May 10, 1960 L. MESTRE 2,936,168

COLLATING MACHINE

Filed May 31, 1957 6 Sheets-Sheet 1

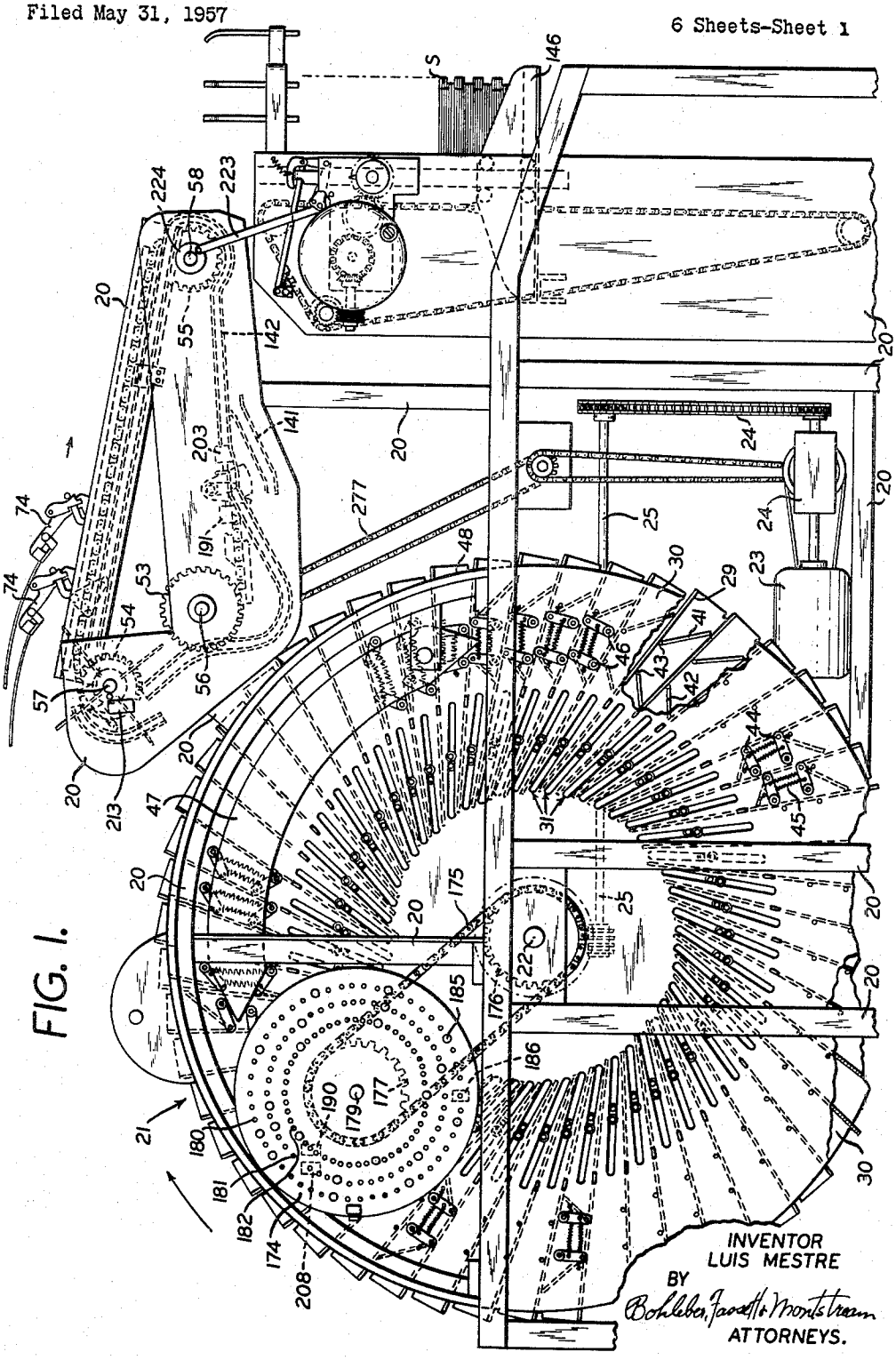


FIG. 1.

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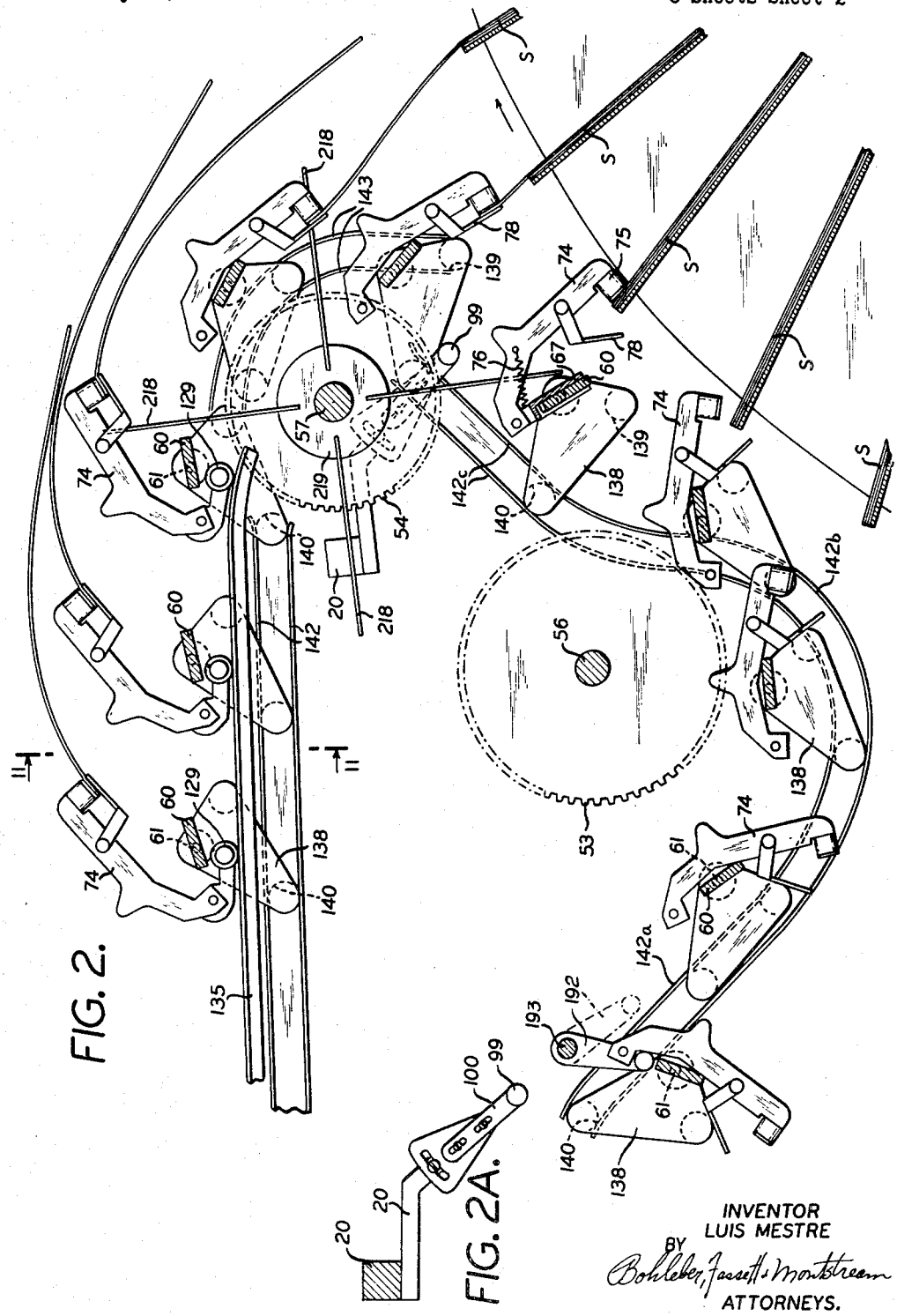


FIG. 2.

FIG. 2A.

