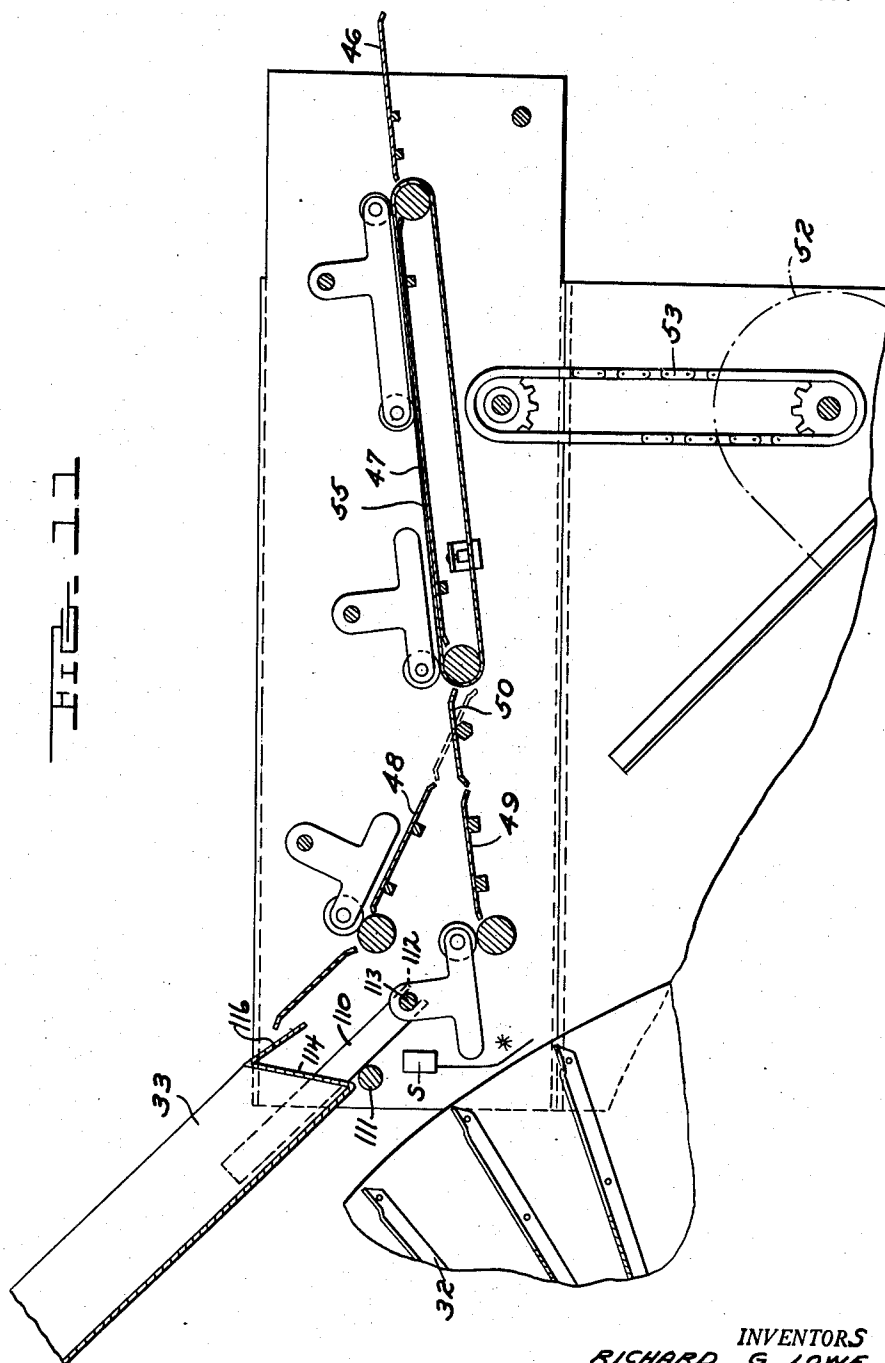
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COLLATING MACHINE

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7 Sheets-Sheet 5



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COLLATING MACHINE

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FIG. 13

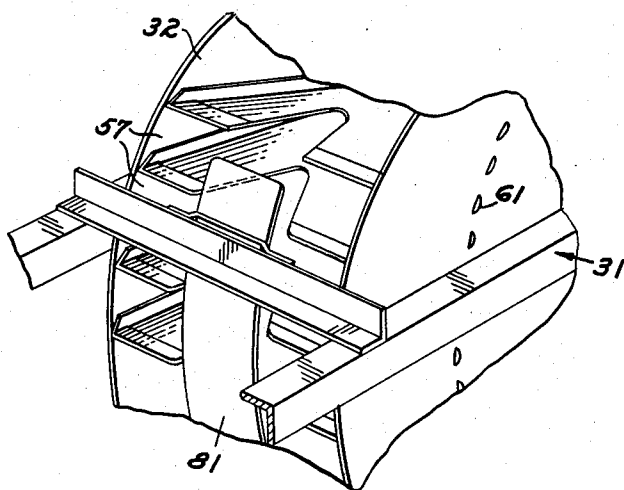
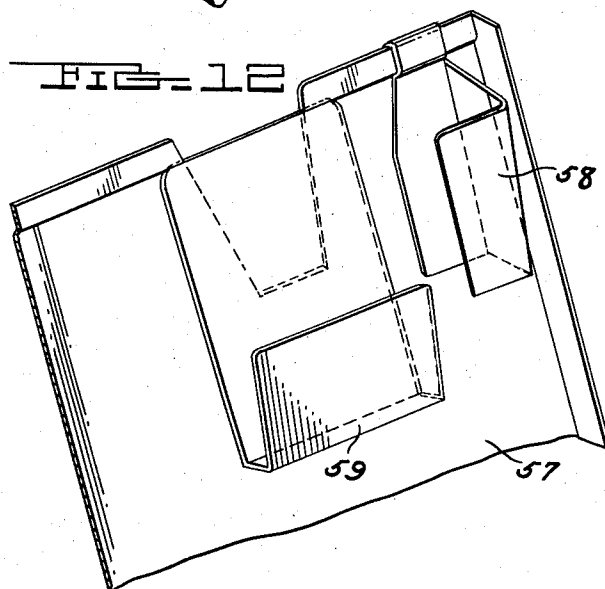


