Sept. 14, 1926. 1,600,022

W. VAN HEEK

COLLATING MACHINE

Filed July 28, 1924 3 Sheets-Sheet 1

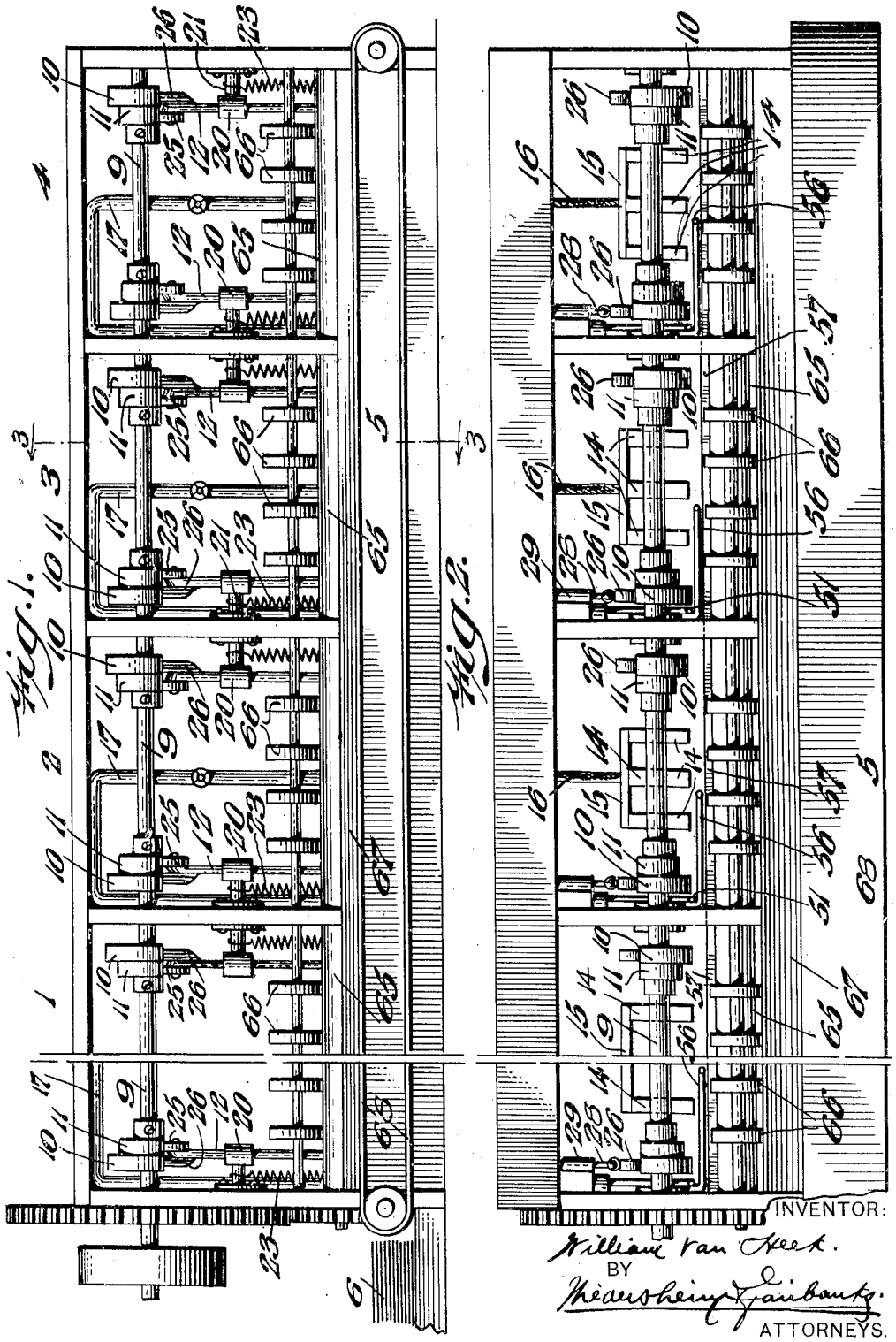


Fig. 1.