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COLLATING MACHINE

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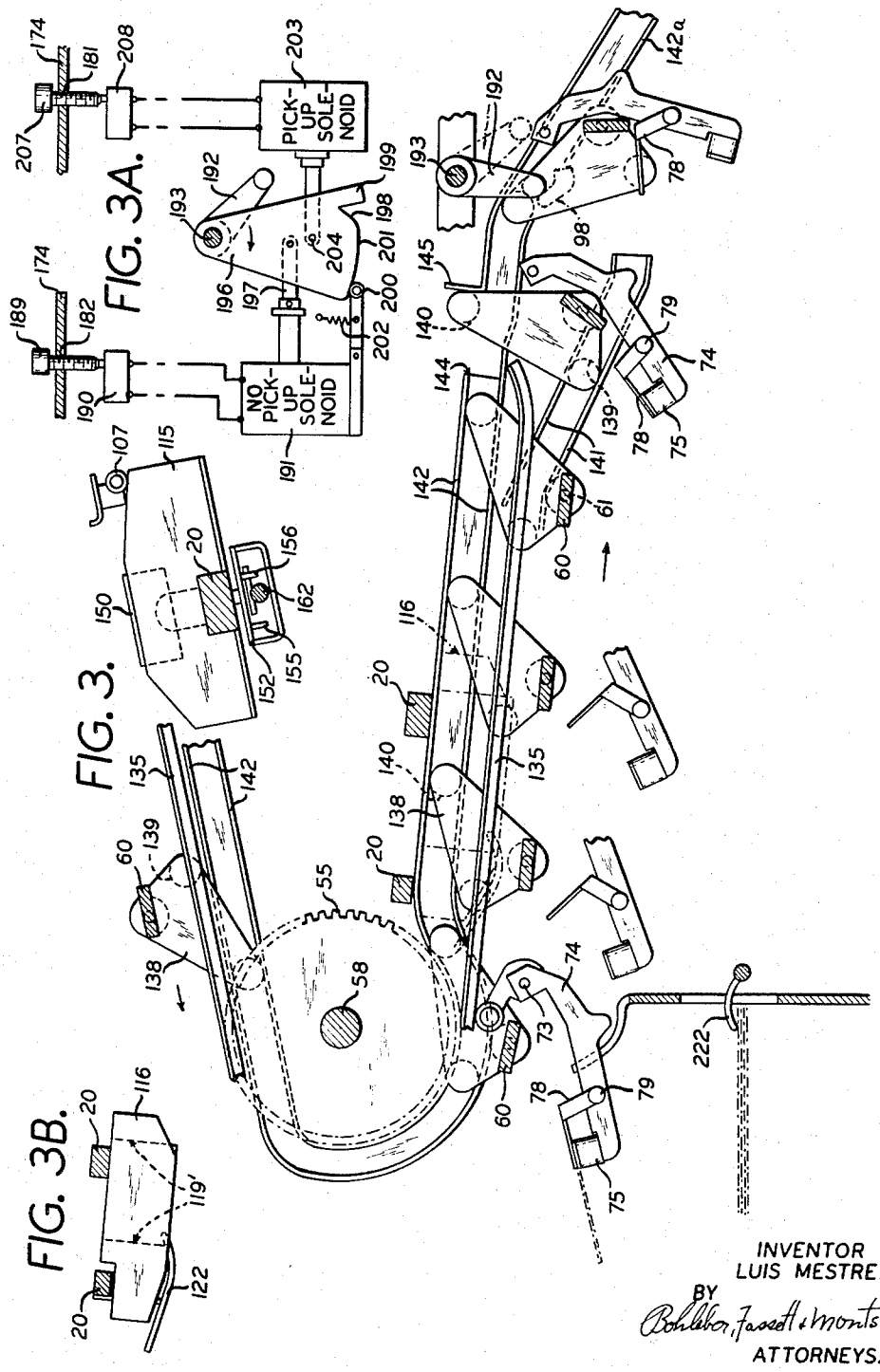


FIG. 3A.

FIG. 3.

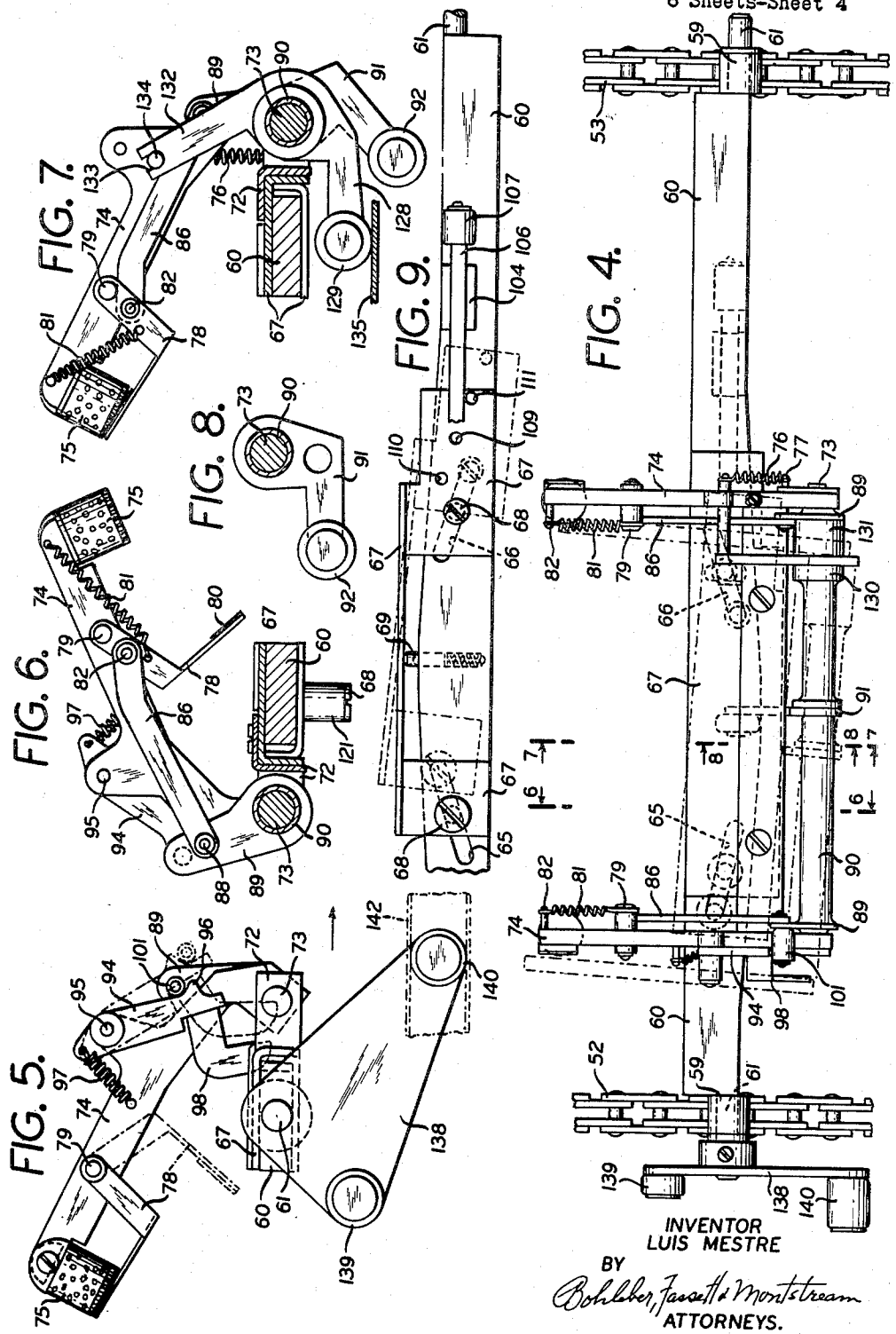
FIG. 3B.

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COLLATING MACHINE

Filed May 31, 1957 6 Sheets-Sheet 4



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COLLATING MACHINE

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FIG. 10.

