

Jan. 19, 1943.

A. DAGER

2,308,804

COLLATOR

Filed Nov. 25, 1940

3 Sheets-Sheet 1

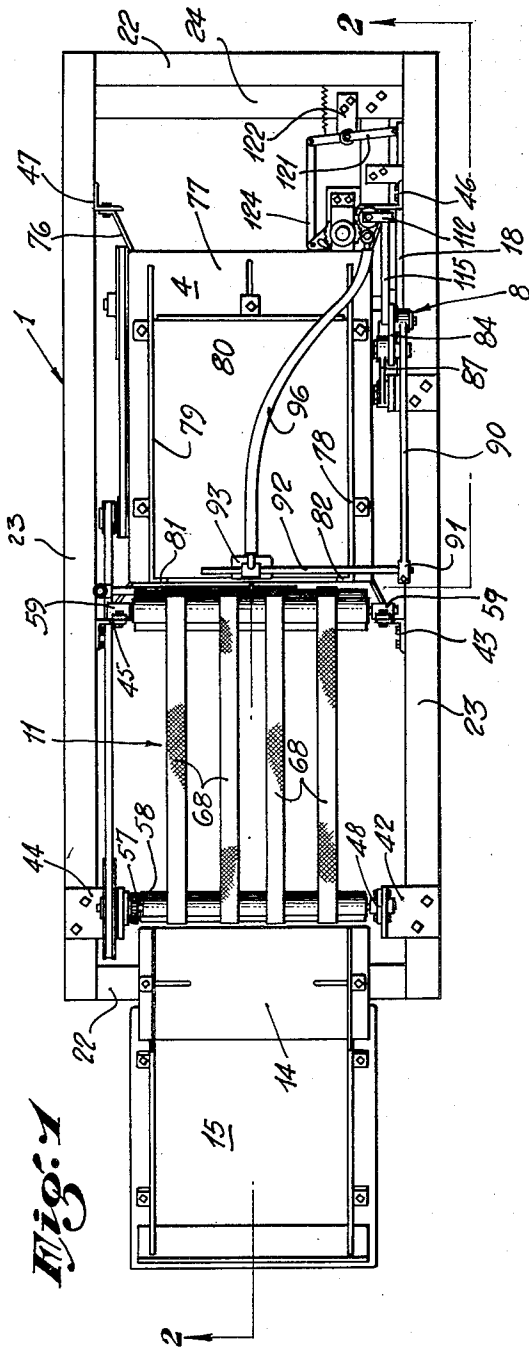


Fig. 6

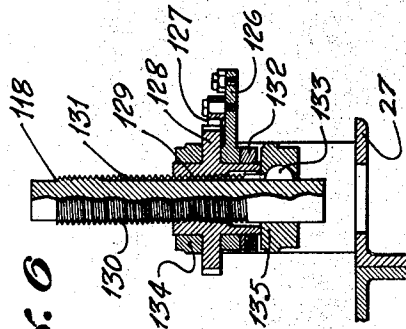
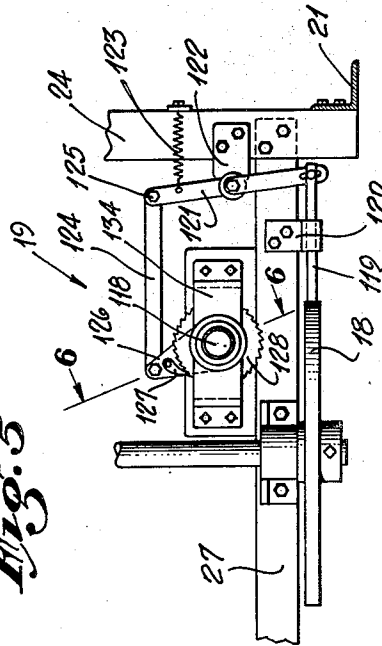


Fig. 5



ALBERT DAGER,
INVENTOR;

BY *John Brown*
ATTORNEY.

Jan. 19, 1943.