FIG. 12



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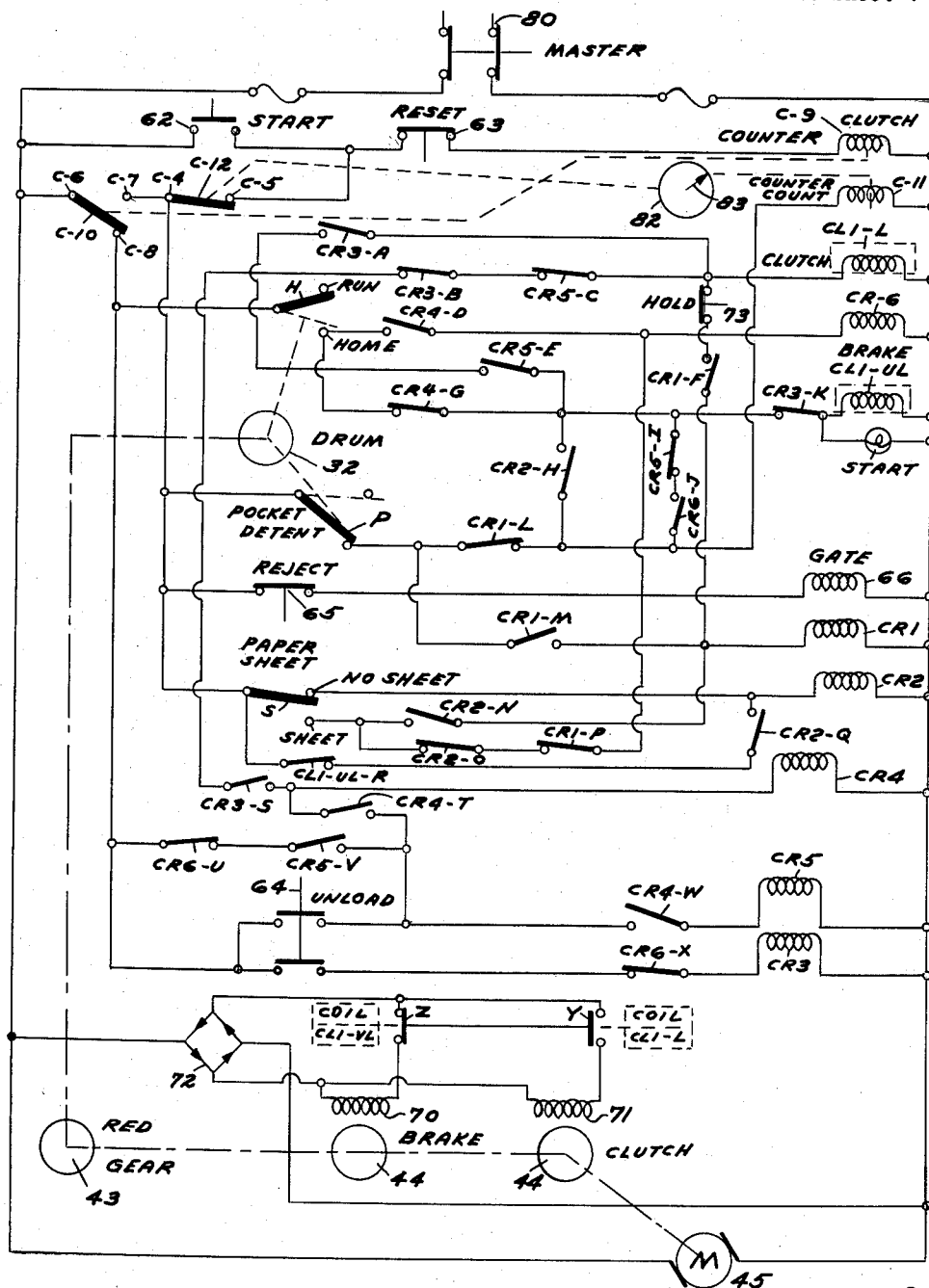


FIG. 14

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3,076,647

COLLATING MACHINE

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Filed Nov. 18, 1960, Ser. No. 70,212
18 Claims. (Cl. 270—58)

This invention relates to paper printing and handling equipment and more particularly pertains to a novel collating or sorting machine which is easily integrated in co-operating relationship with printing machines to receive, sort, and accumulate printed paper sheets as they are ejected by the printing machine.

Printing machines and collating machines have been employed separately wherein all the sets of sheets are all first printed and stacked and then fed through the collating machine making two complete individual operations resulting in double handling and interim storage. For example, where 10 to 100 booklets of 50 to 100 pages each are to be printed and compiled using prior art devices, it is necessary first to print all the sets of sheets and then keep them in identified stacks until all sheets and stacks are printed and then to compile them into booklets, whereas with the instant invention, each sheet is automatically sorted and stored in booklet compilation as fast as printed. This eliminates all interim handling and storage due to the fact that when each sheet of each set is printed and ejected by the printing machine, it is automatically received, sorted, and stored by the collator in booklet compilation so that upon printing the last sheet of the last set, the job is completed.

With the foregoing in view, it is the primary object of the invention to provide a collating machine which easily integrates with sheet printing machines in automatic operation therewith so as to receive, sort, and store the sheets as fast as they are printed in a separate stack in separate pockets with the sheets in proper booklet sequence.

An object of the invention is to provide a collating machine having automatic operational timing and sheet counting in conjunction with the operation of the printing machine.

An object of the invention is to eliminate separate stacking or handling of the sets of printed sheets at the printing machine and to provide a collating machine to receive each sheet from the printing machine as it is printed.

An object of the invention is to provide a collating machine having a rotatable drum equipped with divided sheet storing compartments or pockets and which automatically indexes the compartment pockets as the sheets are printed so that one printed sheet of each set is inserted in each pocket.

An object of the invention is to provide a collating machine having presettable controls for counting the desired number of sheets printed and stored of each set and then to automatically return itself to the starting position for receiving the next set of printed sheets.

An object of the invention is to provide a collating machine for automatic operation in conjunction with a printing machine which is simple in design and construction, inexpensive to manufacture, easy to integrate with a printing machine and which is efficient and money saving in operation.

These and other objects of the invention will become apparent by reference to the following description of a collating or sorting machine singly and in combination with a printing machine embodying the invention taken in connection with the accompanying drawing in which:

FIG. 1 is a side-elevational view of the combined printing and collating machines.

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FIG. 2 is a cross-sectional view of the manual accumulator bin taken on the line 2—2 of FIG. 1.

FIG. 3 is a cross-sectional view of the bin taken on the line 3—3 of FIG. 2 showing cross-laid paper in dotted lines.

FIG. 4 is an enlarged side-elevational view of the collating machine seen in FIG. 1, with the cabinet panels removed indicating the associated printing machine in dotted lines and diagrammatically including electrical components showing the control panel ninety degrees out of position.

FIG. 5 is an enlarged view of the control panel portion of FIGS. 1 and 4.

FIG. 6 is an end-elevational view of the collating machine as seen from the right-hand side of FIG. 4.

FIG. 7 is a partial side-elevational view of the opposite side of the collating machine seen in FIG. 4 showing the conveyor drive elements.

FIG. 8 is a fragmentary perspective view of the conveyor gate and operating solenoid.

FIG. 9 is a fragmentary side-elevational view of the collator drum with parts broken away showing the inner pocket construction in cross-section.

FIG. 10 is an enlarged top plan partial view of the device seen in FIG. 4 showing the conveyor in more detail with the switch gate alternate position in dotted lines.

FIG. 11 is an enlarged cross-sectional view of the device seen in FIG. 10 showing the conveyor elements in more detail.

FIG. 12 is an enlarged perspective view of an individual drum pocket seen in FIGS. 9 and 13 showing the adjustable pocket construction in more detail.

FIG. 13 is a fragmentary perspective view of the collator drum showing the pockets, detents, and switch; and

FIG. 14 is the electrical system wiring diagram schematically including mechanical elements and showing some mechanical connections in dotted lines.