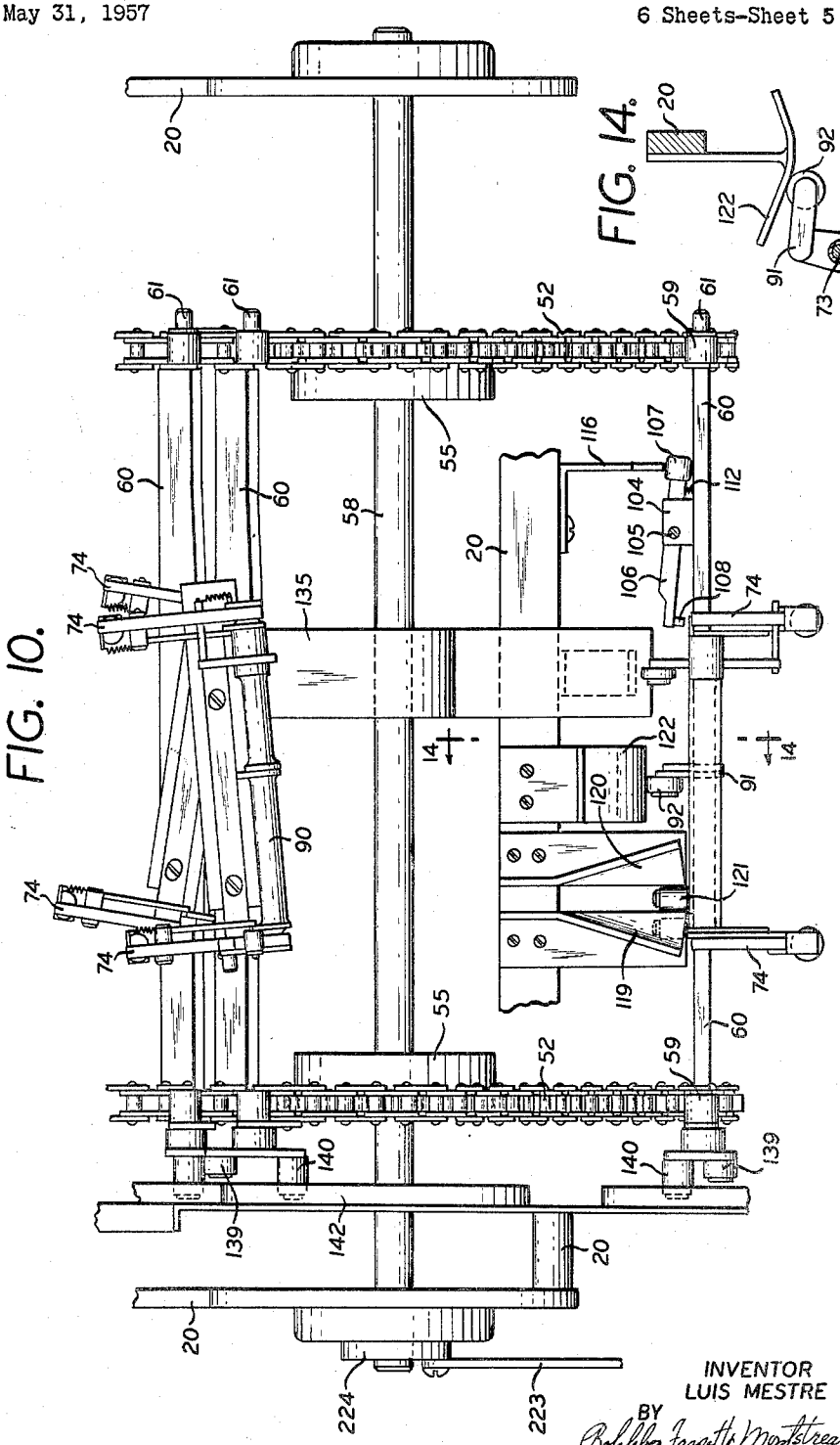


FIG. 14.

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COLLATING MACHINE

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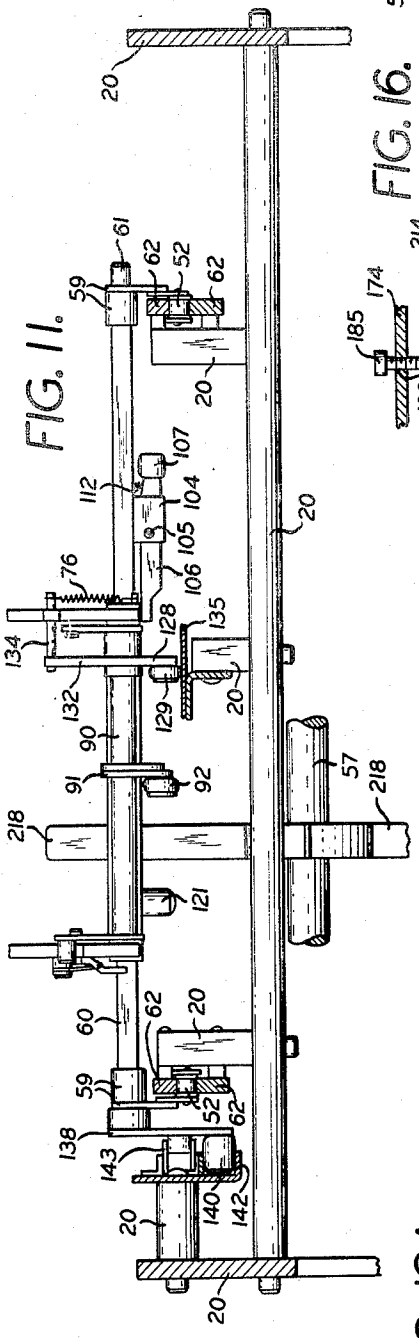


FIG. 11.

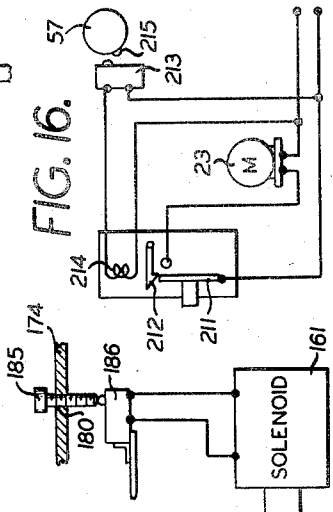


FIG. 16.

FIG. 12.

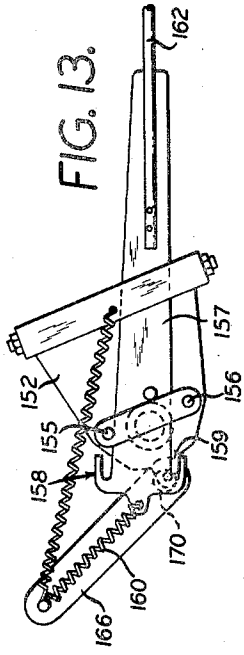


FIG. 13.

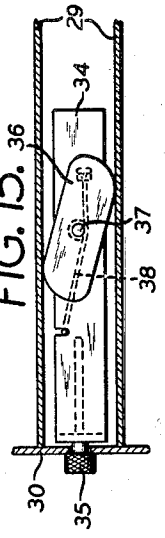


FIG. 15.

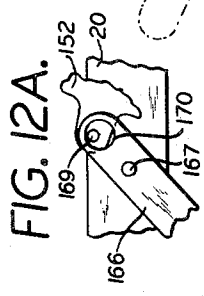


FIG. 12A.

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COLLATING MACHINE

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Application May 31, 1957, Serial No. 662,713

39 Claims. (Cl. 270—58)

The invention relates to a collating machine which withdraws a sheet from each of a series of storage pockets and assembles them together in sequence so that they may be stapled together. Collating machines usually occupy considerable floor space and the collating machine described herein preferably uses a drum with generally radial storage pockets. Each pocket contains a plurality of sheets of the same page and a plurality of sheets of a different page or sheet of a booklet or book to be collated is carried in the other pockets. A sheet is withdrawn from each pocket and carried to an assembling or depositing platform. Here the sheets for one booklet are deposited together in the same relation so that if the booklet for example comprises eight pages, this number of pages is withdrawn from the drum and deposited in one relative or angular position. The next eight pages are then deposited in another relative or angular position with respect to the first so that each set of booklet sheets of eight pages are easily separated from each other.