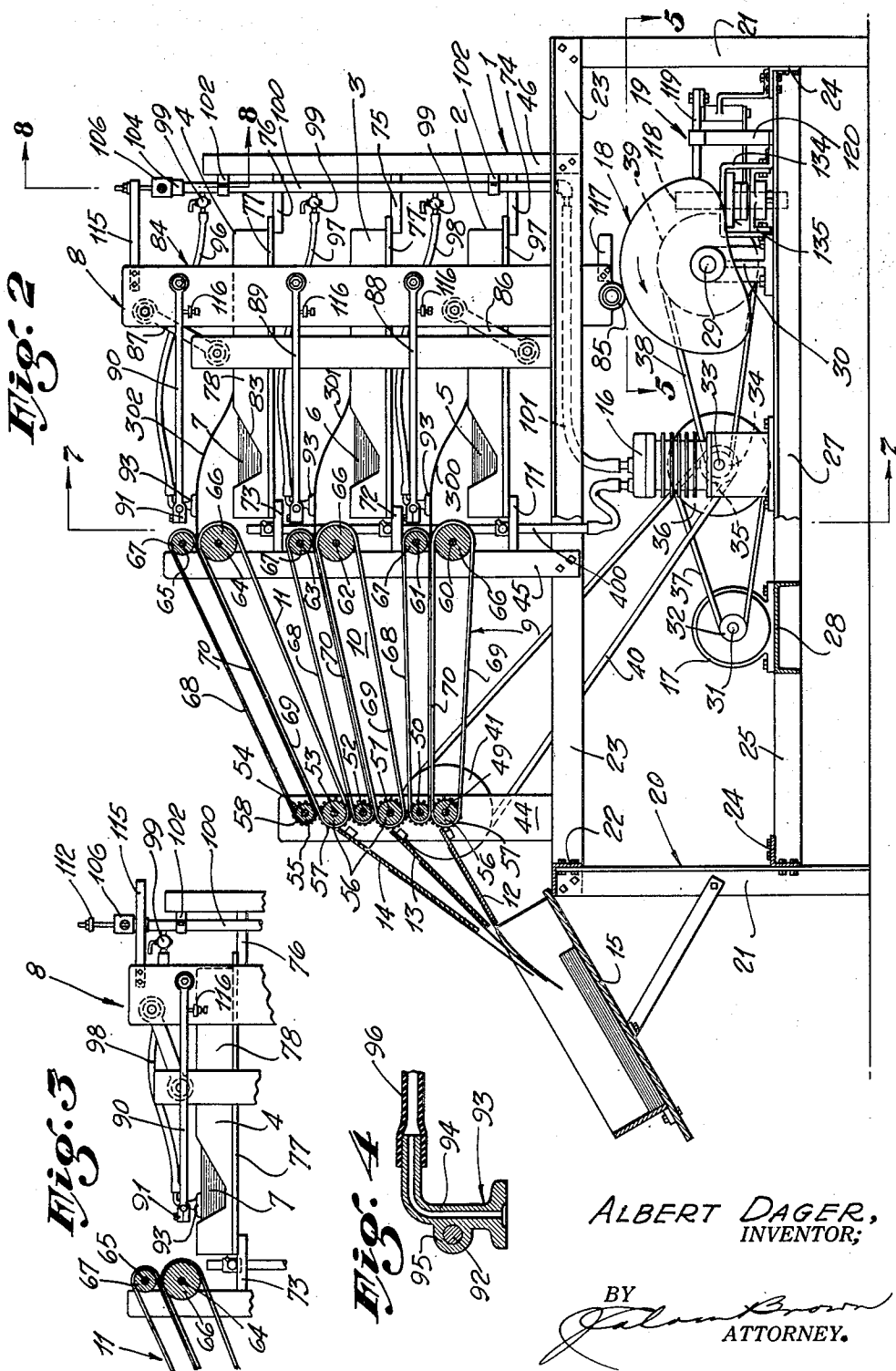
A. DAGER

2,308,804

COLLATOR

Filed Nov. 25, 1940

3 Sheets-Sheet 2



Jan. 19, 1943.

