

Sept. 8, 1942.

F. H. BLYTHE ET AL

2,295,073

COLLATING MACHINE

Filed March 30, 1940

3 Sheets-Sheet 1

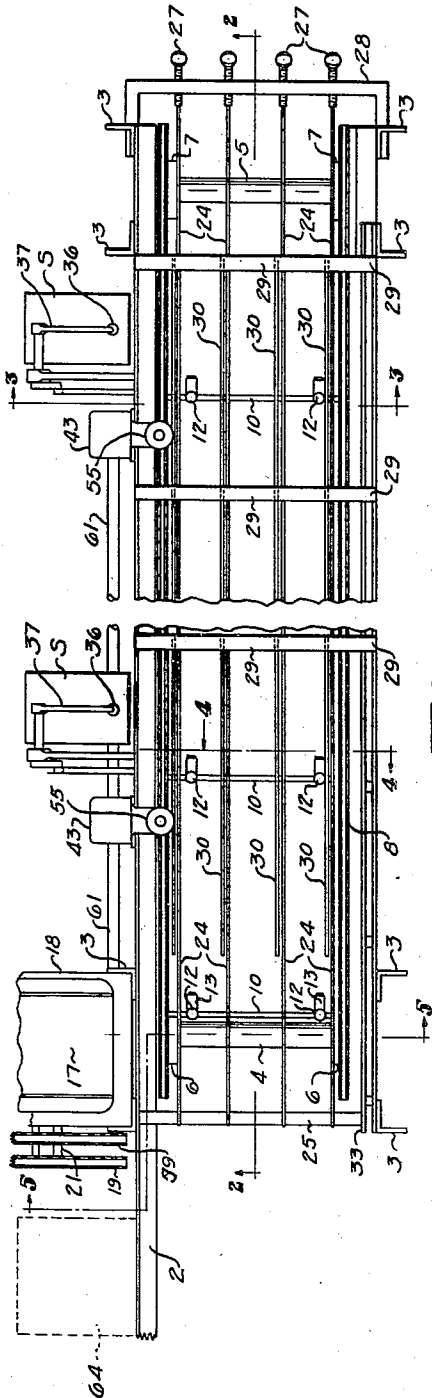


Fig. 1

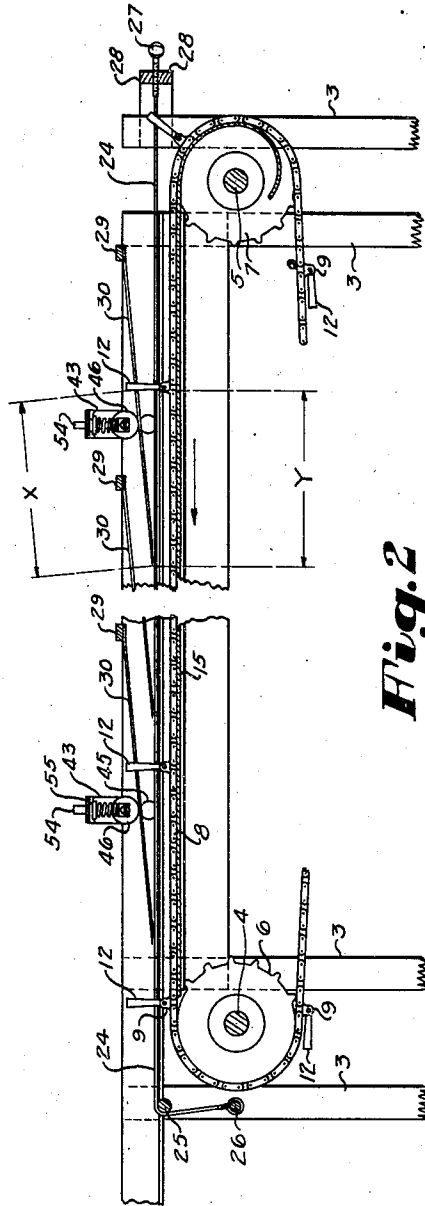


Fig. 2

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3 Sheets-Sheet 2

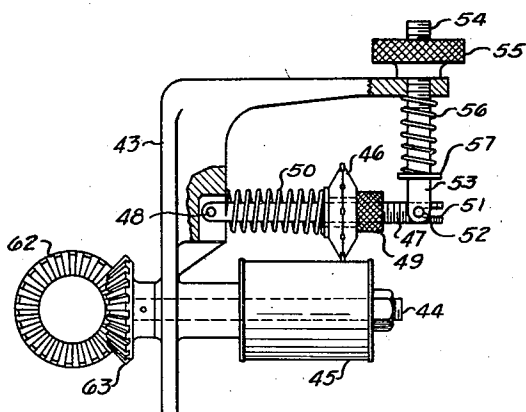


Fig. 7

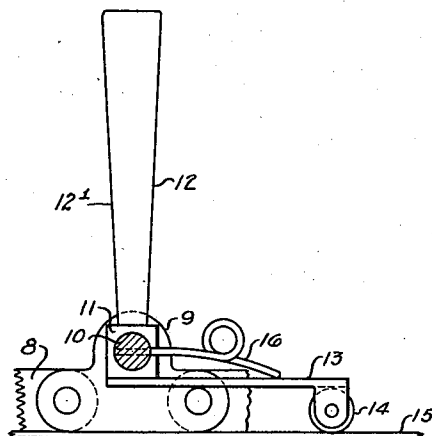


Fig. 6

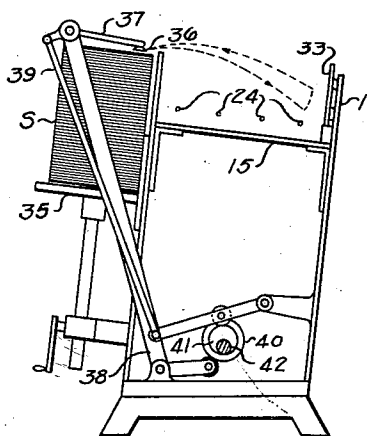


Fig. 3

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3 Sheets-Sheet 3

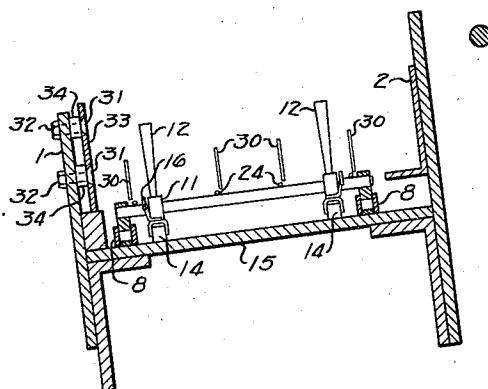


Fig. 4

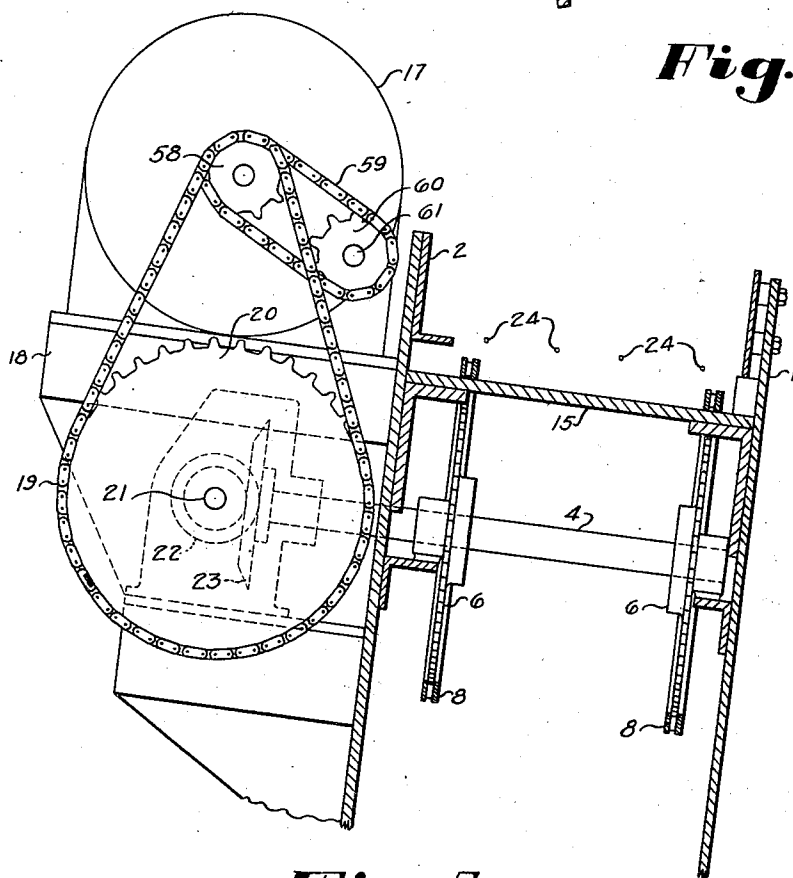


Fig. 5

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UNITED STATES PATENT OFFICE

2,295,073

COLLATING MACHINE

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Application March 30, 1940, Serial No. 326,950

20 Claims. (Cl. 270—53)

This invention relates to collating machines.

In handling small orders of manifold forms, printers have heretofore gathered or arranged the printed forms in the desired order by hand, and have stitched, stapled, glued or otherwise secured them together.

This requires a considerable amount of time and involves so much expense that the cost of such forms is, in many cases, prohibitive, with the result that the printing trade loses many opportunities to sell such jobs.

It is a primary object of the present invention to provide a machine which is admirably adapted for handling small as well as large orders for such printed forms expeditiously and at minimum cost.

Another object of the invention is to provide a machine of the character described which is adapted to a wide variety of work, both as to size requirement and the kinds of paper stock which must be handled.