Fig. 2.

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Fig. 3.

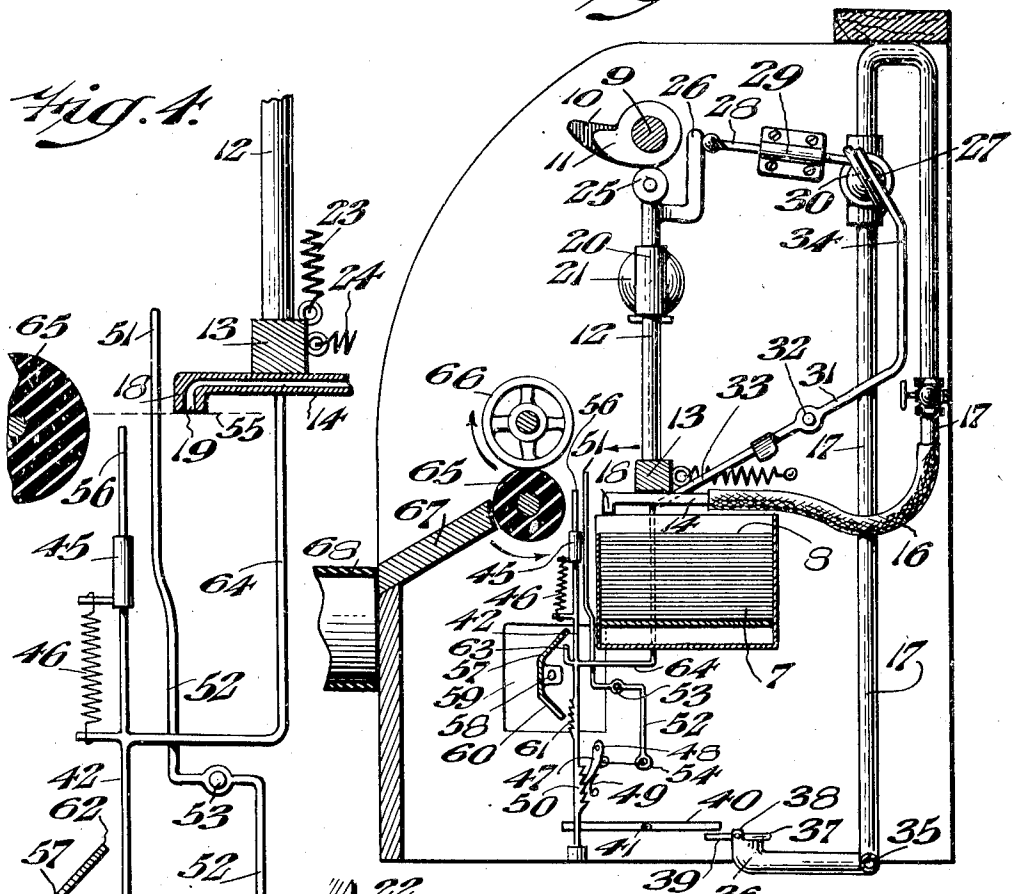


Fig. 4.

Fig. 5.

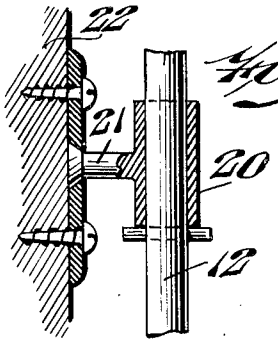
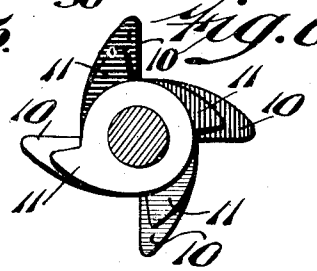


Fig. 6.