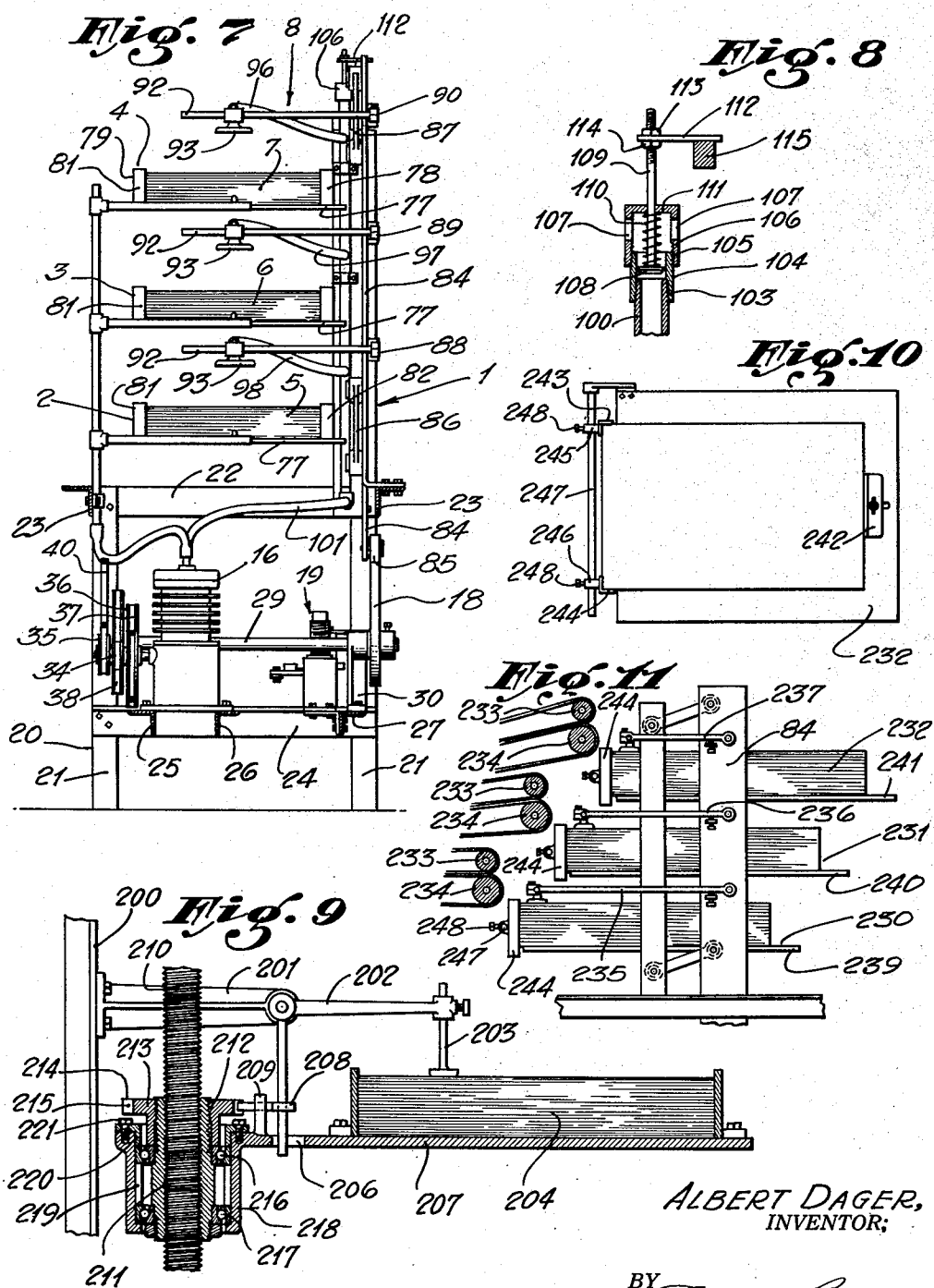
A. DAGER

2,308,804

COLLATOR

Filed Nov. 25, 1940

3 Sheets-Sheet 3



ALBERT DAGER,
INVENTOR;

BY
Calvin B. Brier
ATTORNEY.

UNITED STATES PATENT OFFICE

2,308,804

COLLATOR

Albert Dager, Los Angeles, Calif., assignor of one-half to Elias Shaheen, Los Angeles, Calif.