Referring now to the drawings wherein like designations refer to like and corresponding parts throughout the several views, the collator machine and collator-printing machine combination disclosed therein to illustrate the invention comprises a printing machine 30 which rapidly prints and ejects sheets automatically and a collating machine 31 which automatically receives and individually stores the sheets in separate pockets of the drum 32 or in the collector tray 33 as fast as they are printed and ejected.

More particularly, the printing machine may be any one of many such machines and the Addressograph-Multilith Corp. "Multilith" printing machine may be considered exemplary and is hereinafter referred to as a "printer" and comprises a sheet supply and feeding portion 34, a printing portion 35, and a sheet ejecting portion 36. The operator puts a stencil, plate, or type (not shown) to be printed on the printer 30, places the paper 40 in position, closes the printer master switch 37, sets the printer counter 38 to the desired number of sheets to be printed, and closes the print switch 39 to the printing portion 35 whereupon the printer 30 automatically prints the desired number of sheets and upon the printer counter 38 counting out, the master switch 37 is opened and/or the circuit to the printing portion 35 is broken by the counter 38, and the printing of sheets 40 is automatically terminated. The operator then changes the stencil, plates, or type for printing the next sheet and the printer is ready to print the next set of sheets when the operator closes the master switch, sets the printer counter, and closes the printer switch. A tray or station is usually provided on the printer 30 for receiving the printed sheets and, in the instant invention, this portion of the printer

is deleted and the printed sheets ejecting from the printer are picked up by the collator as hereinafter described.

The collating or sorting machine 31, hereinafter referred to as the "collator" has a frame rotatably supporting the drum 32 which is rotated by the sprocket gear 41 secured to the drum 32 driven by the chain 42, reduction gears 43, brake-clutch drum-drive electric control device 44, and motor 45 which is wired in the printer master circuit in parallel so that when the printer master switch is closed, the collator master circuit is energized with the collator drum drive motor 45 running but not driving the drum 32 as the normal condition of the drum-drive control device 44 is clutch-disengaged and brake-set as hereinafter set forth.

A conveyor 46 on the collator 31 has a single receiving portion 47 for receiving the printed sheets from the printer and a dual delivery portion with top-delivery portion 48 leading to the collector tray 33 and bottom delivery portion 49 leading to the drum 32 with the dual delivery portion being separated from the single receiving portion 47 by a switch gate 50 located at the end of the conveyor receiving portion 47 with the gate being mechanically open to the collector tray 33 and normally mechanically closed to the drum 32 via spring bias.

The position of the gate 50 is reversed when the gate solenoid 51 is energized directing sheet delivery to the drum 32. The conveyor 46 is driven by the conveyor motor 52 via drive chain 53 and inter-connector chain 54 which drives the sprocket gears 54a fixed on the conveyor rollers, which in turn, drive the paper sheet engaging tapes 55 on the receiving portion and similar means, not shown, on the top delivery portion 48 to the tray and bottom delivery portion 49 to the drum; adjustable guides 56 are provided to center various sizes of paper on the conveyor. The conveyor drive motor 52 preferably is wired in parallel with the printer print switch 39 so that it runs when the printer is printing and ejecting sheets; this enables the operator to run the printer 30 without running the collator 31; and since the conveyor gate 50 is normally open to the collector tray 33, the printed sheets 40 are collected and held therein via the conveyor 46. Thus, not only does the circuit to the collator conveyor motor 52 insure its running to receive sheets from the printer 30, but it also enables use of the printer without the collator; further, it enables the operator to shut off the conveyor 46 and the printer 30 when only the collator 31 is being used such as when the drum 32 pockets have the desired amount of sheets 40 and the collator drum 32 is being indexed around as hereinafter more fully described to unload the sorted and compiled sheets from the drum. With this conveyor 46 arrangement, the extra printed sheets 40 can be obtained as desired by setting the printer counter 38 higher than the collator counter; thus, when the collator counter counts out, the additional printed sheets are sent to the collector tray 33 enabling the operator to accumulate surplus or extra printed sheets 40 from the same stencil or type presently on the printer 30.

The drum 32 as shown has fifty individual pockets 57 but may have any multiple of pockets and these may be equipped with adjustable sides 58 and a removable false bottom 59 for accommodating various size sheets of paper. The drum pockets are numbered such as 1 to 50 and when the number one pocket is at the conveyor bottom delivery portion 49, the drum 32 is considered in the "Home" position which is the starting position for setting the collator counter. The drum 32 has a home position detent 61 and pockets detents 60 at each pocket 57 which operate the home and pocket switches respectively as hereinafter more fully described.

The drum pockets 57 are radially disposed about the drum 32 rotational axis so that each pocket 57 axially aligns itself with the conveyor delivery. Gravity holds the sheets 40 in the upper portion of the drum and the arcuate strap 81 holds the paper sheets 40 in the drum 32

in the bottom portion of the drum; the rotational direction of the drum is upwardly at the gate 50 so that the top part of each pocket is clear to receive the next sheet from the conveyor 46.

The collator counter 82 has a clutch coil C-9 operating the two position switch C-10 and a count coil C-11 operating the indicator 83 which, in turn operates normally closed switch C-12 to open momentarily as the counter indicator 83 reaches zero; the count coil C-11 when energized sets up the mechanism to move the counter indicator 83 down one increment upon de-energizing. The indicator is set to the desired number of sheets to be placed in sequential pockets in the drum and the indicator counts down one at a time from the number set to zero as sheets are delivered into drum pockets, and as the drum advances the next pocket.

The drum home switch H moves between the "run" and the "home" positions and is actuated by the drum home detent 61 after the drum 32 moves 360 degrees to the home position again; when the home detent 61 is not at the home position, the home switch H is in the "run" position. The drum 32 is home when the number one pocket is at the sheet receiving position at the conveyor gate 50.

The drum pocket switch P moves between the closed position with the drum 32 standing with a pocket 57 in the paper receiving location and a "null" position in which the drum 32 rotates. When the next pocket 57 comes to the paper receiving location and switch P is closed by a detent 60 on the drum at each pocket and the drum stops in the paper receiving location. When the pocket switch P makes the circuit the counter 82 count coil C-11 is energized and when this circuit breaks one count is counted down by the counter indicator 83 by the coil releasing the spring pressed count mechanism.

The sheet switch S is disposed between the conveyor lower delivery portion 49 and the drum pocket 57 at the receiving location and has a normally closed "no sheet present" position and the normally open "sheet present position"; when a sheet 40 is delivered by the conveyor to the drum pocket 57, the switch S is actuated by the paper 40 from the "no sheet position" to the "sheet position"; after the paper has passed into the drum pocket, the switch S returns to its normal position.

There is one latching relay CL1 having a normally closed selector switch Z to the drum drive control device 44 brake coil 70 and a normally open selector switch Y to the drum drive control device 44 clutch coil 71 and these switches Y and Z are so integrated in the device that one or the other is closed actuating the drive brake coil 70 or the drive clutch coil 71 so that, at any one time, either the clutch or brake is energized and one goes off when the other goes on automatically. It is here considered normal for selector switch Z to be closed setting the brake and selector switch Y to be open disengaging the clutch in the control device 44 and these switches are operated by opposed coils CL1-L and CL1-UL.