A further object of the invention is to provide a machine of the character described having means for registering and maintaining in registered condition at least two edges of individual as well as collated sheets.

A still further object of the invention is to provide a machine of the character described having means for selectively perforating the sheets as they are collated with other sheets.

A still further object of the invention is to provide means for securing the gathered sheets or forms together.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a fragmentary plan view of a collating machine embodying the invention;

Fig. 2 is a fragmentary longitudinal cross-sectional view of the machine, taken on the line 2—2 of Fig. 1;

Fig. 3 is a transverse cross-sectional view of the machine taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary transverse cross-sectional view of the machine, taken on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary view, partly in section and elevation, taken on the line 5—5 of Fig. 1;

Fig. 6 is a detail showing the mounting of one of the gathering pins; and

Fig. 7 is a detail of one of the perforating devices.

Referring more particularly to the drawings, the machine will be seen to comprise a frame consisting of a longitudinally extending plate 1 and angle 2, spaced from each other transversely of the machine, and supported by angle uprights 3.

Journalled on the frame at longitudinally spaced points adjacent the ends thereof are shafts 4 and 5, to each of which is secured a pair of transversely spaced sprockets, the sprockets on the shaft 4 being designated by reference numeral 6, and those on the shaft 5 by numeral 7. Mounted on these sprockets are endless chains 8, certain of the links of which at uniformly spaced intervals are provided with ears 9 (Fig. 6) in which are rigidly mounted transversely extending rods 10.

Each of the rods 10 has pivotally mounted thereon, at points adjacent the chains 8, blocks 11, each of which has projecting upwardly therefrom a tapered finger or pin 12, the function of which will be presently described. Each of the blocks 11 is further provided with a rearwardly extending bracket 13, which supports a roller 14, which normally rides on a table or platform 15. The table 15 is mounted on the frame of the machine immediately below the upper runs of the chain 8, and extends from a point closely adjacent the sprockets 6 to a point below the shaft 5, the rear portion of said table being curved, as shown in Fig. 2, for a purpose to be presently described. Springs 16 are provided which are secured at one end to the rods 10 and bear at their other end on the brackets 13, so as to cause the rollers 14 to bear on the table 15 and maintain the pins 12 in an upright position, as shown in Fig. 2.

The chains 8 are adapted to be continuously driven in the direction indicated by the arrow in Fig. 2, and for this purpose, a motor 17 is provided, which is suitably supported on a bracket 18, which extends laterally from the frame of the machine, and drives the chains through the intermediary of chain 19, sprocket 20, shaft 21, bevel gears 22 and 23, shaft 4 and sprockets 6.