Application November 25, 1940, Serial No. 367,068

7 Claims. (Cl. 270—58)

This invention relates to collators.

The invention has for an object the provision of a collator which is inexpensive in cost of manufacture, fool proof in operation, and capable of giving the average printer, at a minimum of expense, a device which will rapidly collate sheets. Particularly, a collator is of use where manifold-
 ing sheets must be bound together in book form for use by salesmen. The top sheet or original is usually white, the customer's slip being of blue,
 and the sheet retained by the dealer perhaps yellow.

The device of the present invention is adapted to collate any number of sheets. The average print shop so far as the inventor is aware, has been unable to solicit manifolding business as collating machines are extremely costly, and the average shop is unable to obtain enough of this business to warrant the expense of a large machine.

The present invention is compact, occupies small space in the print shop, and embodies a minimum of parts.

The invention has for further objects the provision of a machine which is simple of structure, efficient in operation, and generally superior.

With the above mentioned and other objects in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members and features, all as shown in certain embodiments in the accompanying drawings, described generally, and more particularly pointed out in the claims.

In the drawings:

Figure 1 is a plan view of the device,

Figure 2 is a sectional view on the line 2—2 of Figure 1,

Figure 3 is a fragmentary detail of sheet separator means,

Figure 4 is a fragmentary sectional detail of one of the suction feet used in lifting a sheet from stock,

Figure 5 is a fragmentary view on the line 5—5 of Figure 2,

Figure 6 is a sectional view on the line 6—6 of Figure 5,

Figure 7 is an elevation looking in the direction of the arrow 7—7 of Figure 2,

Figure 8 is a sectional view on the line 8—8 of Figure 2,

Figure 9 is a modified form of feed bin elevating mechanism,

Figure 10 is a fragmentary top plan view of a modified form of arrangement for the bins, and,

Figure 11 is a side elevation of the modified arrangement of the bins shown in Figure 10.

Referring now with particularity to the drawings, the improved collator as an entirety is designated by the numeral 1, and the same includes two or more bins arranged one above the other for the purpose of holding paper which is to be collated. In the present instance, three bins are shown at 2, 3 and 4. Stock of different colors may be placed within the bins, as for instance, white paper at 5, blue or red at 6, and yellow at 7. Through suitable means, designated generally as 8, paper from each stack 5, 6 and 7 is lifted so as to position the same between pairs of feed conveyors designated generally as 9, 10 and 11. The feed conveyors direct the paper onto guide plates 12, 13 and 14, and thence in collated relationship within a receiving bin 15. The means 8 operates in conjunction with a compressor 16 driven by a motor 17, the motor in turn driving the pairs of conveyors 9 to 11, inclusive, and likewise a cam 18, which controls operation of certain of the elements of the means 8, and through means designated generally as 19 is adapted to control proper operation of an element of the means 8.

I have provided a suitable framework generally designated as 20 and which, in the present instance, includes four posts or legs 21, spaced apart by two transverse top frames 22 and two spaced side top frames 23. A sub frame is provided, and includes a pair of transverse end members 24 extending between the legs and longitudinally extending frame members secured to the transverse members, as shown at 25, 26 and 27. A framing is provided at 28 and secured between the members 25 and 26 for supporting the motor 17. The compressor 16 is mounted between the framing members 25 and 26. The cam 18 is mounted upon a shaft 29, the shaft in turn being secured between pedestal type journals 30 mounted on the members 25 and 27.

The shaft 31 of the motor 17 carries a pulley 32, and shaft 33 of the compressor 16 carries three different diameter pulleys 34, 35 and 36. A continuous belt or chain 37 extends between pulley 32 of the motor and pulley 36. A continuous belt or chain 38 extends between pulley 34 and pulley 39 carried on shaft 29. A continuous belt or chain 40 extends between pulley 35 and pulley 41. This latter pulley is adapted to drive the conveyors 9 to 11, inclusive, as will be hereinafter detailed. It will be observed from the pulley diameters that the compressor speed is slow as compared to the motor speed. The pulleys

are all dimensioned so that the device will operate in proper timed relationship, as herein-after detailed.