In a collating machine it is desirable that the machine have considerable flexibility so that the machine may be set up for a book or booklet of few or many sheets up to the capacity of the storage means or drum. Or the machine may be loaded with sheets to be assembled into different books or booklets for example, one book may comprise eight pages, a second book six pages, a third book four pages and so forth and the machine sorts the pages into the proper set and in proper sequence. Again a booklet may have eight pages the same and another booklet may have the same eight pages and one, two, or more additional sheets. The machine also will collate automatically such different books.

It is an object of the invention to construct a collating machine having a new and novel storage drum.

Another object is to construct a collating machine which can be set up with many variations in its operation.

A still further object is to provide a collating drum with holding means for holding a package of sheets in each pocket of the rotating drum which holding means releases the sheets at the position at which the sheets are withdrawn from the pockets.

Another object is to construct a collating machine utilizing efficient and effective clamps for withdrawing a sheet from a pocket of the storage means, gripping or clamping a sheet, transporting each sheet to a delivery platform or position, and releasing the sheet thereon.

A still further object is to provide a collating machine with a new and effective mechanism for assembling a series of sheets on the depositing platform in groups of one or more sheets alternately at two different positions so that they may be readily separated.

Another object is to construct a collating machine with a deposit platform having mechanism to move the platform and pile of sheets downwardly under the control of the pile.

Another object is to provide a collating machine having clamping means which are pivoted from a rearwardly extending position to a forwardly extending position.

A still further object is to have a clamping means which can be selectively closed so that it will not pick up a sheet.

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

Fig. 1 is a side view in reduced size of the entire collating machine;

Fig. 2 is approximately a full-sized view of a series of clamping means carried on an endless band or chain means which clamping means removes one sheet from a pocket of the storage means and clamps or grips the same for transport to and release on a depositing platform;

Fig. 2A is a partial view of the clamping finger tripper;

Fig. 3 is a partial side view of the cam mechanism between the sheet depositing position or end of the machine and pick-up position for reversing or swinging the clamping means to forward position and means for releasing the clamping means lock;

Fig. 3A is a view of the means for selectively closing the clamping means;

Fig. 3B is a partial view showing location of cams;

Fig. 4 is a top view of a sheet clamping means mounted on an endless carrier or chain;

Fig. 5 is a detailed side view of one of the clamp arms with a clamping finger in clamping position and the clamping finger locking means;

Fig. 6 is a side view of a clamping means taken on line 6—6 of Fig. 4 with a clamping finger in open position and the clamping finger operating means;

Fig. 7 is a side view of a clamping arm of the clamping means taken on line 7—7 of Fig. 4 showing the clamp pivoting means;

Fig. 8 shows a roller taken on line 8—8 of Fig. 4 for controlling the closing of the clamping fingers;

Fig. 9 is a bottom view of the shifting means by which the clamping means are shifted to its three positions and the lock for locking the clamping means in each position;

Fig. 10 is an enlarged end elevation of the machine with some of the clamping mechanisms removed showing the clamping means adjacent to depositing position and shows the cam means for restoring the clamping means to central position and the operating means for the clamp frame locking means and other structure;

Fig. 11 is a view of a clamping means as taken on line 11—11 of Fig. 2;

Fig. 12 is a detailed view of the shifting means for shifting the clamping means to its two angular positions;

Fig. 12A is a partial view of the shifting means;

Fig. 13 shows the means for operating a vane by means of which the clamping means is shifted to one side or the other side of central position;

Fig. 14 is a view of the clamp closing cam after deposit of sheet taken from line 14—14 of Fig. 10;

Fig. 15 shows the drum pocket bottom rest; and

Fig. 16 shows the control means for short rotation of the storage drum.

The collating machine in its general aspects provides a main frame 20 of many parts for supporting all of the mechanism. The machine includes a storage means shown particularly as a rotating circular drum 21 having a series of radial pockets therein open at the periphery for holding the various sheets which are to be assembled as a book or booklet. Each pocket is adapted to carry a quantity of sheets of one kind or sheet number. With the circular storage means illustrated the drum rotates continuously. The machine also includes a plurality of clamping mechanisms having clamping means which removes one sheet from each successive or any desired pocket and delivers it to an assembling or depositing platform of any suitable type. Each clamping mechanism is in continuous motion in withdrawing a sheet from a pocket, clamping the sheet for transport to the depositing platform and return to pick-up position at the storage means. The machine particularly shows a depositing platform which is fed downwardly as the sheets or pages are deposited thereon. Finally the machine in-

cludes electrical control means for controlling the desired operation of the machine.

Storage means

The storage means which is adapted to hold the sheets to be collated includes a series of pockets which move successively to pick-up position. The storage means preferably is a circular drum 21 mounted on a shaft 22. The drum is rotated by a motor 23 connected with a reduction gear unit 24 and a suitable connection is made from the reduction gear to the shaft of the drum to rotate it at a uniform speed. The driving means shown includes a chain 24, shaft 25. Suitable gears such as a worm and worm gear may connect shaft 25 with the drum shaft 22.

The drum carries generally radial pockets formed by partitions 29 extending in a general radial direction. Preferably the partitions project not towards the center of the drum but project tangent to the top of a circle having the center of the drum as the center so that in the upper right hand quadrant of the drum, where the sheet pick-up position is located, the partitions and sheets are in an inclined or angular position. In the form of drum illustrated the partitions and sheets are in a more generally level position than if the partitions were radial although this is not essential. The drum has spaced side plates 30 to which the partitions are secured in any desired manner and at least one side plate carries a slot 31 for each pocket.

A pocket bottom rest, Fig. 15, is mounted in the slots 31 so that the depth of the pockets may be adjusted as desired for the length of the sheets S to be stored therein. Since the pockets taper or the partitions 29 are at an angle with respect to each other, an adjustable bottom support is provided. This bottom support or rest includes a bottom bar 34 having a nut 35 by which the bar may be adjusted in the slot of the drum side wall and the pocket. A bottom plate 36 is pivotally mounted on the bottom bar by a pivot 37 and a spring 38 turns the plate to bring its outer edges into contact with the partitions irrespective of their spacing.

Means are provided to hold or clamp the package of sheets in each pocket through substantially three fourths of the revolution of the drum and to release the same at pick-up position of the pockets where a sheet is withdrawn from the pockets. This pocket clamping means (Fig. 1) comprises a pair of pocket clamping plates 41 and 42 each mounted upon spaced pivotal shaft 43 mounted in the side plates of the drum. One plate 41 extends angularly outwardly towards the periphery of the drum and the other plate 42 extends angularly inwardly. A lever 44 is attached to each pivotal shaft and springs 45 connected between the levers for each pair of clamping plates propel the plates with their ends into clamping contact with the package of sheets in its pocket against a partition. Each lever carries a cam roller 46 or follower for engagement with an opening cam 47 which comprises a radial band having a pointed lower end 48 and providing camming surfaces or edges. One roller engages the inner camming surface to swing the inner clamping plates to open or unclamped position and the roller for the other clamping plate engages the upper or outer surface of the radial cam and propels its clamping plates 41 to open position thereby releasing both clamping plates from contact with the package of sheets in its pocket. These pocket clamps are held in unclamped position for approximately 90° of the revolution of the drum by the radial cam through the pick-up position. The radial cam is mounted on the main frame 20. When the rollers ride off of the end of the radial cam at the top of the machine, the springs 45 pull the cam plates to sheet clamping position.

Transporting mechanism

A plurality of spaced clamping mechanisms are provided, each of which picks up the top sheet in its respective pocket of the storage means or drum and transports the sheet to a depositing position or platform. Each clamping mechanism includes a clamping means or gripper mounted on an endless means such as a chain or band which clamping means grips the sheet and carries it to a depositing platform or station. The endless means shown comprises a pair of spaced chains 52 (Fig. 10) each of which is carried on a series of spaced sprockets or wheels 53, 54, 55, three being particularly shown for each chain mounted on shafts 56, 57, 58 respectively. The shafts are rotatably mounted in the main frame. Two pairs of sprocket wheels 53, 54 are provided adjacent the periphery of the storage means or drum and are spaced with respect to the periphery of the drum so that the clamping means contacts the top sheet in a pocket and gradually moves away from the periphery of the drum and in so moving slides the top sheet therewith until it is far enough away from the clamping means to grip the sheet whereupon it is transported to the depositing platform. The span of each chain between the sprocket wheels may be supported by spaced chain guides 62 carried by the main frame and between which the chain travels.