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Fig. 7.

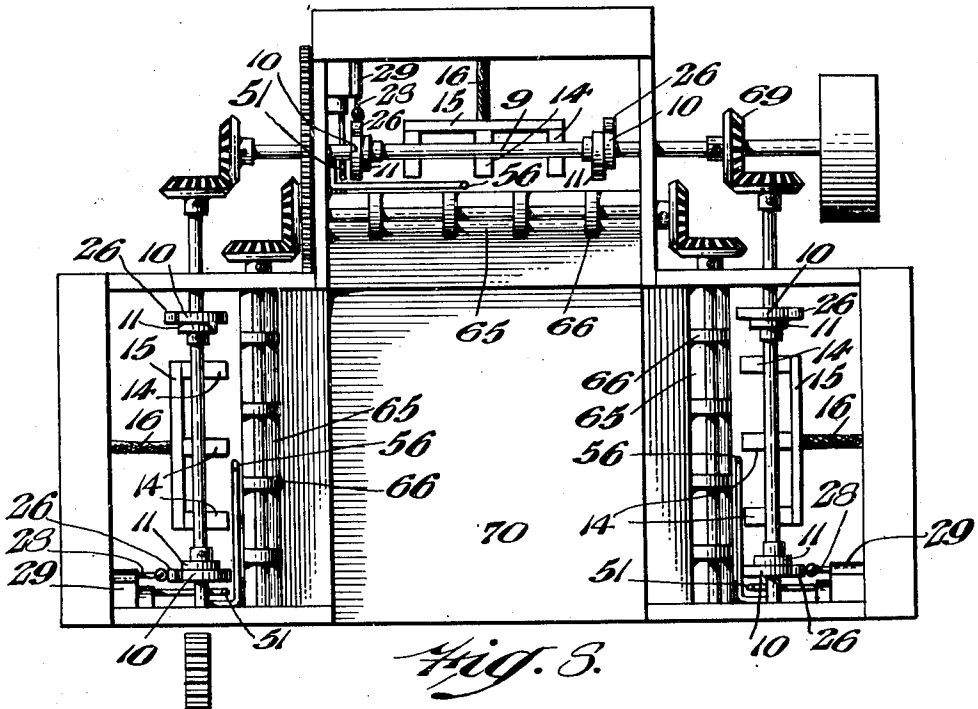
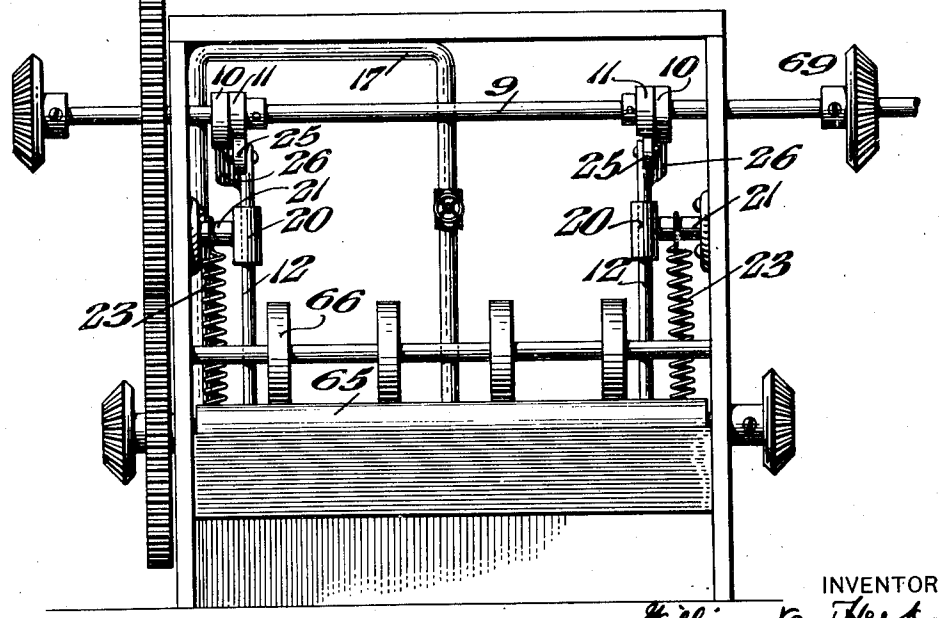


Fig. 8.