Coil CL1-L of latch relay CL1 when energized opens selector switch Z to the drum drive brake coil 70 and closes selector switch Y to the drum drive clutch coil 71 and these switches will so remain until the opposite coil CL1-UL of latch relay CL1 is energized; when coil CL1-UL is energized selector switch Y to the drum drive clutch coil 71 opens and selector switch Z to the drum drive brake coil 70 closes and this condition obtains until the opposite coil CL1-L is energized again as stated.

The six control relays are numerically designated CR1 through CR6 and each relay has multiple normally-open and multiple normally closed selector switches when their coils are not energized, and when the coils are energized, the selector switches change to the opposite position of open or closed as the case may be. Their actuating coils are shown on the right hand side of the wiring diagram and their selector switches are disposed throughout the diagram to simplify the wiring. The selector switches are

alphabetically designated A through X with a prefix designating the operating relay and the relay coils are considered normally not energized.

A normally open start switch 62 and a normally closed re-set switch 63 are in series with the counter 82 clutch coil C-9 so that when the start switch 62 is closed counter coil C-9 is energized moving counter switch C-10 off pole C-8 and on pole C-7 closing a shunt circuit around the start switch 62 through normally closed reset switch 63 and through normally closed counter switch C-13 locking in the counter clutch coil C-9. Upon the counter 82 counting out to zero, switch C-13 is momentarily operated by the counter indicator 83 breaking the shunt circuit de-energizing counter clutch coil C-9 permitting counter switch C-10 to move off counter pole 7 and contact counter pole 8. Counter pole 8 is in series with the collator home switch H circuit and also in series with the drum unloading switch 64 whereas counter pole 7 is in series circuit with the drum pocket switch P, the sheet switch S, and the manually operated normally closed reject switch 65 to the gate solenoid coil 66 which is energized when the start switch 62 is closed to swing the conveyor gate 50 to the bottom delivery portion 49 to the drum 32; pressing the reject switch button opens the reject switch 65 breaking the circuit to the gate solenoid coil 66 allowing the gate 50 to move via spring bias to its normal position directing sheets to the conveyor upper delivery portion 48 to the collector tray.

In loading the collator drum automatically with printed sheets only control relays CR1 and CR2 are used, whereas, in unloading the drum control relays CR3 through CR6 are also used.

The drum drive control device 44 brake coil 70 and the drum drive control device 44 clutch coil 71 are shown in a direct current circuit as developed by the full wave rectifier 72 but the drum drive circuit may be operated by alternating current or otherwise, if desired.

After previous collator use and unloading, the collator drum 32 is usually not in the proper position to start receiving sheets 40 from the printer 30 and the collator circuit is integrated so that upon closing the master switch 80, with the counter 82 at zero, the drum 32 will automatically be rotated to the home position as counter 82 switch C-10 feeds current to counter pole C-8 to the home switch S in the "run" position which energizes latch relay coil CL1-L opening selector switch Z to the drum drive brake coil 70 and closing selector switch Y to the drum drive clutch coil 71 and this condition obtains until the drum home detent 61 moves the home switch H from the "run" position to the "home" position de-energizing latch relay coil CL1-L opening selector switch Y to the drum drive clutch coil 71 and energizing latch relay coil CL1-UL closing selector switch Z to the drum drive brake coil 70. This automatically conditions the collator for operation with the printer with the collator counter at zero and the drum 32 at the "home" position.

It is important to remember that this hook-up is not only effective after previous use and after unloading but it is also effective every time the collator counter 82 counts to zero as movement of the counter indicator 83 to zero momentarily opens counter switch C-12 breaking the shunt circuit to the counter clutch coil C-9 permitting counter switch C-10 to move to normal contact with counter pole C-8 leading to the home switch H common side. This transfers power from the pocket switch P and sheet switch S deactivating their circuits and as the home switch H is in the "Run" position, it keeps the drum turning through latch relay coil CL1-L to selector switch Y to the drum drive clutch 71 and upon the drum arriving at the home position the home detent 61 thereon moves the home switch H from the "Run" to the "Home" position cutting power from the drum drive clutch 71 and throwing power to the drum drive brake 70 via selector switch Z and latch relay coil CL1-UL. This stops the drum at home automatically every time the collator

counter counts out so that the drum is automatically properly positioned each time. The utility of this operation can be better understood by the realization that the collator is usually used at less than its full capacity of pockets requiring that the last unused pockets be skipped.

For example, in a fifty-pocket drum, sheet assemblies of less than fifty are more usually compiled than the full capacity. This suits the device to the actual needs of the job, insures accurate sheet compilation, and eliminates manual run-out of unused pockets. It is also important to note that upon closing the master switch the drum automatically homes prior to pressing the start button as the drum homing circuit is energized with the counter switch C-10 normally contacting counter pole C-8 leading to the home switch H.

Readying for Operation

As previously indicated, the printer 30 is set for operation when the proper stencil or type is installed, a supply of paper 40 in station 34, the printer counter 38 set to the desired number of sheets to be printed such as 60, and the printer master switch 37 closed powering the printer and the collator conveyor 46; the printer 30 is now ready to print and the collator conveyor ready to deliver upon the printer "print" switch 39 being closed.

Preferably the collator master circuit is wired in parallel with the printer master switch 37 thereby eliminating the necessity for a collator master switch 80 which has been shown and described for purposes of illustration.

Thus with the collator master circuit wired in parallel with the printer master circuit, immediately upon closing the printer master switch 37, both machines are ready to operate as the drum immediately "homes," the collator conveyor motor 52 is running, and the collator drum drive motor 45 is running as is the printer drive motor, not shown.

With the drum at "home" and the machine powered, the operator sets the collator counter 82 to the number of sheets to be collated into drum 32 pockets 57, such as 40 sheets, and presses the start switch 62 button with the drum at home which causes the collator counter 82 to lock itself in dis-connecting the home switch H and connecting in the pocket switch P and the sheet switch S. This sets the collator 31 for action with the printer 30 with collator counter coil C-11 energized through pocket switch P, with control relay CR2 energized through sheet switch "S" directly and also through selector switches CL1-UL-R and CR2-Q and with selector switch Z closed energizing drum drive brake coil 70. Both machines are now ready for operation with the pocket switch P on a pocket detent 60 and sheet switch S at the "no sheet" contact.

The operator now presses the "print" switch 39 button on the printer 30.

Operation

Immediately upon the operator pressing the "print" button, the printer 30 prints a sheet 40, ejects it to the collator conveyor 46, and the collator conveyor delivers the sheet through the gate 50 into the drum pocket 57 past the sheet switch "S" moving switch S from the "no sheet" position which breaks the direct circuit to CR2 coil (coil CR2 then holds on shunt circuit through selector switches CL1-UL-R and CR2-Q) and moves switch S to the "sheet" position connecting in the coil of CR1 through selector switch CR2-N, and also connecting in the coil of CL1-L through selector switches CR2-N, CR1-F, and the "hold" switch 73 whereupon CL1-L being energized selector switch Z opens to the drum drive brake coil 70 and selector switch Y closes to the drum drive clutch coil 71 and the drum 32 starts to rotate.