Clamping mechanism

Each chain carries a plurality of spaced brackets 59 secured thereto and projecting in an outward direction. A bearing is provided in each bracket and receives a clamping mechanism including a mounting bar 60 having a pivot pin 61 secured to or integral with the ends of a mounting bar so that the bar is pivotally mounted in a pair of spaced brackets, one carried by each of the chains. A clamping means is mounted on each bar and hence is pivotally mounted in the brackets. There is one clamping mechanism for each pocket in the storage means or drum.

Each clamping mechanism includes a clamping means carried on the mounting means or bar and each bar carries means for movably mounting the clamping means thereon so that it can be shifted to and from at least two lateral positions and preferably to and from three positions namely a center position and a position on each side of center position. This mounting means includes preferably a pair of angularly disposed and spaced slots 65 and 66 (Figs. 4–9) shown particularly in the mounting bar. A clamping means frame 67 shown as of U-shaped construction is mounted for lateral movement on the bar. Pins or screws 68 secured to the clamping means frame extend through the slots so that when the frame and clamping means have been shifted so that the pins are at the left end of their respective slot, the clamping means is tilted laterally and at one angle as viewed in Fig. 4, and when the frame and clamping means is shifted so that the pins are at the right hand end of the slot, the clamping means is positioned laterally and at an opposite angle. The angular shifting of the clamping means is desirable but not essential. In center position, each clamping means is straight or parallel with respect to the longitudinal axis of the machine or the endless chains. The pins or screws in the slots also retain the clamping means frame on the mounting bar. A spring pressed pin 69 may be carried by the mounting bar to engage the clamping means frame.

The clamping means frame carries spaced extensions 72 in which the ends of a shaft 73 are pivotally mounted. A pair of spaced clamping arms 74 are secured to the shaft so that the arms pivot with respect to the clamping means frame. The end of each arm carries a clamping pad 75 which may be of rubber or similar material for engagement with a sheet. A spring 76 having one end secured to the arm and the other end secured to the clamping means frame by a pin 77 normally pivots the clamping arms towards and in contact with the clamping means frame. A clamping finger 78 is pivotally mounted on each arm on a pivot 79 and may have a clamping

pad 80 on its end. A spring 81 connected between the arm by pin 82 and the finger propels the finger to clamping position with its end in contact with the clamping pad on the arm.

Means are provided to pivot the clamping finger to and from clamping position in contact with the clamping pad (Figs. 4–9). A link 86 is provided for each finger connected at one end to its clamping finger 78 by means of a pin 87 and the other end is attached by a pin 88 to a lever 89. These levers are secured to a sleeve 90 which is pivotally and rockably mounted on the shaft 73. Pivoting of the levers relatively to the clamping arms will pull the links and pivot the clamping fingers to open position as shown in Fig. 6 and when released, the springs 86 pull each finger to closed position as shown in Fig. 7. Secured to the sleeve is an arm 91 carrying a cam follower or roller 92 which pivots the sleeve on the shaft and the levers and through the links pivot the clamping fingers to open position.

Means are provided to lock the clamping fingers 78 in open position and the means particularly shown includes a finger locking lever 94 pivotally carried on a pivot 95 mounted on one of the clamping means arms. The locking lever has a locking projection 96. A spring 97 connected between the locking lever and the clamping arm normally retains the clamping lever in locked or finger open position as shown in dot-dash lines in Fig. 5. The locking lever carries a release trigger 98 by means of which the finger lock may be released which is shown as an extension secured to or forming a part of the lock lever. An operating pin 99 (Fig. 2) carried by bracket 100 secured to the main frame engages this release trigger or extension when a clamping means passes at pick-up position when a sheet has been withdrawn far enough from a storage pocket to be clamped, to trip the locking lever and move it to release position. The locking shoulder or projection 96 is engaged by a locking pin 101 carried by the finger operating lever 89 and holds this lever in finger open position. When the locking lever 99 is shifted to the solid line position, Fig. 5, the locking pin is released whereupon the finger is moved to finger closed or clamping position under the influence of its spring 81.

Means are carried by the clamping means mounting bar or means 60 for locking the clamping means and its frame 67 in each of its positions. As shown in Figs. 9, 10 and 11, the mounting means or bar 60 carries a pair of flanges 104 having a pivot 105 on which a locking lever 106 is mounted. One end of this lever carries a cam follower or roller 107. The other end of the lever carries a locking pin 108 which engages in any one of three locking holes 109, 110, 111 carried by the clamping means frame. In Fig. 9 the clamping means is locked in central position. When the clamping means is shifted to the right, the locking pin engages in the hole 111. When the clamping means has been shifted to the left the locking pin engages in the locking hole 110. A spring 112 propels the locking lever to locked position.

Cam means are provided to release the locking means for the clamping means frame at the position in which the clamping means is shifted to the left or right in its position and also when the clamping means is shifted or restored to central position. In the former case just before the clamping means is shifted to one of its side or angular positions, the roller 107 is engaged by a cam 115 (Fig. 3) carried by the main frame 10 during the upper pass between sprockets 54 and 55, which lifts the locking pin out of the central locking hole 109. The clamping means is then shifted after which the roller rides off of the cam and the locking pin enters one of the locking holes 110 or 111 depending upon the direction in which the clamping means is shifted. After the sheet has been deposited on the depositing platform, the frame is shifted or restored to central position, as will be described. Before the clamping means is restored to central position the cam roller or follower 107 engages a cam 116 (Figs. 3, 10) in the lower pass which releases the locking pin from the locking hole. When the clamping means frame has been restored to central position the roller rides off of the cam and enters the central hole 109 to again lock the clamping means frame in central position.

The means or mechanism for restoring the clamping means to central position, Fig. 10, includes a pair of spaced cam plates 119, 120, secured to the main frame so as to engage a clamping means shift follower or roll 121 carried by the clamping means frame after the sheet has been deposited on the deposit platform. This roll may be carried on the screw 68. The cam plates have angular sides spreading outwardly facing towards depositing position or rearwardly. The cam plates are carried by the main frame to engage the shift cam follower on the lower pass of the chains or clamping means. The shift roll or follower engages either the cam plate 119 or 120 depending upon to which side the clamping means has been shifted and shifts the clamping means to central position. The cam plates are spaced apart a distance corresponding with the diameter of the follower or roll so that the clamping means frame is held in central position until the follower 107 for the locking lever 106 for the clamping means frame rides off of its cam 116 and locking the clamping means frame in central position. Just before the clamping frame is shifted, the clamping means passes a cam 122 which engages the finger opening roller 92 and the fingers are moved to open position and locked open by the lever.

The clamping means arms 74 are secured to the shaft 73 carried in the bearings of the extensions 72 of the clamping means frame and the spring 76 connected with one arm and with the clamping means frame propels the arms generally toward the clamping means frame so that the arms if unrestrained pivot into contact with this frame. During the travel of each clamping means on the upper level of the chain the clamping means arms are tilted and held at an upwardly inclined angle by tilt means so that each clamping sheet being transported rests on the succeeding sheet or sheets. This prevents any untoward bending and buckling of the sheets as they lie in overlying relation and move towards the depositing platform. The tilt means extends also to the lower pass.