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Patented Sept. 14, 1926. 1,600,022

UNITED STATES PATENT OFFICE.

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COLLATING MACHINE.

Application filed July 28, 1924. Serial No. 728,519.

My invention relates to a new and novel construction in machines for collating a plurality of sheets of paper into a single group, from a number of different groups, and superimposing them upon each other in said single group. My invention further relates to a novel construction of a machine adapted to collect sheets of paper from different groups, in proper sequence, and to deposit them in the same sequence upon a single group.

With above ends in view, my invention consists of a new and novel collating machine having a plurality of paper feeding devices properly timed with respect to each other and a single receiving device adapted to receive the sheets of paper from the various paper feeding devices.

My invention further consists of a paper feeding device consisting of a paper magazine, a paper suction device and means to convey said sheets of paper to a single point.

My invention further consists of a novel control mechanism for each of said paper feeding mechanisms, whereby each of the mechanisms will be retained inoperatively for one cycle of the machine in the event that any one of the feeding mechanisms misses or fails to feed a sheet of paper in the proper sequence.

For the purpose of illustrating my invention, I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

In the drawings, in which like reference characters designate like parts:—

Fig. 1 represents a front elevation of my novel collating machine.

Fig. 2 represents a plan view of the same.

Fig. 3 represents a section on line 3—3 of Fig. 1 on an enlarged scale, showing the paper feeding mechanism in detail.

Figs. 4, 5 and 6 represent detail views of the paper feeding mechanism shown in Fig. 3.

Fig. 7 represents a plan view of a modified form of my invention.

Fig. 8 represents a front elevation of the same.

Referring to the drawings, 1, 2, 3 and 4 designate the series of paper feeding mechanisms as shown in Figs. 1 and 2, aligned parallel to a conveyor 5 adapted to receive the paper from the various paper feeding mechanisms and to deposit the same at a point 6.

Each of the paper feeding mechanisms 1 to 4 inclusive, consists of a paper magazine 7, as shown in Fig. 3 containing within it a stack of similar sheets of paper, and adapted to retain the upper level 8 of said stack at the same point, by any well known means not shown. The cam shaft 9 passing through the machine longitudinally, carries a series of cams 10 and 11 respectively, corresponding to each of the paper feeding mechanisms, adapted to actuate a paper lifting rod 12, in a vertical and in an arcuate path, to thereby raise a sheet of paper from the stack in the magazine 7, and to thereafter move said sheet forward in a substantially horizontal direction. As will be seen from Fig. 1, there is provided a paper lifting rod 12 on each side of each of the paper feeding devices. The transverse bar 13 extends between the ends of the paper feeding rod 12 and is fixed thereto.

In order to effect an engagement between the lifting mechanism and the sheets of paper in the stack magazine 7, there is provided a suction device carried by the transverse rod 13 consisting of a plurality of suction tubes 14 communicating with a single manifold 15, which manifold in turn is connected by means of a flexible tube 16 to a vacuum line 17. Each suction tube 14 is provided with a slight vertical portion 18, having therein an opening 19. Thus when the end of the tube 18 is brought into contact with the uppermost sheet of paper in the magazine 7, the suction will cause said sheet of paper to adhere to said suction tubes and thus to be raised when tubes are raised.