Extending along the machine directly above the rods 10 is a series of transversely spaced taut parallel wires 24, which lie in a plane parallel with the table 15 and extend to a point forwardly of the sprockets 6, thence over a stationary rod 25 which extends at right angles to said

wires, and have their forward ends secured to a second stationary rod 26 disposed below and parallel with the rod 25. The wires also extend to a point rearwardly of the sprockets 7, at which point they are secured to screws 27 which are threadedly mounted in a cross-bar 28 affixed to the frame of the machine. By manipulating the screws 27, the tension on the wires 24 may be adjusted in order to maintain them substantially taut.

Mounted on the frame members 1 and 2 at points spaced to correspond with the spacing of the pins 12 are stationary bars 29, to each of which is secured a series of transversely spaced wires 30 which extend forwardly from said bars and at an appreciable angle to the common plane of the wires 24. The wires 30, as may be further noted, are disposed almost directly above the wires 24, corresponding in number with the latter, and are unsupported at their forward ends.

Secured to the frame member 1, as by means of screws 31 and nuts 32, is a gauge or register plate 33, said plate being maintained in parallel spaced relation to said frame member by means of collars 34, mounted on the screws 31. By substituting for the collar 34 other collars of different lengths, the position of the gauge plate may be adjusted to accommodate the sheets of varying lengths.

Means are provided for feeding the sheets to be collated onto the wires 24, which constitute the gathering or collating table, such means being shown only diagrammatically in Figs. 1 and 3 of the drawings, since they form subject matter of an application Serial No. 360,052, filed October 7, 1940. Such means comprises a series of automatically elevatable feed tables 35 spaced to correspond with the spacing of the pins 12 and bars 29, each table having disposed thereon a stack S of sheets to be collated with sheets removed from the other tables. The tables are mounted on the machine proper, as shown in Fig. 3 and are inclined to correspond with the inclination of the tables 15 so as to facilitate removal of the sheets and the feeding of the same onto the wires 30.

The sheet feeding mechanism further includes sucker tips 36, mounted on arms 37, which are actuated by means of levers 38 and 39 to cause said sucker tips to pick up the uppermost sheet of the stack, transfer it onto the wires 30 and return to the stack to pick up the next sheet. The path of movement of the sucker tips is indicated by the dotted lines in Fig. 3. The levers 38 and 39 are respectively actuated by cams 40 and 41 mounted on a shaft 42 driven in synchronism with other moving parts of the machine. Mechanism is also provided for automatically creating and breaking the suction in the tips 36, such mechanism being well understood by those familiar with this art, and hence not necessary to describe.

Means are also provided for perforating the individual sheets prior to collating them with other sheets, such means being best shown in Figs. 1, 2 and 7. Such means comprises a series of perforators spaced along the machine at points spaced to correspond with the spacing of the sheet feeders. Each perforator comprises an angle shaped bracket 43 which is mounted on the frame of the machine and has journaled therein a stub shaft 44, to the inner end of which is rigidly secured a perforator bed cylinder 45.

Cooperating with the cylinder 45 to perforate sheets which pass over said cylinder during the

collating operation is a perforator wheel 46, which is revolutely mounted on a shaft 47. Shaft 47 is pivotally mounted on the bracket 43 as at 48, and has a threaded portion to which is secured a knurled adjusting nut 49. A compression spring 50 is interposed between the bracket and the wheel 46 and normally maintains said wheel against the nut 49. Rotation of the cylinder 45 is imparted to the perforator wheel, the portion of the wheel along the cylinder being adjustable as by means of the nut 49 to thereby vary the point at which the sheet is perforated.

The end of the shaft 47 is slotted as at 51 for the reception of a pin 52 which is carried by a clevis head bolt 53, the stem 54 of which extends through the bracket 43 and has secured thereto, above the bracket, a nut 55. A compression spring 56 is interposed between the head 57 of the clevis bolt and the bracket 43, this spring providing a desired resilient backing for the perforator wheel. The primary purpose of the nut 55 is to permit the perforator wheel to be moved upwardly to an inoperative position, so as to provide for selective perforation of the sheets.

The cylinders 45 of the various perforators are driven by the motor 17 through the intermediary of sprocket 58, chain 59, sprocket 60, shaft 61, and bevel gears 62 and 63.