The tilt means (Fig. 7) for pivoting the arms or clamping means and holding them in this inclined position includes a tilt lever 128 having a roller or follower 129 at its end. The lever is pivotally mounted on the sleeve 90 surrounding the clamping means shaft 73 between two spaced collars 130, 131, carried on the sleeve. This lever has a tilt arm 132 with a slot 133 on the end of the arm in which slot is received a pin 134 carried by one of the clamping arms to form an operating connection therewith. Pivoting of the lever and its cam follower pivots the two clamping arms, since both clamping arms are secured to the clamping means shaft. After the clamping means has passed around the upper sprocket 54 there is a tilt track 135 which is engaged by the track follower and pivots the clamping arms to the tilt position shown in Fig. 2. This tilt track is between the chains and follows in a general way or is parallel with the chains. The tilt track extends the full length of the upper level of the clamping means, continues around the sprocket and extends approximately half way along the lower level to approximately a gap in a cam track, which will be described. Throughout this travel, therefore, the clamping arms are held tilted away from the clamping means frame. The clamping means is held secure during the opening of the clamping fingers by the tilt roller being between the tilt track and the clamping means. After the tilt roller rides off of the tilt track the spring 76 pulls the clamping arms into contact with the clamping means frame. The clamping arms remain in this position until they have passed around the sprockets 53.

Pivoting mechanism for clamping mechanism

It has been described hereinbefore that the mounting bar 60 for the clamping means is pivotally mounted between brackets 59 carried by the endless chains. Mechanism is provided to control the pivotal position of the clamping mechanism including the mounting bar and hence the pivotal position of the clamping means. This pivoting mechanism is in addition to the tilt means. The mechanism for controlling the pivotal movement of the mounting bar and clamping means includes a cam follower plate 138 secured to one of the mounting bar pivot pins 61. This plate carries a short cam follower 139 and a long cam follower 140 spaced from each other and spaced from the pivot pins 61. The cam follower 139 operates in a cam 141 and cam follower 140 operates in cam track 142 which control the pivotal position of the mounting bar. The short follower also engages in a cam track 143.

After a sheet has been deposited on a depositing platform, the clamping arms extend in a rearward direction or in the direction of the depositing platform. The clamping means or arms are then swung forwardly so that they will be brought into position to engage the top sheet in a pocket of the drum. This pivoting of the clamping mechanism and its clamping means is shown in Figs. 2 and 3. The long cam roller 140 is within the cam track 142 formed by spaced side walls. This cam track has a short cap 144 in one side wall and the wall begins again with an upwardly extending abutment 145. The second cam track 14 having a pair of spaced side walls receives a short cam roller 139 just before roller 140 reaches the gap. The track 141 extends downwardly to swing the clamping means to approximately a vertical position, assisted partly by the roller 140 engaging the abutment. The cam track 141 therefore bridges the gap to control the position and pivoting of the clamping mechanism in this interval. The abutment with the descending cam track 141 swings the mounting bar through a substantial angle whereupon the track 141 terminates and the long roller enters the continuation of its cam track. The cam track 142 then has an angularly downwardly extending portion 142*a* which extends outside of the line of travel of the mounting bar pivots 61 and continues to swing the mounting bar as shown in Fig. 2 so that the clamping means now is projected forwardly in a substantially horizontal position or towards the storage means or drum.

As the mounting bar 60 and the clamping means pass around the sprocket 53, the cam track 142*b* curves inwardly towards the shaft 56 of the sprocket so that the clamping means retains an approximately horizontal position as the ends or clamping means of the clamping arms are projected over a package of sheets S in a pocket of the drum. The curve of the cam track also turns the mounting bar 60 and hence the clamping means to bring the clamping pads 75 on the ends of the clamping arms 74 into contact with the top sheet of the package of sheets S in the pocket. This moves the clamping arms away from contact with the clamping means frame 67 so that the spring 76 presses the pads against the top sheet. At the pads move away from the pocket by the divergent paths of the clamping means and the pocket, the top sheet is drawn outwardly and the clamping finger locking lever 94 is released whereupon the finger closes and clamps the sheet between the arm pads and the fingers. The finger locking lever is released when the trigger 98 passes by and is engaged by the operating pin 99.

The endless chain assumes a straight or approximately a straight path between the two sprockets 53, 54, between which the cam track 142 in portion 142*c* is straight and retains the clamping mechanism in somewhat downwardly inclined position. The spring 76 restores the clamping means into contact with the clamping means frame. The cam track 142*c* ends at the sprocket 54 at

the same moment or shortly therebefore the short roller 139 enters the arcuate cam track 143 which retains the clamping means in substantially horizontal position for a portion of its travel. This cam track curves inwardly towards the shaft of the sprocket so that as the mounting bar 60 passes around the sprocket 54, the clamping means is tilted angularly upwardly and the cam track terminates. Just before the cam track 143 terminates, the long roller has entered the mouth of the cam track 142 and retains the mounting bar in substantially horizontal position and the mounting bar with some upward incline. This track continues to the sprocket 55 (Fig. 3) where the cam track moves outwardly and then follows a curvature having the center of the sprocket shaft as a center for a substantial distance around the sprocket shaft where it continues on as the cam track for the lower pass. Because of the change of direction of the endless chain, the clamping means changes from a forward direction to a rearward direction and carries the sheet carried by the clamping means adjacent to a pile of sheets on a depositing platform 146 where the sheet is released. With the cam followers of different lengths and hence with the edges of the cam tracks in different vertical planes, there will be no interference between the cam followers as the respective cam tracks take over control of the pivotal movement of the clamping mechanism and hence the clamping means. The cam tracks are suitably secured to the main frame 20.

Shifting means

In the construction particularly illustrated herein, the clamping means is shifted to at least two positions. This shifting means is used when the sheets are piled on a depositing platform as particularly shown. The means provided to shift the clamping means to one side or the other of a central position in order that alternate sheets or alternate groups of sheets may be deposited on the depositing platform in spaced or angular relation with respect to the previous group of sheets and in alternate relation, will be described. Preferably the shifting means effects a shifting, shown as an angular shifting, of the clamping means so that the sheets are deposited in different angular relation on the depositing platform. Each group or set of segregated sheets can readily be separated from the other groups. The change in the position of the clamping means occurs in the upper level or pass of the clamping means and is between the pick-up position and depositing position.

The shifting of the clamping means is accomplished by a vane 150 (Figs. 3, 12, 13) carried by a pivot 151 pivotally mounted in a part of the main frame 20 such as a cross bar. With the vane in the position shown in solid lines in Fig. 12, the shift roller 121 carried by the clamping means frame engages the vane as the clamping means moves rearwardly with respect thereto and pushes the roller and clamping means to the left. Just prior to the roller engaging the vane the clamping means frame lock lever 106 is released as previously described so that the clamping means may be shifted after which the clamping means lock roller 107 rides off of its cam 115 and the locking means engages the hole 111 to lock the clamping means in the left hand position. Pivoting of the vane to the position shown in dot-dash lines shifts the clamping means to the right and after being shifted it is locked in shifted position by the locking lever pin 108 entering the hole 110.

The vane is shifted from one angular position to the other by shifting a vane operating plate 152 secured to the pivot 151. This vane operating plate carries a pair of spaced stop screws 153 which may be adjusted as to their position and each engages a stop abutment 154 carried by the frame crossbar. This vane operating plate carries a pair of spaced pins 155 one on each side thereof. One pin 155 is engaged by a pull member 157 having a slot 158 on one side. A similar slot 159 is

provided for the pin 156 on the other side or edge thereof. A spring 160 holds the edge of the pull member against the pin so that the pin is received in the slot when the member is pulled. The pull member is connected with a solenoid 161 through a pull rod 162 so that energization of the solenoid pulls the pull member to the right so that the operating pin 155 enters the slot 158 and is pulled to the right. This swings the vane operating plate 15 to the dot-dash position which swings the shifting vane 150 therewith. The spring 160 now pulls the other edge of the pull member into contact with the operating pin 156. A second operation of the solenoid again pulls the pull member to the right so that the pin 156 is engaged in its slot 159 and presses the vane operating plate back across dead center position and it returns to its solid line position.