Secured to each side top frame member 23 are aligned pairs of uprights 42, 43, 44, 45, 46 and 47. The uprights 42 and 44 carry journals designated generally as 48, whereby a series of shafts may be held therebetween. In Figure 2, it will be noted that there is an aligned vertical series of shafts carried by the uprights 42 and 44, the shafts being indicated as 49 to 54, inclusive. Each shaft, between its respective journals, has rollers secured thereto. The rollers carried by the shafts 50, 52 and 54 are of lesser diameter than those carried by shafts 49, 51 and 53. The small rollers are designated by the numeral 55 and the large rollers as 56. Intermeshing spur gears are carried at one end of each roller. The spur gears are designated for the large rollers as 57 and the small rollers as 58. The pulley 41 is mounted on the shaft 49, with the result that when the pulley is being driven by the continuous belt or chain 40, all of the said spur gears are rotated.

Included between the uprights 43 and 45 are a plurality of parallelly-arranged and in ascending series, journals 59, between aligned pairs of which journals are carried shafts 60 to 65, inclusive. Mounted on the shafts 60, 62 and 64 are rollers 66 and on the shafts 61, 63 and 65 are rollers 67, the rollers 67 being of lesser diameter than rollers 66. Between the rollers 55 and 67 are a plurality of spaced-apart continuous belts 68, and between rollers 56 and 66 are continuous belts 69.

It is to be noted that the continuous belts 68 and 69 operate in pairs, with one length of each thereof in contiguous relationship, as shown at 70. Furthermore, the shafts 61 and 62 are spaced-apart a substantial distance as are likewise the shafts 63 with relation to the shaft 64, with the result that the feed end of the lowermost pair of belts lies slightly below horizontal, the feed end between rollers 62 and 63 at a slight angle above horizontal, and the feed end between rollers 64 and 65 at a greater angle above horizontal.

The uprights 43 and 45 carry therebetween a series of spaced-apart platforms 71 to 73, inclusive, and corresponding platforms 74 to 76, inclusive, are transversely carried between the uprights 46 and 47. The bins 2, 3 and 4 are supported between the platforms 71, 74; 72, 75; and 73, 76. The bins are identically formed and in the manner depicted in Figure 1. Each bin includes a base 77 provided with adjustable sides 78 and 79, and an adjustable end 80. The sides 78 and 79 are provided with angular ends 81 and 82. Thus, sheets of a given dimension may be placed between the sides 78 and 79 with ends of the sheet brought against members 81 and 82 and held thereagainst by adjustment of the end 80. As shown in Figure 2, the sides may be cut away, as shown at 83. This construction permits ready access to the sheets and likewise permits one to observe the depth of the stock within a bin.

The base 77 of each bin may be held secured between its respective platforms in any manner, such as by screws, bolts, welding, or otherwise.

The means 8 includes member 84, comprising a bar carrying at one end roller 85 for engagement with cam 18. A pair of spaced-apart links 86 and 87 secure the bar to the upright or post 45. A pantograph arrangement is the result. In other words, the bar 84 moves parallel with re-

spect to the upright 44. This bar is an actuated member and wherein the cam 18 is the actuator. Member 84 has secured thereto any number of arms, of which three are shown in the present embodiment of the invention at 88, 89 and 90. One end of each arm is pivotally secured to the member 84, while the opposite end of each of said arms 88 to 90, inclusive, is split to provide jaws 91 for securing rods 92 at right angles to the lever. Each rod 92 adjustably secures and carries a suction foot 93, a detail of which is shown in Figure 4. As shown in Figure 4, the suction foot may be formed of rubber or other material, the foot having a shank 94 provided with an offset, transversely bored portion 95, through the bore of which is passed the rod 92. The shank is bent angularly, as shown, with a hose secured thereto. There is a hose for each foot as, for instance, disclosed in Figure 2, at 96, 97 and 98. The opposite end of the hose is secured to suitable cocks, designated generally as 99, the cocks of which connect with a pipe 100, the pipe in turn leading to the compressor 16 in any suitable manner, such as by the hose 101.