Immediately upon the drum rotating the pocket switch P falls off the pocket detent 60 and opens all circuits from the pocket switch P which de-energizes collator counter coil C-11 allowing spring release which moves the counter indicator 83 one increment and which de-

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energizes CR1 coil opening selector switches CR1-F and CR1-M and closing selector switches CR1-L and CR1-P.

The sheet 40 enters the drum as the drum starts to move and the sheet switch S after the sheet passes moves backs to its "no sheet position" again energizing the coil of CR2. The drum continues to move with the sheet in the pocket until the next pocket detent contacts the pocket switch P.

Immediately upon the pocket switch P riding up the next pocket detent 60, the pocket switch P closes energizing the coil of CL1-UL through selector switches CR1-L, CR2-H, and CR3-K whereupon selector switch Y opens to the drum drive clutch coil 71 and selector switch Z closes to the drum drive brake coil 71 stopping the drum 32. Concurrently, as soon as coil CL1-L is energized selector switch CL1-UL-R opens breaking the shunt circuit to CR2.

Now we see in the basic operation circuits that, when the pocket switch P is off pocket detent 60 it is completely inactive and that when it contacts a pocket detent 60 on the drum that it basically and normally stops the rotation of the drum with the next pocket at the conveyor delivery station.

Also we see that in the basic operation circuits that when the sheet switch S is actuated by a sheet passing it, that it basically and normally starts the drum rotating from the last pocket position.

Thus every time a sheet is delivered by the printer via the conveyor to a pocket the sheet switch S is activated by a delivery and causes the drum to rotate, and, upon the drum moving one pocket rotation the pocket switch P hits the next detent and stops the drum with the next pocket in position for delivery of the next printed sheet from the printer.

Every time the printer prints a sheet and the conveyor delivers it to the drum, the sheet switch S changes position momentarily while the sheet passes and this change in position starts the drum rotating and every time the drum moves, the collator counter counts one increment when the pocket switch P opens when it falls off the last pocket detent and when the pocket switch P contacts the next pocket detent it closes stopping the drum and again energizing the counter count coil C-11.

After 40 sheets have been delivered to the drum in 40 sequential pockets, the collator counter 82 counts out and as the collator counter indicator 83 moves to zero it momentarily opens counter switch C-12 de-energizing counter clutch coil C-9 letting counter switch C-10 break with pole C-7 and make with pole C-8. Upon breaking the circuit to pole C-7, the circuit to the pocket switch P, sheet switch S, and conveyor gate solenoid coil 66 are all broken so that the gate 50 in the conveyor closes to the drum and directs the next printed sheet 40 from the printer 30 to the collector tray 33 and upon the printer counter 38 counting out, the "print" switch 39 is opened and further printing stops. Upon collator counter 82 switch C-10 making with pole 8, the home switch H is energized in the "Run" position sending current to CL1-L which opens selector switch Z to the drum drive brake coil 70 and closes selector switch Y to the drum drive clutch coil 71 which drives the drum to the "home" position where the "home" detent moves switch H to the "home" position cutting power to CL1-L and connecting power to CL1-UL which opens selector switch Y to the drum drive clutch coil 71 and closes switch Z to the drum drive brake coil 70 stopping the drum in the home position.

The operator now quickly changes the stencil on the printer, sets the counters on the printer and the collator, and pushes the print button on the printer. The operation previously described again occurs. Assuming that a 75 sheet booklet is being run off, the operator will change the stencil, set the counters, and push the print button 75 times whereupon he will have 75 different sheets in each of 40 drum pockets as he has had the

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collator counter set at 40 each time. He will also have all the overrun extra sheets in the collector tray for each particular time he has set the printer counter higher than the collator counter. If the operator sets the printer counter at 60 every time, he will have 20 extra printed copies of each sheet printed in the collector tray. Conversely, if he sets both the printer counter and the collator counter at the same number, there will be no extra sheets in the tray.

The operator removes the collector tray 33 from the collator 31 and removes the collected sheets 40 from the drum 32 manually by pressing the unload switch 64 to bring the loaded drum pockets to the top of the machine so that the sheets 40 can be lifted out of the pockets 57.

Unloading the Drum

Bearing in mind that we have power to the common side of the home switch H as well as the unload switch 64 with the collator counter 82 at zero, we now proceed to unload the drum 32 by operating the double-pole double-throw unload switch 64. This sends current to the coil of CR-3 through selector switch CR6-X. With the coil of CR-3 energized selector switches CR3-A and CR3-S are closed and selector switches CR3-B and CR3-K are opened. With the opening of selector switch CR3-K power is removed from latching relay coil CL1(UL) and with the closing of selector switch CR3-A power is applied to latching relay coil CL1(L). This power transfer closes selector switch Y and opens Z causing the drum 32 to move.

With sufficient movement of the drum 32 to cause the home switch H to roll off the home detent 61, the home switch H closes in the "Run" position energizing CR-4 coil through the now closed selector switch CR3-S.

When the coil of CR-4 is energized selector switches CR4-D, and T, and CR4-W are closed and selector switch CR4-G is opened. With the closure of selector switches CR4-T and CR4-W the coil of CR-5 is energized closing selector switch CR5-V and sealing in both CR-4 and CR-5 coils through selector switches CR4-T, CR6-U, CR5-V, and CR4-W.

At any point during the unload cycle the movement of the drum 32 may be stopped by releasing the Unload switch 64 push button which opens the circuit and allows the coil of CR-3 to fall out opening selector switches CR3-A and CR3-S and closing selector switch CR3-K. With this, power is released from CL1-(L) coil and applied to CL1-(UL) coil through selector switch CR3-K and the now sealed in selector switch CR5-E stopping the drum 32.

Pressing the "Unload" button again, reverses the action as described in the preceding paragraph and the drum 32 revolves until the home switch H rides up on the home detent. When this happens current flows through the sealed selector switch CR4-D and energizes the coil of CR-6. When CR-6 is energized selector switches CR6-U and CR6-X are opened which allows the coil of CR-3 to drop out. Relay coils CR-4 and CR-5 would also fall out except that they are held in through the second set of circuits including selector switches CR4-T and CR4-W. With the selector switches in this position selector switch CR-3A also opens when the coil of CR-3 drops out removing power from CL1-(L) coil and power is applied from the common side on the home switch H through selector switches CR5-E and CR3-K to the coil of CL1-(UL) releasing the drum drive clutch and applying the brake to the drum drive stopping the drum.

Releasing the unload switch 64 push button allows the coils of CR-4, CR-5, and CR-6 to drop out and prepares the circuit for another unload cycle or pressure on the "Start" button. Obviously the operator removes the sets of collated sheets from the drum pockets as they come over the top position and the usual operation is to press the "unload" button until several pockets are on

top; then release the button and remove the sheets from the drum. This operation is repeated until the drum is completely unloaded.