Means are provided to hold the vane operating plate 152 and the vane 150 in operated position which means includes a lever 166 pivotally mounted on the frame crossbar by a pivot 167 and having a spring 168 connected between the end of the lever and another part which may be the crossbar. The more suitable attachment, however, is with the operating plate 152 as shown. This lever is connected with the vane operating plate through a pin 169 carried by the plate and engaging in a hole 170 in the lever 166 so that the lever is pivoted with the plate but in opposite directions. When the vane operating plate is pivoted towards dash-dot line position, the lever swings upwardly to the same side of center line between pivots until the spring passes over to the other side of the pivot center line whereupon the spring assists in propelling the vane plate and vane to its dot-dash position and holds it and the vane in this position. A second operation of the solenoid reverses the operation and carries the lever and spring to the other side of dead center or the pivot center line so that the spring both partly operates the plate and holds the plate and the vane in each of the two positions.

Control means

Control means are provided to operate the shift means whereby the clamping means is shifted to one side or the other of center position on the upper pass or level of the movement of the clamping means between pick-up position and depositing position. Control means are also provided to selectively open desired clamping means in the lower passage or level of the movement of the clamping means from or between depositing position to pick-up position. These control means are embodied in one unit which includes preferably a disk 174 (Fig. 1) driven by the machine such as a chain 175, a sprocket 176 on the drum shaft 22 and a sprocket 178 secured to a shaft 179 mounted on the main frame so that the disk rotates at the same speed as the drum, that is each makes one revolution in the same time. The disk has three rows of holes 180, 181, 182 concentric with the center of the disk. There is one such hole in each circle of holes for each pocket of the storage drum and hence for each clamping means of the machine. This control means may be connected with any driven part of the collating machine such as the drive connection or the sprockets for the endless chains for the clamping means. Since, however, it is more convenient to relate it with the pockets of the drum, it is adjacent to the drum and mounted on the main frame at the side of the drum.

An operating or contact screw or pin is inserted in a hole corresponding with a pocket in the drum and hence the clamping means for that pocket which is to be controlled. Any series of holes may control the desired part of the collating machine. The outer circle of holes has been selected for controlling the number of pages in each book or booklet. That is a control pin or screw 185 (Fig. 12) in a hole shifts the vane to one of the angular positions to shift one or more of the clamping means as each passes the vane. The control pin or screw is inserted or advanced in the hole at the position in which the vane is to be shifted. In other words, if there are five empty holes between succeeding operating pins or screws, then the vane is shifted for every sixth clamping means. Hence six successive clamping means are shifted to the same lateral position as they pass the vane. Six pages are therefore off-set at one position or angle upon the depositing platform. The screws in this circle close a switch 186 which energizes the solenoid 161 for changing the angular position of the vane. The next screw again closes the switch which again energizes the solenoid and operation of the solenoid restores the vane to its first angular position and the clamping means are shifted to the other lateral position. Each succeeding control pin therefore changes the angular position of the vane.

The angular position of the vane may be shifted once for each revolution in which event the sheets picked from all of the pockets are positioned in one position and the sheets in all of the pockets in the next revolution of the drum are positioned in the other position. A control pin or screw in each hole shifts the vane for each clamping means passing the vane. Any other arrangement may be made such as for a fifty pocket drum, there may be five changes of ten sheets each. Likewise the control means may be set for different numbers such as 6, 8, 10, 12 and 14 or any other arrangement.

Selecting means

The inner circle of holes 182 receives one or more control pins or screws 189 (Fig. 3A) to operate a switch 190 when it passes the same in the rotation of the control disk 174. It will be recalled that the clamping means is opened to deposit a sheet in deposit position by the cam 122 which opens each pair of the clamping fingers and they are locked in open position. This switch 190 is connected with a solenoid 191 which moves a tripper 192 carried on a shaft 193 to its solid line position Fig. 3 for selectively engaging the lock release lever or trigger 98 for the clamping fingers at the lower level or pass of the clamping means. In this position the tripper is in position for engagement with the lock release lever for the finger locking means. The clamping fingers, therefore, are again closed so that when the clamping means pass into the drum pocket they do not pick-up or clamp a sheet in the pocket.

The tripper operating means includes a tripper plate 196 secured to the shaft 193 and connected with the solenoid 191 by a suitable connection 197 pinned to the plate. Energization of the solenoid 191 pulls the tripper to the left as shown in Fig. 3A. The tripper plate has a notch 198 and a stop 199 so that when the tripper plate is pulled to the left a roller 200 rides over a surface 201 and is pulled into the notch by a spring 202 to releasably or resiliently retain the roller in the notch. The stop 199 is engaged by the roller so that it does not override the notch. A second solenoid 203 is also connected to the tripper plate by a pin 204 so that when energized it pulls the tripper plate and the tripper 192 to the right or to the dot-dash position of Fig. 3.

The middle circle of holes 181 receives one or more control screws or pins 207 which when each passes a switch 208 it closes its contacts and this energizes the solenoid 203 to swing the tripper away from the path of travel of the release lever for the locking means for the clamping finger as shown in dot-dash lines in Fig. 3. In this position of the tripper the locking lever for each clamping means or clamping fingers is not engaged as it passes so that the clamping fingers or clamping means remains open. When the clamping means enters a pocket of the drum at the pick-up position, a sheet is picked up.

With this control means and tripper, the sheet in any pocket or pockets may be selectively picked-up or passed by the clamping means as desired. One purpose of this

control or rejection of sheets may be desirable for example if one book or group of sheets includes pages 1 to 20 and the next booklet may have the same pages from 1 to 15, excluding pages 16 to 20. Obviously any desired selection or rejection of sheets from any particular pocket or pockets may be made.

It has been stated that a control screw or pin may be inserted in any desired hole of the control disk. It is clear that each hole may have a screw (as shown) or pin inserted or screwed farther into the hole to bring it into contact with its respective switch or withdrawn outwardly so that it does not contact its switch. Likewise either the control disk may rotate and the switches be fixed, as particularly illustrated, or the disk may be fixed and the switches or switch means rotate. It is necessary only that the disk or the switches rotate with respect to the other.

Short drum control

Means are provided, as shown in Fig. 16, to operate the storage drum for a short portion of a rotation so that the pockets may be filled with sheets. By closing a switch 211, the switch is held closed by a latch 212 and the motor is energized to drive the machine and rotate the drum. A switch 213 is connected with a latch release coil 214 so that when the switch is closed the coil is energized to release the latch and switch 211 is opened. The latch release switch 213 is closed after the drum has rotated a portion of a full revolution. The operator for switch 213 may be a ridge 215 carried by a collar on the sprocket shaft 57 or any other part of the machine. The first switch opens when the drum has rotated about four or five pockets whereupon rotation stops. The top pockets with their pocket clamps open then may be filled wtih sheets and the switch again operated to rotate the drum another short part of a revolution.

When a sheet is clamped by the clamping means at pickup position, a buckle or bend may exist between the two spaced clamps. To straighten the sheet a plurality of flexible blades 218 (Fig. 2), four being shown, are carried by a collar 219 mounted upon the sprocket shaft 57 and rotating therewith. The blades press or strike the clamped edge of the sheet between the clamping arms which straightens the sheet and removes the bend.

Any form of depositing device may be used upon which the sheets are deposited. The depositing device particularly shown is a platform 146 having feed means to move the platform downwardly. The downward movement is under the control of a feeder finger 222 which is periodically brought into contact with the top sheet of the pile on the platform through mechanism driven from a link 223 connected off center to a collar carried by the sprocket shaft 58. If the pile is too high, the finger does not descend as far which trips a feed mechanism and the table is lowered until the greater descent of the trigger finger disconnects the feed mechanism.

The endless means or chains have a driving connection with the motor or with the storage means or drum such as a chain 277 with suitable sprockets. The sharper curve in the cam track 142 at the rear sprocket flips the sheet rearwardly as the clamping means pass around the sprocket so that the sheet is laid flat on the depositing platform.

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

What is claimed is:

1. A collating machine for sheets and the like comprising a main frame, storage means carried by the main frame having a plurality of pockets of a size to carry a plurality of sheets, mounting means mounting the storage means for movement to bring the pockets successively to pick-up position where a sheet is removed from a pocket, a depositing platform, a plurality of clamping mechanisms each including sheet clamping means, the sheet clamping means including a fixed arm and a pivoted finger movable towards and away from the fixed arm to close and open the clamping means, endless means mounting the clamping mechanisms in spaced relation and for movement from adjacent the depositing platform to pick-up position adjacent the storage means and return, means to close the clamping means at a pocket at pick-up position, means to open the clamping means at the depositing platform, and driving mechanism connecting the storage means and the endless means to move both means.