The pipe 100 is held by brackets 102 to the upright 46. The upper end of the pipe 100 is provided with a valve of the type shown in Figure 8. The upper end of the pipe is threaded, at 103, and has secured thereto an internally threaded coupling 104. The coupling in turn is externally threaded at 105 to receive the internally threaded cap 106. This cap is provided with ports 107. A valve 108 is adapted to seat against the upper end of the pipe 100. A coil spring 110 surrounds the shaft 109 and is interposed between the valve 108 and the inner surface of the end 111 of the cap. The shank is passed through an opening in the base of the cap and carries exteriorly of the cap a transverse arm 112. This arm may be secured to the shank in any manner, such as between nuts 113 and 114, the shank to this end being threaded. The spring 110 normally urges the valve to seated position.

An arm 115 is secured to the member 8 and is adapted to engage arm 112 to lift the valve from its seated position when the member 8 is in the position illustrated in Figure 2.

In order that the suction feet should at all times be brought into proper engagement with a sheet of paper to be lifted and positioned between the feed rollers, I have provided means which controls the extent of downward movement of the member 8. Particularly it is to be observed that I have provided adjustment screws 116 for limiting swinging movement of arms 90 in one direction. In addition thereto, I have provided an outstanding arm 117 secured to the lower end of member 8. This member is adapted to be brought into contact with the upper end of post 118 (see Figure 6). When the member 117 contacts the upper end of member 118, member 8 is arrested from further downward movement, irrespective of engagement between the roller 85 and the edge of cam 18. Member 118 is adapted to be progressively lowered as paper is fed from the stock bins.

Referring to Figure 5, the means 19 includes a rod 119 carried by a guide 120 secured to framing 25. An end of this rod engages the edge of the cam 18 and the rod is actuated forwardly and backwardly as the cam revolves. The opposite end of rod 119 is secured to lever 121, this lever being pivotally secured to a bracket 122, the bracket in turn being mounted on member 24. A coil spring 123 tends to revolve the

lever clockwise so as to bring an end of rod 119 into cam engagement. A link 124 is secured at one end of lever 121 at 125, and the opposite end of the link is pivotally secured to lever 126. Lever 126 is provided with a pawl 127 adapted to engage teeth of a ratchet gear 128. The ratchet gear is internally threaded at 129, and member 118 comprises a bolt provided with external threads 130 in screw-threaded engagement with threads 129. This bolt is likewise longitudinally provided with a kerf or groove 131. A collar 132 carries a Woodruff key 133 received in the groove 131. The ratchet gear 128 is interposed between two U-shaped supporting brackets 134 and 135, the brackets being carried by framing member 27 (see Figure 2). The collar 132 is confined so that rotation thereof is prevented, as see Figure 6. Hence, as the lever 121 and link 124 are reciprocated, the pawl will engage a tooth of the ratchet gear to rotate the ratchet and cause the member 118 to move downwardly as paper is progressively fed between the feed rollers.

In Figure 9, I have shown an arrangement whereby the bins for holding stock may be elevated as paper is fed therefrom, to the end that the suction feet may be brought into proper contact with the upper sheets. It is to be understood that Figure 9 illustrates but one of the bins, and other bins would be provided as shown in Figure 2.

To an upright 200 secured to the framing 23 is secured a bracket 201. This bracket in turn has pivotally secured thereto a bell crank 202. One end of the bell crank carries a foot member 203 adapted to rest against the top sheet of a stack of sheets 204 in feed bin 205. The other lever of the bell crank is passed through a slot 206, in an extension of the bin base 207. This lever of the bell crank carries a transverse rod 208, the rod being supported in an upright 209. The arrangement is such that rocking movement of the bell crank causes reciprocal movement of member 208.

An elongated feed screw 210 has threaded thereto sleeve 211. This sleeve is externally threaded at 212. A flanged nut 213 is threaded to the threads 212. The flange 214 of said nut is provided on its rim with one or more spaced notches or grooves 215. Top and bottom bearing race members 216 and 217 are interposed between the sleeve 211 and a casing 218; this casing is adapted to carry the assembled members just described and forms a part of the general casting which includes the base 207. It is obvious, however, that the casing might be separate from the base.