Special Circumstance Controls

Any time the manually operated reset switch 63 push button is momentarily pressed both the direct and shunt circuits to the counter 82 clutch coil C-9 are broken de-energizing counter clutch coil C-9 which permits counter switch C-10 to disengage counter pole C-7 to the collator operation circuits, and to engage counter pole C-8 to the home switch H whereupon the drum 32 normally is rotated to the home position. Thus the reset switch permits complete interruption and resetting.

Pressing the hold switch 73 push button opens the hold switch 73 and interrupts current to latch relay coil CL1-(L) and will continue to do so as long as held. When hold switch 73 is released the drum moves to the next pocket and stops.

In the event the sheet switch S is held in the "sheet present" position by a paper jam, selector switch CR2-O will close with the opening of selector switch CL1-UL-R and selector switch CR1-P will close when the pocket switch P rolls off the pocket detent 60 and the coil of CR2 is cut out as both circuits to CR2 coil are interrupted. With CR2 coil de-energized selector switches CR2-H, CR2-N, and CR2-Q are open and CR2-O is closed and since selector switch CR2-H is open latch relay CL1-UL coil is interrupted from power through selector switch CR2-H. However, with selector switches CR2-O and CR1-P closed there is a complete circuit to the coil of CR6 closing selector switch CR6-J and allowing pocket switch P to energize the coil of CL1-UL when the pocket switch P reaches the next drum pocket detent 60 through selector switches CR5-I, CR6-J, CR3-K, and CR1-L causing the drum 32 to stop. The drum will remain stopped until the paper jam is removed from under the sheet switch S.

Manual pressure on the reject switch 65 push button opens reject switch 65 de-energizing the conveyor 46 gate 50 solenoid 66 which permits the gate 50 under spring bias to move to its normal position of directing sheets from the conveyor receiving portion 47 to the upper conveyor delivery portion 48 leading to the collector tray 33; this closes off delivery of sheets to the drum 32.

Referring to FIGS. 1, 2, and 3, the paper accumulator bin assembly 90 comprises a bracket 91 having an inverted U shaped hook portion 92 detachably gripping the collator panel 93 at one end and a bin supporting trough 94 at the other end; the bin 95 sits in the trough 94 and is easily set thereon and removed therefrom by the operator. The bin 95 comprises two sides 96 and 97 set at right angles and an interconnecting bottom 98 and since the bin 95 sits at an angle with the sides 96 and 97 slanting downwardly to the bottom 98, and, since the bottom 98 is also at an angle, the cross laid papers 99 and 100 are confined by the sides and bottom via gravity.

The bin assembly 90 is highly useful in conjunction with unloading the drum as sets of papers 99 are laid one way and sets of papers 100 are laid the other way with their edges accurately aligned by the bin sides 96 and 97 supported by the bottom 98. After a bin 95 is filled it is easily removed and replaced by a similar bin 95 and thus the operator can quickly remove sheets from the drum pockets and alternate their ends against the bin sides so that each set of sheets is readily identifiable for subsequent removal from the bin.

The collector tray 33, FIG. 11, has paired extending arms 110 abutting the collator cross rod 111 and forked ends 112 engaging the collator rod 113 demountably mounting the tray 33 on the collator for easy insertion and removal as the operator has only to lift the tray 33 endwise outwardly from the position seen to effect re-

moval and to reverse the movement to effect insertion. The tray 33 bottom end 114 between the arms 110 inwardly inclines for camming the sheets delivered thereto toward the bottom of the tray and has a flange 116 for underlying the conveyor portion 48.

With the conveyor gate 50 in the dotted line position a sheet of paper speedily travels along the conveyor 46 to the gate 50 and then upwardly over conveyor 48 from where it is projected upwardly past the tray 33 lip flange 116 whereupon it falls into the tray and settles against the bottom end 114. If the tray 33 fills with sheets, it is easily removed and supplanted with a like tray; or if desired, different sheets can be kept in different trays thereby providing temporary protective containers.

It can now be seen with the novel collator-printer combination that one operator is provided with equipment for single-handedly printing and sorting multiple multi-page booklets or brochures with the machines printing, sorting, storing, and collating automatically as fast as each sheet is printed and also that extra sheets can be printed if desired. One operator can easily supply the paper, change the stencils, set the counters, and push the switch buttons as this is all the operator has to do; the machine then automatically prints, collates, and stores extra sheets and while this is going on the operator readies the next stencil for quick change. Thus one operator can completely do a job in a short time which previously took many people a much longer time. Moreover only a small space is required for the complete job whereas formerly a large area was required.

Although but a single embodiment of the invention has been shown and described in detail, it is obvious that many changes may be made in the size, shape, detail, and arrangement of the various elements of the invention within the scope of the appended claims.

We claim:

1. A collating machine comprising a frame, a drum rotatably disposed on said frame, dividers in said drum forming individual radially disposed outwardly opening pockets in said drum, a sprocket gear on said drum, a reduction gear assembly on said frame, a chain connecting said reduction gear assembly to said sprocket gear, a drive control device including an electric brake and clutch connected to said reduction gear assembly, a motor connected to said drive control device providing power to move said drum through said drive connections; a latching relay having a double-throw switch bi-directionally moved by opposed electrical coils connected to said drive control device electric brake and electric clutch adapted to selectively energize either said brake or said clutch for moving or stopping said drum; said drum having a switch actuating raised detent at each of said pockets; a pocket switch on said frame having an arm actuated by said pocket detents to close said pocket switch; said pocket switch being open when said pocket switch arm is off said detents; said pocket switch being connected to said latching relay so that when said pocket switch is closed it energizes said latch relay to operate said double-pole double-throw switch not only to de-energize said electric clutch cutting motor drive to said drum but also to energize said electric brake to stop said drum immediately so as to accurately position said drum pocket; a conveyor on said frame adapted to deliver a sheet of paper to one said drum pocket located at said conveyor, a sheet operated two-position switch on said frame having an arm disposed in the path of paper delivery from said conveyor to said drum pocket with said arm being adapted to actuate said switch from its normal position to its actuated position; said sheet switch actuated position closing a circuit to said latch relay coil actuating said double switch cutting current to said drum drive control device brake, and energizing said clutch, thereby connecting drive to said drum, causing said drum to move said next drum pocket into sheet receiving position at said conveyor, where said pocket switch stops said drum by

being actuated by said drum detent at said next pocket.

2. A collating machine comprising a frame, a drum rotatably mounted on said frame having radially disposed pockets opening outwardly and a detent at each said pocket; a conveyor for delivering sheets to one of said drum pockets at said conveyor, means on said frame actuated by the delivery of a sheet to said drum pocket at said conveyor, and means on said frame actuated by said drum detents; means rotating said drum including an electrically energized reciprocally acting brake and clutch; said sheet actuated means upon actuation energizing said clutch connecting drive to said drum to move said drum pocket which receives the sheet away from said conveyor; said detent actuated means upon contacting a detent at said next drum pocket de-energizing said clutch and energizing said brake stopping movement of said drum with said next drum pocket at said conveyor; a counter having an indicator adapted to count sheet loaded drum pockets, and means on said counter upon counting out the desired number disconnecting said pocket switch and said sheet switch preventing further sheet delivery to drum pockets; a collector tray above said drum; said conveyor having a lower delivery portion to said drum, an upper delivery portion to said tray, a switch gate directing sheet delivery to either said upper or lower portions, and means for switching said gate; said counter actuating said gate upon counting out to switch to said upper delivery portion to said tray whereby further conveyed sheets are sent to said tray.