Means are indicated at 64 for stitching, gluing, stapling or otherwise securing together the edges or ends of the collated sheets, such means preferably having a variable drive, so as to permit the speed thereof to be varied in accordance with the width of the sheets which are being collated, the sheet conveying means being preferably driven at a constant speed irrespective of the width of the sheets.

Operation

With the machine in operation, sheets are removed from the respective stacks S by the sucker tips 36 and are deposited on the wires 30, the inclination of the machine facilitating movement of the lower edges of the sheets toward the plate 33, which thus accurately gauges such edges, the points at which such sheets are deposited on the wires being termed by us "sheet depositing stations."

Immediately after being thus deposited the side edges of the sheets are engaged by the pins 12, which thus gauge such edges, so that before any movement of the sheets occur, they are accurately gauged at at least two edges.

The pins 12 then push the sheets along the wires 30 and onto the sheets which have been pushed along the wires 24 from the preceding stations, the sheets being collated in this manner into sets as required. It will be noted that the pins 12 are tapered as at 12'. The degree of this taper is such that the distance X along the wires 30 is equal to the distance Y along the wires 24 (see Fig. 2), and insures that the rear edge of the upper sheet will register with the rear edges of the lower sheets, when such upper sheet leaves the wires 30.

In its movement along the wires 30, the sheet may or may not be perforated adjacent its ungauged edge, depending on whether the perforator or wheel 46 is in operative position.

In this connection, it may be noted that the perforators may, if desired, be disposed at the opposite side of the machine from that shown, so that the sheets may be perforated adjacent their gauged edges.

The collated groups of sheets are carried along by the pins to the device 64, which assumes control over such groups. Immediately thereafter, the rollers 14 move clear of the forward edge of the table 15, causing the springs 16 to bias the pins to a position more or less parallel with the chains 8, so as to quickly move the pins out of the path of the plane of the gathered set of sheets, and in this way, preventing buckling of said set of gathered sheets, in the event that the device 64 moves the set of sheets at a slower speed than it was moved by the pins 12. In this connection, it may be noted that the device 64 is preferably driven at a slower speed than the pins 12.

As the pins approach the rear sprockets 7, the rollers 14 are engaged by the cam-like rear portion of the table 15, thereby moving the brackets 13 to a position in which the pins are restored to their normal upright position.

Due to the lateral inclination of the apparatus as a whole, the lower edges of the sheets are maintained in a gauged condition throughout the collating operation, with a minimum of effort. Moreover, due to the inclination of the wires 30, the sheets are pushed along the machine with a minimum of effort.

It will be understood that the machine may have as many sheets depositing stations as desired so as to handle any desired number of sheets.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of our invention, or the scope of the subjoined claims.

Having thus described our invention, we claim:

1. In a collating machine, a sheet gathering table comprising a plurality of laterally spaced wires lying in an inclined plane, and a plurality of sets of sheet-receiving wires disposed in parallel planes angularly inclined to said first-named inclined plane.

2. In a collating machine, a sheet gathering table disposed in a plane inclined laterally to the direction of gathering, and a plurality of sheet-receiving tables inclined toward said first table in the direction of gathering.

3. In a collating machine, a sheet gathering table having longitudinally extending openings therein, endless conveyor chains having their upper runs disposed below the plane of said table, sheet gathering pins carried by said chains and movable in said openings, said pins being pivotally movable relatively to the common plane of said upper runs, and means for maintaining said pins substantially perpendicular to said plane during movement thereof in said openings.

4. In a collating machine, a sheet gathering table, a plurality of sheet-receiving tables inclined toward said first table in the direction of gathering, and pins movable in the direction of gathering, said pins having tapered conical surfaces.

5. In a collating machine, a sheet gathering table, a plurality of sheet-receiving tables inclined toward said first table in the direction of gathering, and a plurality of sets of gathering pins movable to push sheets along said tables, said pins being of greater diameter at the top than at the bottom.

6. In a collating machine, the combination of a plurality of spaced sheet-depositing stations,

means for gathering the sheets deposited at said stations, and means disposed between each pair of adjacent stations in advance of the assembly points of said sheets for perforating the sheets moving from the first station in said pair to the second.

7. In a collating machine, a sheet gathering table comprising a plurality of laterally spaced wires, and a plurality of sets of sheet-receiving wires disposed in parallel planes inclined at an angle of less than 90° to the plane of said gathering table.