A spacer ring 219 is interposed between the race members for holding the same separated and a flanged retainer ring 220 may be secured to the upper end of the casing 216, as by means 221, to hold the top race assemblage. It is evident, upon referring to the drawings, that if the pin 208 is out of engagement with a notch or groove in the edge of the nut, that the entire assemblage will rotate as the screw 210 rotates. However, if the pin 208 engages a notch 215, the nut 213 is held against rotating simultaneously with rotation of the sleeve and feed screw, whereupon the sleeve will travel along the threads of the feed screw and elevate the base 207 until such time as a height is reached that the member 203 swings the bell crank sufficiently to release the pin from notch engagement.

The bins 2, 3 and 4 in the several figures have

been arranged in substantially spaced parallelism and alignment. However, the bins may be staggered, as illustrated in Figure 11 and wherein the front of the lowermost bin 230 is in advance of the bin 231 immediately thereabove, and the bin 232 is rearward of the bin 231. As before, any number of bins may be provided, three being simply illustrative of one arrangement. The feed rollers over which the feed belts are passed are also arranged in staggered relationship as shown for the small rollers 233 and the large rollers 234. The arms 235, 236 and 237, which support the suction feet 238 also progressively decrease in length. These arms are secured to the member 84. I have also found it expedient to provide platforms or stock tables 239, 240 and 241, all having an adjustable rear stock bracket 242 without the side walls. In place of providing the customary transverse wall for a bin, I have provided two angular brackets 243 and 244 for each bin, and these brackets are adjustably carried on slides 245 and 246 mounted on rod 247. The slides may be held in a clamped position by means of wing screws 248. The platforms or stock tables are adapted to be elevated by mechanism such as shown in Figure 9, although within the purview of the invention, the arrangement shown in Figure 2 is applicable.

It is evident that a large amount of stock may be supported on the stock tables or platforms and the movement of the arms 233 to 237, inclusive, need not be as great as for the structure shown in Figure 2, with the result that more rapid operation of the device results. The arrangement of the front stock brackets 243 and 244 is such as to readily accommodate any width stock upon the stock table.

The operation, uses and advantages of the invention are as follows:

If we assume that stock is placed in the bins 2, 3 and 4, as illustrated in Figure 2 at 5, 6 and 7, this stock may be of different colors or the same color, and of different weight, as desired. Any number of bins may be provided, three being shown for illustrative purposes. When the motor 16 is operating, the compressor 16 is being driven, as is likewise the heart-shaped cam 18. The adjustable post 118 is positioned so that the striker arm 117 will contact the same to properly position the actuated member 8 so that the suction feet 93 will at all times be brought into proper engagement with the top sheet of the stock within the bins. This adjustment is easily accomplished by releasing the pawl 127 and rotating the ratchet 128 to either raise or lower post 118.

The valve shown in Figure 8 is so adjusted as to break the vacuum to the suction feet when a sheet of the stock is positioned between a pair of the feed rollers as, for instance, illustrated in Figure 2, showing sheets of stock 300, 301 and 302, fed between the feed rollers. In the position shown in Figure 2, the valve is open (see Figure 8). When the portion of equal radius of the cam 18 is reached, the arm 115 lifts the valve 108 from its seat, breaking the vacuum which releases the feet from stock engagement. As the cam continues to turn in the direction of the arrow on said cam, a portion of decreased radius is reached, which causes the actuated member 8 to lower. This lowering is vertical due to the pantograph arrangement, with the result that the arms 88 to 90, inclusive, move backwardly and permit the suction feet 93 to

engage the top sheet of the stock 5 to 7, inclusive. The valve is closed to re-establish vacuum and permit the feet 93 to lift the top sheet of the stock from each bin, whereupon the actuated member 8 is again elevated and moved forwardly to position the sheets between their respective feed rollers. The vacuum is then broken to the feet, as before detailed. Each sheet is fed between pairs of conveyor belts, received upon the plates 12, 13 and 14, and directed in collated relationship within the receiving bin 15. Each time the actuated member 8 lowers, the pawl 127 moves the ratchet gear 128 slightly to lower the post 118, thus assuring a proper positioning of the feet 93 with relation to the top sheet of the stock in each bin. The arms 88 to 90, inclusive, are likewise adjustable as to swing through the means 116.