In order to effect the lifting and the horizontal shifting of the suction tubes and hence of the sheet of paper, the lifting rod 12 is slidably supported in a guide bracket 20 which in turn is pivotally supported at

a center 21 on the frame 22, thus permitting said lifting rod 12 to move vertically and also to oscillate in an arcuate path about 21 as a center. The transverse rod 13 is constantly urged upwardly by a spring or other tensioning device 23 while it is urged rearwardly about the center 21, by a second spring 24. The vertical sliding motion of the rod 12 and hence the vertical movement of the suction tube 14 is governed by the cam 11 bearing against the follower roller 25, carried by the upper extremity of each of the vertical lifting rods 12, while the oscillating arcuate movement of the rods 12 as well as of the suction tubes 14, is controlled by the cam 10 bearing against the arm 26 carried by and fixed rigidly to each of the lifting rods 12. Thus the movement of the suction tubes 12 is as follows:—The cam 11 first depresses the rods 12 and hence the suction tubes 14, against the tensioning springs 23, in a vertical direction, into contact with the uppermost sheet of paper, thereafter the rods 12 and hence the suction tubes 14 are permitted to rise, actuated by the springs 23, at which point the cam 10 engages the arm 26, thus oscillating the tubes 14 to thereby carry forward the sheet of paper adhering to the ends of the suction tubes. After that the action of the cams ceases and the rod 12 and hence the suction tubes 14 are withdrawn to their normal positions, by the springs 23 and 24 respectively.

In order to cut off the suction at the proper point, so as to release the engagement between the lifting mechanism and the sheet of paper, after the said sheet has been properly positioned, there is provided a control valve 27 interposed between the source of vacuum and the suction tubes 14, which is controlled automatically by the movements of the paper lifting device described above. Accordingly there is provided a suction release rod 28, slidably mounted in the guide bracket 29 and bearing against the arm 30 of the control valve 27 at one end thereof and contacting with the arm 26 at the other end thereof. Thus it will be seen that while the suction device 14 is swung forward in the direction of the arrow shown in Fig. 3 about the pivot 21, the rod 28 is imparting a rotary movement to the valve 27, so as to close the same, and thus to release the force of the suction on the sheet of paper. When the valve 27 is thus closed it will remain closed until it is positively engaged again by a valve opening device actuated by the transverse rod 13. This consists of a pivoted rocker arm 31 fulcrumed on 32, having one arm 33 thereof extending underneath the transverse rod 13, and having the other end 34 thereof in operative engagement with the handle 30 of the valve 27. Thus in lowering or depressing the transverse rod 13 in the successive operations of the paper lifting mechanism, the arm 33 will be depressed, oscillating the rocker arm 31 about the pivot 32 and thereby opening the valve 27 again, and inducing a suction thereby at the openings 19 of the suction tubes 14.

In order to effect a control of each of the series of the paper feeding mechanisms by the paper in any one of the said series; namely, to prevent the feeding of the sheets of paper from any of the stacks, in case a sheet of paper from one of the stacks is missed and not fed in the proper sequence, through any failure of some part of the mechanism, there is provided a novel error or miss control mechanism, illustrated in Figs. 3 and 4. Accordingly, the vacuum line 17 of each of said feeding mechanisms communicates with a common manifold 35, which is provided with a vacuum release trap 36, whereby the vacuum in the whole system may be broken by simply opening the lid 37 on said trap 36. The lid 37 pivoted at 38, is provided with an arm 39 extending transversely across the machine, against which arm 39 one end of each of a series of rocker arms 40 bears, so as to open said lid 37 by a downward movement of the end of any one of said rocker arms 40. The rocker arms 40 are fulcrumed on pivots 41, and the other arm of each of said rocker arms 40 being operatively engaged by one of a corresponding series of vertical slides 42, as shown in Fig. 4, by means of the slot 43 in each of said slides 42, into which the said rocker arms extend. The slides 42 are guided by two guide brackets 44 and 45 respectively, and are constantly urged upwardly by the springs 46. As will be readily seen, from Figs. 3 and 4 the upward movement of any one of the slides 42 will raise the corresponding end of the corresponding rocker arm 40, and thereby raise and open the lid 37, so as to break the vacuum in the entire system. In the normal position of the machine as shown in Fig. 4, a pawl 47 pivoted at 48 and actuated by the spring 49, retains the slide 42 in the normal position shown in Fig. 4, by engagement with one of the teeth of a rack 50 carried by said slide 42. When, however, upon lifting a sheet of paper the transverse bar 13 is moved forward in the direction of the arrow, it encounters the upper extremity 51 of a rocker arm 52 pivoted at 53, which engages the pawl 47 at the lower extremity thereof as at 54, and thereby withdraws said pawl 47 from engagement with said rack 50, thus permitting the slide 42 to travel upwardly due to the tension of the spring 46, which slide 42 thereby tends to lift the lid 37 so as to break the vacuum. When, however, a sheet of paper has been lifted, and is retained by the vacuum tubes 18 as indicated by the dotted line 55, the upper extremity 56 of the slide 42 encounters the sheet of