8. In a collating machine, a sheet-gathering table comprising a plurality of laterally-spaced wires lying in an inclined plane, and a plurality of sets of sheet-receiving wires, each disposed in a plane at an acute angle to the plane of said gathering table.

9. In a collating machine, a sheet-gathering table, a sheet-receiving table inclined toward said gathering table in the direction of gathering and means for simultaneously moving sheets on said gathering table and on said sheet-receiving table, said means being equidistant from the lower end of said sheet-receiving table, measured along the top of said table, and from a point on the gathering table directly below said lower end of the sheet-receiving table, measured along the top of said gathering table.

10. In a collating machine, a sheet-gathering table, a sheet-receiving table inclined toward said gathering table in the direction of gathering, and means for simultaneously moving sheets on said gathering table and on said sheet-receiving table, said means comprising pins having sheet-engaging faces which form the base of an isosceles triangle, the sides of which are formed by the upper surfaces of the sheet-receiving and sheet-gathering table.

11. In a collating machine, a sheet-gathering table, a sheet-receiving table inclined toward said gathering table in the direction of gathering, and means for simultaneously moving sheets on said gathering table and on said sheet-receiving table, said means comprising pins having tapered sheet-engaging edges, the degree of taper being such that the distance along the sheet-receiving table from said edge to the lower end of the table is equal to the distance along the sheet-gathering table to a point immediately below the lower end of the sheet-receiving table.

12. In a collating machine, a frame, a sheet-gathering table mounted on said frame and disposed in an inclined plane, a plurality of sheet-receiving tables inclined toward said gathering table in the direction of gathering, and a plurality of sheet-feeding tables mounted on said frame at points spaced to correspond with said sheet-receiving tables, said sheet-feeding tables being inclined to correspond with the inclination of said sheet-gathering table.

13. In a collating machine, a sheet-gathering table, sheet-gathering pins movable along said table, means for maintaining said pins substantially perpendicular to the plane of said table during movement thereof along said table, and means for moving said pins into a plane substantially parallel with the plane of said table, after completion of the movement of the pins along the table.

14. In a collating machine, the combination of a plurality of spaced sheet-depositing stations, means for depositing sheets at each station, means for collating said sheets, perforating means disposed between at least some of said stations and

in advance of the assembly points of said sheets, and means for driving the collating and perforating means.

15. In a collating machine the combination of a plurality of spaced sheet-depositing stations, means for depositing sheets at each station, means for collating said sheets, perforating means disposed between at least some of said stations and in advance of the assembly points of said sheets, said perforating means being selectively movable into and out of operative position, and means for driving the collating and perforating means.

16. In a collating machine, the combination of a plurality of spaced sheet-depositing stations, means for depositing sheets at each station, means for collating said sheets, perforating means disposed between at least some of said stations, and in advance of the assembly points of said sheets, means for rendering each perforating device ineffective independently of the other perforating device and means for driving the collating and perforating means.

17. In a collating machine, the combination of a plurality of spaced sheet-depositing stations, means for depositing sheets at each station, means for collating said sheets, perforating means disposed between at least some of said stations and in advance of the assembly points of said sheets, all of said means being driven in synchronized relation with each other.

18. In a collating machine the combination of a plurality of spaced sheet-depositing stations,

means for depositing sheets at each station, means for collating said sheets, perforating means disposed between at least some of said stations and in advance of the assembly points of said sheets, securing means aligned with the edges of the collating sheets for securing together the edges thereof, means for driving the collating, perforating and securing means, said securing means being driven independently of the other means.

19. In a collating machine a sheet gathering table, sheet feeding means for feeding sheets to said table including sheet receiving tables, means for moving sheets along said tables comprising gathering pins engaging the rear of said sheets, and means on said pins for registering the rear edges of the upper and lower sheets when the upper sheet leaves the receiving table.

20. In a collating machine, a sheet gathering table having longitudinally extending openings therein, endless conveyor chains having their upper runs disposed below the plane of said table, sheet gathering pins carried by said chains and movable in said openings, said pins being pivotally movable relatively to the common plane of said upper runs, means for maintaining said pins substantially perpendicular to said plane during movement thereof in said openings and means for quickly moving said pins out of the plane of the gathered sets of sheets.

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