To aid in proper segregation of sheets of each bin, the exhaust from the compressor 16 may be directed through a tube 400, this tube having associated therewith nozzles 401 adapted to direct streams of air against edges of the sheets of the stock.

In Figure 3, I have shown the lowered position for the arms, with a suction foot engaging the top sheet of the stock just prior to movement of the actuated member 8 upwardly to lift the stock to position the same between a pair of feed rollers, as shown in Figure 2.

In place of the means for controlling the lowering of the actuated member 8 as paper is progressively fed between the feed rollers, the arrangement shown in Figure 9 may be utilized, and wherein all of the feed bins may be elevated. As the operation of the device of Figure 9 has heretofore been detailed and explained, it is thought that no further statement of its operation is necessary.

The operation of that form of the device shown in Figures 10 and 11 has heretofore been detailed.

A device of the character of this invention has been operated with success and at a high rate of speed. The device requires little attention when operation thereof is commenced, and it has been found to satisfactorily perform the work required of it.

I claim:

1. In a collator, a plurality of stock bins adapted to hold sheets or the like to be collated, means for simultaneously lifting a sheet from each stock bin, and means for delivering said sheets to a bin in stacked relationship, and said bin; said first means comprising a vacuum operated gripper foot for each bin, a compressor, and a valve control line between the compressor and each gripper foot, and means for moving each gripper foot simultaneously into stock engagement, the valve being closed, to move sheets from said stock to said second means, the valve being open.

2. In a collator, a frame, a post secured to said frame, a cam, a bar and spaced apart links secured between said bar and said post; said bar engaging said cam to raise and lower the

bar and cause movement of said bar by said linkage toward said post and away from said post as the cam is rotated; a plurality of vertically arranged and spaced apart bins adapted to hold stock of sheets to be collated, arms carried by said bar, and gripper feet secured to said arms, movement of said bar in one direction positioning said gripper feet upon the stock in each bin, and movement of said bar in a second direction lifting and displacing a sheet of stock from each bin.

3. In a collator, a plurality of stock bins spacedly arranged one above the other, pairs of conveyor belts forwardly of each bin, a cam, and a member to be actuated by the cam to raise and move the same forwardly toward the pairs of conveyor belts and downwardly and rearwardly toward the bins.

4. In a collator, a plurality of stock bins spacedly arranged one above the other, pairs of conveyor belts forwardly of each bin, a cam, a member to be actuated by the cam to raise and move the same forwardly toward the pairs of conveyor belts and downwardly and rearwardly toward the bins, and means adjustably limiting downward movement of the member actuated by the cam.

5. In a collator, a plurality of stock bins spacedly arranged one above the other, pairs of conveyor belts forwardly of each bin, a cam, and a member to be actuated by the cam, spaced arms provided with gripper feet secured to the cam actuated member; said cam actuating the cam actuated member to position the gripper feet over the bins and forwardly adjacent the conveyor belts.

6. In a collator, a frame, a post secured to said frame, a cam, a bar and spaced apart links secured between said bar and said post; said bar engaging said cam to raise and lower the bar and cause movement of said bar by said linkage toward said post and away from said post as the cam is rotated; a plurality of vertically arranged and spaced apart bins adapted to hold stock of sheets to be collated, arms carried by said bar, and gripper feet secured to said arms, movement of said bar in one direction positioning said gripper feet upon the stock in each bin, movement of said bar in a second direction lifting and displacing a sheet of stock from each bin, and means controllable by rotation of said cam to regulate the degree of lowering of said bar to position the gripper feet upon the top sheet of stock of each bin.

7. In a collator; a plurality of bins, adapted to hold stock, arranged one above the other in staggered relationship; stock feed conveyors adjacent each bin, gripper members for engaging the top sheet of the stock in each bin, and common means for simultaneously actuating each gripper member to bring the same into top sheet engagement and moving the said sheet into engagement with said feed conveyors.

ALBERT DAGER.