paper and is thereby limited in its upper movement by said sheet of paper, thus retaining the lid 37 in the closed position shown. In case, for any reason whatsoever, the sheet of paper in any one of the feeding mechanisms shall be positioned wrongly, or shall have been dropped by the vacuum device, or in case for any reason whatsoever, the vacuum tubes shall have failed to raise the sheet of paper from any one of the stacks of paper, the end 56 will not encounter any obstruction when the slide 42 is urged upward by the spring 46, and freed from the locking action of the pawl 47, the slide 42 will thus rise, and thereby lift the lid 37 and break the vacuum, causing all the other paper feeding mechanisms to drop the sheet of paper lifted, thereby preventing said other sheets from being collated. The importance of this miss or error control mechanism, is readily seen when it is desired to superimpose on a single stack a number of different sheets of paper in the same sequence. With the aid of this novel mechanism the omission of any one of the sheets of a series will automatically prevent any of the other sheets from being collated during that particular cycle of the machine.

In order to lock the slides 42 of all the other feeding mechanisms against any upward movement, during a "miss" cycle, so that none of the other slides shall raise the lid 37 and break the vacuum; there is provided a rocker pawl arm 57 pivoted at 58 and extending transversely across the machine as shown in Figures 2 and 3 through apertures 59 in the frame of the machine. The pawl edge 60 of said rocker pawl arm is in operative alignment with a rack 61 carried by each of the slides 42, while the upper edge 62 of the rocker pawl arm is in alignment with a projection 63 carried by each of the slides 42. Thus when any one of the slides 42 is raised due to the omission of the sheet of paper in the particular feeding mechanism, the projection 63 of said slide encounters the edge 62, and forces the pawl edge into engagement with the racks 61 on each of the slides 42, thereby locking said slides in an inoperative position with respect to the vacuum trap 36.

In order to reset the error or "miss" control mechanism and to lower the slide 42 of the feeding mechanism which "missed," so as to close the vacuum trap 36, which has been opened during the previous cycle of the machine, there is provided an arm 64 carried by each of said slides 42, and projecting upward in alignment with the transverse bar 13. Thus when the bar 13 descends again during a subsequent cycle of the machine, it forces the arm 64 and hence the slide 42 downwardly into its normal position, thus closing the lid 37.

In order to receive the various sheets from the various feeding mechanisms there is provided a continuously revolving roller 65 and a corresponding series of auxiliary wheels 66 bearing against said roller 65, and revolving in the direction shown by the arrows, which engage the sheet of paper and transmit the same down the inclined guide table 67 onto the moving belt 68 which deposits the same at the point 6 indicated in Fig. 1.