3. A collator comprising a rotatable drum having pockets opening radially outwardly with said pockets being numerically designated such as 1 to 50, a pocket detent on said drum at each pocket and a home detent on said drum at said number one pocket; a mechanical drive rotating said drum including a motor, a drive control device including a separately energizable electric brake and clutch; a latching relay including a double-pole double-throw switch alternately energizing either said brake or said clutch, and selectively energizable coils for throwing said switch in either clutching position to rotate said drum or braking position to stop said drum with said switch holding said positions until said other coil is energized to change its position; a pocket switch actuated by said pocket detents from a null position to close a circuit to said latching relay to throw said relay switch to energize said drive control brake to stop said drum upon said pocket switch contacting a pocket detent; a two-position sheet switch operable between a first "no sheet" position and a second "sheet position;" a first control relay energizable by said sheet switch in said second sheet position to close a selector switch (F) to said latching relay clutch coil (with said sheet switch in the sheet position) powering said circuit to actuate said clutch coil to cause said drum to move and keep moving; a conveyor for delivering a sheet into a drum pocket at said conveyor past said sheet switch to actuate said sheet switch from its first position opening the circuit to said clutch coil and moving it to its second position; said sheet switch upon a sheet passing moving back to its first no sheet position; a second control relay energized when sheet switch is in the first "no sheet" position closing a normally open selector switch (H) between said pocket switch and said latching relay brake coil whereupon said pocket switch contacting said next pocket detent it energizes said brake coil to throw said latching relay switch to brake said drum and to stay braked.

4. A printing machine which prints and ejects a multiple series of differently printed sheets and a collating machine which receives each series of sheets from the printer one sheet at a time and collates the sheets in individual pockets including a sheet from each series in each pocket comprising in combination, a source of sheet supply such as a printing machine having quickly changeable printing media facilitating short-run printing in amounts up to around one-hundred sheets, automatic

means for rapidly printing sheets, and automatic means for ejecting each printed sheet individually; a collating machine having a rotatable drum equipped with separate sheet receiving and storing pockets, a conveyor leading from the sheet ejection point at said supply source to the drum pocket sheet delivery point on said collating machine, drive means rotating said drum pockets past said conveyor, drive control brake and clutch means disposed in said drive means, brake-release and clutch-actuation sensing means triggered by delivery of a sheet by said conveyor into said drum pocket to move said sheet delivered pocket away from said conveyor, and clutch-release brake-actuation sensing means triggered by said drum moving one pocket to stop said next yet to be delivered pocket at said conveyor for the delivery of the next printed sheet.

5. In a device as set forth in claim 4, a collector tray on said collating machine above said drum; said conveyor having a sheet receiving portion, a lower drum pocket delivery portion, an upper tray delivery portion, and a switch gate disposed between said receiving portion and said delivery portions adapted to selectively direct sheets from said receiving portion to either said lower or upper delivery portions, and means for actuating said gate to the desired position.

6. In a device as set forth in claim 5, a counter on said collator adapted to count the number of pockets in said drum into which sheets have been delivered; said counter when in counting position actuating said gate actuating means to switch said gate to the lower drum pocket delivery position and actuating said gate upon counting out to the upper tray delivery position.

7. In a device as set forth in claim 5, said counter on said collator being actuated to effect one count every time said drum moves one pocket; said counter being settable to the number of sheets to be collated in a series; said counter upon counting out being adapted to automatically switch said gate from the lower conveyor delivery portion to said drum pockets to the upper tray conveyor delivery portion automatically so that the next sheets ejected by said supply source are conveyed to said collector tray.

8. A collator comprising a rotatable drum having individual numerically numbered pockets opening radially outwardly and a pocket detent at each pocket, a pocket switch actuated from a null position to a circuit closing position when contacted by a pocket detent, a circuit leading from said pocket switch, a mechanical drive moving said drum including a motor, an electric control device having a brake and a clutch, and reduction gears; a latching relay including a switch selectively connecting either said brake or said clutch in circuit, a latching coil actuating said switch to energize said clutch moving said drum, and an unlatching coil actuating said switch to energize said brake stopping said drum; said circuit leading from said pocket switch including said unlatching coil so as to operate said control device brake to stop said drum upon said pocket switch being actuated by a pocket detent; a conveyor for loading a sheet into one said drum pocket at the conveyor at the time, a two-position sheet switch normally at a first position actuated to a second position by sheet contact while being loaded into said drum pocket at said conveyor, a second circuit from said sheet switch second position including said latching relay latching coil so as to operate said drive control clutch to move said drum upon said sheet switch being actuated by loading a sheet into said drum.

9. In a device as set forth in claim 8, a normally closed selector switch (CR1-L) in said first circuit to said brake, a normally open selector switch (CR1-F), in said second circuit to said clutch, a first control relay (CR1) initially energized by said sheet switch when actuated by a sheet being loaded into one of said pockets thereby opening said normally closed selector switch (CR1-L) in said first circuit to said latch relay unlatch

coil to said brake permitting said drum to rotate to move off said detent of said loaded pocket and closing a selector switch (CR1-F) in said second circuit from said sheet switch second position to said latch relay clutch coil, a second control relay (CR2), a third circuit from said sheet switch no-sheet position to said second control relay (CR2), a shunt circuit around said sheet switch to said second control relay including a normally open selector switch (CR2-Q) closed by said second control relay when energized and also including a normally closed selector switch (CL1-UL-R) actuated to open when said latching relay brake coil is energized breaking said shunt circuit, a normally open selector switch (CR2-N) in said second circuit being closed when said second control relay (CR2) is energized and locked in by said shunt circuit sending current to said latching relay clutch coil causing said drum to move when said sheet switch moves to its said second position when actuated by a sheet delivery; a normally open selector switch CR2-H actuated by said second control relay CR2; said sheet switch upon said sheet passing moving to its closed first said position energizing said second control relay (CR2) closing said normally open selector switch (CR2-H) from said pocket switch to said brake coil and opening its second position breaking the circuit to said clutch coil and said first control relay CR1 permitting said selector switch (CR1-F) to open in the clutch coil circuit and selector switch (CR1-M) to open in the circuit from said pocket switch to said first control relay (CR1) and selector switch (CR1-L) to close in the circuit to said brake coil (CL1-UL) from said pocket switch so that upon said next pocket detent contacting said pocket switch said brake coil is energized stopping said drum.