In Figs. 7 and 8 there is shown a modified form of my invention wherein the various paper feeding mechanisms are arranged along the sides of a square instead of being aligned along the edge of a belt, and wherein, moreover, the conveying belt 68 is dispensed with entirely. Thus in this modification of my invention the shaft 9 is not continuous throughout the machine but is individual to each section thereof, and the individual sections are connected by the bevel gears 69; the various sections being so timed that the feeding action of the various paper feeding mechanisms will take place in the desired sequence, and the stack will be formed at 70, in the center of the square.

It should be noted here that the collating machine of my novel construction has for its particular purpose the gathering of individual segregated sheets of relatively thin paper and collating the same in predetermined order, so as to produce a single stack of sheets of paper with the different sheets alternating in proper sequence.

Collating machines of various forms have been known heretofore for the purpose however, of collating signatures or relatively thick sheets of paper such as cards. In contradistinction to these prior collating machines, however, my machine is particularly adapted to gathering and collating relatively thin, individual and single sheets of paper, such as office forms and the like, or collating the various different sheets in the production of blank books, sales books, etc., wherein duplicates and triplicates of each sheet are desired, the duplicates and triplicates being of different form or color.

It will be further seen that my novel collating machine gathers the segregated sheets from horizontal stacks without any preliminary arrangement of the sheets to adapt them to the machine, thus making it unnecessary, in the use of my novel machine, to arrange the sheets endwise or at an angle, as is common practice in collating machines known heretofore.

It will now be apparent that I have devised a novel and useful construction in a collating machine which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have, in the present instance, shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and re-

liable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. In a collating machine, a paper feeding mechanism consisting of a vertical slidable rod, a pivotally mounted bracket supporting said rod, a suction device carried by said rod, means to actuate said rod vertically, means to oscillate the same in an arcuate path about said pivot, and a miss control mechanism cooperating with said feeding mechanism consisting of a feeler slide, means to actuate said slide contact with a sheet of paper, a vacuum trap, and means intermediate said vacuum trap and said slide to open said trap when said slide does not encounter a sheet of paper.

2. In a collating machine, a plurality of paper feeding mechanisms, each consisting of a suction device mounted for a vertical and an oscillatory movement, and a series of corresponding miss control devices, each consisting of a feeler, means urging said feeler into contact with a sheet of paper retained by said suction device, a vacuum relief device, means intermediate said vacuum relief device and said feeler to relieve the vacuum when said feeler does not encounter a sheet of paper.

3. In a collating machine, a plurality of paper feeding mechanisms each consisting of a suction device mounted for a vertical and an oscillatory movement, and a series of corresponding miss-control devices, each consisting of a feeler, means urging said feeler into contact with a sheet of paper retained by said suction device, a vacuum relief device, means intermediate said vacuum relief device and said feeler to relieve the vacuum when said feeler does not encounter a sheet of paper, means carried by said slide to reset said slide to the normal position thereof when said suction device is lowered during the succeeding cycle of the machine.

4. In a collating machine, a plurality of paper feeding mechanisms, each consisting of a suction device mounted for a vertical and an oscillatory movement, and a series of corresponding miss-control devices, each consisting of a feeler, means urging said feeler into contact with a sheet of paper retained by said suction device, a vacuum relief device, means intermediate said vacuum relief device and said feeler to relieve the vacuum when said feeler does not encounter a sheet of paper, and means common to each of said miss-control mechanisms to lock the feelers of the other mechanisms during the "miss" cycle.

5. In a collating machine, a plurality of paper feeding mechanisms each consisting of a suction device mounted for a vertical and an oscillatory movement, and a series of corresponding miss-control devices, each consisting of a feeler, means urging said feeler into contact with a sheet of paper retained by said suction device, a vacuum relief device, means intermediate said vacuum relief device and said feeler to relieve the vacuum when said feeler does not encounter a sheet of paper, a rocker pawl arm common to the feelers of each of said miss control mechanisms, a rack carried by each of said feelers in alignment with said pawl arm, and a projection carried by each of said feelers to force said pawl into engagement with each of said racks when any one of said feelers rises.

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