10. In a device as set forth in claim 9, said drum pockets being numerically designated such as 1 to 50; a counter having count means actuated by said drum detents through a circuit including said pocket switch; said drum being at "home" when said number one pocket is at said conveyor; said counter being settable to the number of sheets to be inserted in drum pockets starting at home, a home detent on said drum, a home switch on said collator actuated by said home detent; said home switch when detent actuated causing said drive control means to de-clutch and to brake stopping said drum and when not detent actuated to de-brake and to clutch rotate said drum; a two-position switch on said counter selectively powering either said pocket switch or said home switch alternately, said counter when set to the desired number operating said two-position switch cutting out said home switch and connecting in said pocket switch whereupon said pocket switch when contacted by a pocket detent stops said drum at the pocket at the detent; said counter upon counting out the desired number operating said two-position switch cutting out said pocket switch and connecting in said home switch whereupon said drum rotates to the home position and stops.

11. A printing machine which prints and ejects a multiple series of differently printed sheets and a collating machine which receives each series of sheets from the printer one sheet at a time and collates the sheets in individual numbered pockets including a sheet from each series in each pocket comprising, in combination, a printing machine having quickly changeable printing media facilitating short-run printing in amounts up to around one-hundred sheets, automatic means for rapidly printing sheets, and automatic means for ejecting each printed sheet individually; a collating machine having a rotatable drum equipped with separate sheet receiving and storing pockets, a conveyor leading from the sheet ejection point at said printing machine to a drum pocket sheet delivery point on said collating machine, drive means rotating said drum pockets past said conveyor, drive control brake and clutch means disposed in said drive means, brake release and clutch actuation means triggered by delivery of a sheet by said conveyor into said drum pocket to move said sheet delivered pocket away from said con-

veyor, and clutch-release brake-actuation means triggered by said drum moving (one pocket) to stop said next (yet to be delivered) pocket at said conveyor for the delivery of the next printed sheet; a collector tray on said collating machine above said drum; said conveyor having a sheet receiving portion, a lower drum pocket delivery portion, an upper tray delivery portion, and a switch gate disposed between said receiving portion and said delivery portions adapted to direct sheets from said receiving portion to either said lower or upper delivery portions, and means for actuating said gate to the desired position; a counter having count means actuated by said drum counting said pockets when said drum rotates; said drum being at "home" when said number one pocket is at said conveyor; said counter being settable to the number of sheets to be inserted in drum pockets starting at home, a home detent on said drum; said brake actuation means including a pocket switch on said collator energizing said counter count means each time a pocket passes said pocket switch; a home position on said drum, a home switch on said collator actuated by said home position, a two-position switch on said counter selectively powering either said pocket switch or said home switch alternately; said counter upon being set to the desired number actuating said two-position counter switch cutting out said home switch and connecting in said pocket switch whereupon said pocket switch stops said drum at each pocket; said counter upon counting out the desired number of pockets actuating said two-position switch cutting out said pocket switch and connecting in said home switch whereupon said drum rotates to the home position and stops, said clutch actuation means including a sheet delivery switch actuated by a sheet being delivered to a pocket by said conveyor to actuate said clutch to rotate said drum; said counter two-position switch controlling the position of said conveyor gate.

12. A collating-printing combination comprising a printing machine having means automatically printing and ejecting sheets and a printer counter having means settable to automatically terminate sheet printing and ejecting upon reaching the desired count pre-set by the operator on said printer counter, a collating machine adjacent said printing machine having a drum, pockets in said drum for receiving and storing sheets, a collector tray above said drum for receiving and storing sheets, a conveyor on said collating machine having a receiving end at said printing machine, a lower delivery end at said drum, an upper delivery end at said tray, and a switch gate leading from said receiving end positionable to either said drum or said tray delivery ends, drive and drive control means incrementally rotating said drum past said conveyor pocket by pocket as said conveyor delivers a sheet to each pocket, a counter on said collator actuated to count sheet deliveries to drum pockets; said counter being settable to the number of pockets to receive sheets and to count as pockets receive sheets and to count out at the desired number; and means actuated by said counter controlling said conveyor gate position; said counter when set and counting positioning said gate in the drum delivery position and when counted out in the tray delivery position.

13. In a device as set forth in claim 12 means actuated by said counter counting out disconnecting said drive control incrementally rotating means and connecting drive control rotating means, and a switch in said means disconnecting said drive control rotating upon said drum rotating to position its first pocket at said conveyor drum delivery end.

14. A collating machine comprising a rotatable drum having sheet receiving and storing pockets sequentially movable past a conveyor, a conveyor adjacent said drum for traveling a sheet of paper into one said drum pocket at said conveyor, power means adapted to turn said drum so as to pass said pockets past said conveyor, a motor driving said conveyor continuously to receive paper sheets

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from a supply source such as a printing machine as fast as they are delivered; sensing actuating means including a sheet switch on said collator tripped by delivery of a sheet from said conveyor to one said drum pocket causing said power means to rotate said drum, and sensing stopping means including a detent on said drum at each said pocket and a pocket switch on said collator tripped by said drum pocket detent stopping said power means rotation of said drum with the next said pocket at said conveyor to receive delivery of the next paper sheet.

15. A collating machine comprising a rotatable drum having sheet receiving and storing pockets sequentially movable past a conveyor, a conveyor adjacent said drum for traveling a sheet of paper into one said drum pocket at said conveyor, power means adapted to turn said drum so as to pass said pockets past said conveyor, a motor driving said conveyor continuously to receive paper sheets from a supply source such as a printing machine as fast as they are delivered; sensing actuating means including a sheet switch on said collator tripped by delivery of a sheet from said conveyor to one said drum pocket causing said power means to rotate said drum, and sensing stopping means including a detent on said drum at each said pocket and a pocket switch on said collator tripped by said drum pocket detent stopping said power means rotation of said drum with the next said pocket at said conveyor to receive delivery of the next paper sheet; said conveyor having a first delivery portion to said drum pockets and a second delivery portion adapted to receive sheets therefrom, a tray at said second delivery portion, and a switch gate in said conveyor for selectively directing sheets to either said first or second delivery portions to place sheets selectively in said drum pockets or in said tray.

16. In a device as set forth in claim 15, means demountably mounting said tray; said tray being easily demountably mounted over said drum not only for clearing said drum for unloading but also for quickly replacing said tray in conjunction with delivery of differently

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printed sheets thereto or for quickly replacing said tray when loaded.

17. In a device as set forth in claim 15, a counter on said collator, a first wiring circuit including power to said sheet switch and said pocket switch, a solenoid in said circuit actuating said gate to said conveyor first drum delivery portion; said gate being normally spring biased to said conveyor second tray delivery portion; said counter having a switch connecting power to said first wiring circuit while counting and disconnected by said counter counting out so as to de-energize said wiring circuit and said solenoid to swing said gate to said conveyor second delivery portion to said tray to convey sheets delivered after said counter has counted out to said tray; said counter switch first wiring circuit disconnected also de-energizing said sheet switch and said pocket switch to discontinue incremental pocket to pocket rotation of said drum.

18. In a device as set forth in claim 17, a second wiring circuit; said counter switch upon disconnecting said first wiring circuit being adapted to connect power to said second wiring circuit; a home switch in said second circuit on said collator, a home detent on said drum; said second circuit being adapted to energize said power means to rotate said drum so as to bring said home detent into contact with said home switch to de-energize said power means to stop said drum at the home position.

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