2. A collating machine as in claim 1 in which the endless mounting means is a pair of spaced flexible band means, wheel means mounting each flexible band means including a pair of wheels at depositing position, a pair of upper and lower wheels spaced from each other at the pick-up position and spaced at different distances relatively to the storage means to move the clamping means gradually away therefrom between the spaced wheels, and means mounting the wheels on the main frame.

3. A collating machine as in claim 1 in which the clamping mechanism includes mounting means pivotally mounting the clamping means on the endless means, and means carried by the clamping mechanism and by the main frame to pivot the clamping means forwardly in their movement between the depositing position and the pick-up position.

4. A collating machine as in claim 1 in which the clamping means includes a clamping arm, a clamping finger pivotally mounted on the clamping arm and movable to clamping and open positions, a spring connected with the clamping finger propelling the finger to closed position, means locking the clamping finger in open position, means to open the clamping finger at depositing position, and means to release the locking means at pick-up position.

5. A collating machine as in claim 4 including a second release means movably carried by the main frame at a position following the clamping means opening means to release the locking means for the clamping fingers, and means to move the release means to and away from release position.

6. A collating machine as in claim 5 in which the means to move the release means includes a solenoid to move the release means to release position, a solenoid to move the release means away from release position, a switch to energize each solenoid, and control means connected with the driving mechanism to operate the switches.

7. A collating machine as in claim 1 including mounting means for the clamping means for movably mounting the clamping means for movement to at least two lateral positions, shifting means between the pick-up position and depositing position to shift the clamping means alternately to each position, and means to retain the clamping means in each lateral position.

8. A collating machine as in claim 7 including means to lock the mounting means for the clamping means in each lateral position, and means located adjacent the shifting means for the clamping means to release and reengage the locking means for the mounting means for the clamping means.

9. A collating machine as in claim 7 in which the shifting means includes a cam follower carried by the clamping means, a pivoted vane pivotally mounted in the main frame and in the path of the cam follower upon movement of the clamping means between pick-up position and depositing position, and means to alternately pivot the vane to and from its two angular positions.

10. A collating machine as in claim 1 in which the clamping mechanism includes mounting means for the clamping means for movably mounting the latter to three positions namely a central position and a lateral position on each side of the central position, shifting means po-

sitioned between the pick-up position and the depositing position to selectively move the clamping means to one lateral position, means between the depositing position and the pick-up position to move the clamping means to central position, and retaining means to retain the clamping means in each position.

11. A collating machine as in claim 10 in which the mounting means includes a pair of spaced slots, the slots being angularly directed and of opposite angularity to angularly shift the clamping means to either side of central position, and pins engaging in the slots.

12. A collating machine as in claim 10 in which the retaining means is a locking lever carried by the mounting means to clock the clamping means in each position, and means to release the locking lever from locked position prior to lateral shifting of the clamping means and restore the locking lever to locked position when the clamping means has been shifted.

13. A collating machine as in claim 10 including a cam follower carried by the clamping means, a pivoted vane pivotally mounted on the main frame and in the path of the cam follower upon movement of the clamping means between pick-up position and depositing position, and means to alternately pivot the vane to and from each of its two angular positions.

14. A collating machine as in claim 10 including a cam follower carried by the clamping means, a pair of spaced angular cams carried by the main frame and located to be engaged by the cam follower on movement of the clamping means from depositing position to pick-up position.

15. A collating machine as in claim 10 in which the shifting means to selectively move the clamping means to lateral position includes a cam follower carried by the clamping means, a pivoted vane mounted on the frame in the path of the cam follower, an operating plate secured to the pivoted vane and having a pair of spaced stops, fixed stop means engaged by the spaced stops, spring means connected with the operating plate to hold a spaced stop on the plate against the fixed stop means, and means to move the operating plate from one stop position to the other.

16. A collating machine as in claim 15 in which the means to move the operating plate from one position to the other is a solenoid, and switch means operated by the driving mechanism to energize the solenoid.

17. A collating machine as in claim 15 including a pair of spaced plate pins carried by the operating plate, a pull rod having a pair of spaced notches spaced apart less than the spacing of the spaced plate pins and mounted for lateral movement, and means to laterally retain the pull rod with a notch in alignment with one of the plate pins.

18. A collating machine as in claim 1 including mounting means to pivot the clamping mechanism in its movement from depositing position to pick-up position from a rearwardly extending position to a forwardly extending position comprising a cam track adjacent the path of movement of the clamping mechanism, and means carried by the clamping mechanism engaging in the cam track.

19. A collating machine as in claim 18 including a pair of spaced brackets carried by the endless means for each mounting means, a shaft extending from each end of the mounting means and pivotally mounted in a bracket, a cam follower plate secured to a shaft, a pair of cam followers carried by the cam follower plate spaced from each other and from the shaft, a first and second cam tracks between depositing position and pick-up position each receiving one of the cam followers to swing the mounting means and clamping means from rearwardly extending position to forwardly extending position.

20. A collating machine as in claim 19 including wheel means at the storage means, and a pair of spaced wheel means at the depositing platform to mount the endless means, in which the first cam track extends from the wheel means at the pick-up position, around the shaft for the wheel means at deposit position and continuing around the shaft for the lower wheel means at pick-up position, and a third cam track for the other cam follower at pick-up position beginning and ending adjacent the ends of the first cam track to retain the clamping means in generally horizontal position.

21. A collating machine as in claim 1 including pocket clamping means in each pocket, and means operable at pick-up position to open the clamping means.

22. A collating mechine as in claim 1 in which the storage means is a drum, means mounting the drum for rotation with its periphery adjacent the movement of the clamping mechanism, normally closed pocket clamping means in each pocket, and a cam carried by the main frame adjacent to the drum to open the pocket clamping means at pick-up position.

23. A collating machine comprising a main frame, storage means carried by the main frame having a plurality of pockets, mounting means mounting the storage means for movement to bring the pockets successively to pick-up position where a sheet is removed from a pocket, a depositing platform; an endless means mounted for movement from adjacent the depositing platform to pick-up position adjacent the storage means and return; a plurality of clamping mechanisms carried in spaced relation on the endless means each including sheet clamping means, and mounting means pivotally mounting the clamping mechanism, means to close the clamping means at pick-up position, means to open the clamping means at the depositing platform, pivoting means between the depositing platform and the pick-up position to pivot the clamping mechanism from rearwardly extending to forwardly extending position, means at the storage means to retain the clamping means in generally horizontal position for engaging the top sheet in its pocket, and driving mechanism connecting the storage means and the endless means.

24. A collating machine as in claim 23 including pivot means pivotally supporting the clamping means on the mounting means, a lever connected with the clamping means and having a track follower, and a tilt track carried by the main frame extending from adjacent the pick-up position to the opening means for the clamping means and engaged by the track follower to tilt the clamping means on the mounting means.

25. A collating machine comprising a main frame, storage means carried by the main frame having a plurality of pockets and movable to bring the pockets successively to pick-up position, a depositing platform; endless means mounted for movement from adjacent the depositing platform to pick-up position and return; a plurality of clamping mechanisms carried by the endless means in spaced relation each including sheet clamping means, a spring to close the clamping means, means locking the clamping means in open position, and mounting means pivotally mounting the clamping mechanism; release means at pick-up position engaging the locking means to release the same and close the clamping means, means to open the clamping means at the depositing platform, pivoting means between the depositing platform and the pick-up position to pivot the clamping mechanism from rearwardly extending to forwardly extending position, movable release means located adjacent the next aforesaid means to engage the locking means for the clamping means to release the same, means to move the movable release means to and from releasing position, means at the storage means to retain the clamping means in generally horizontal position for engaging the top sheet in its pocket, and driving mechanism connecting the storage means and the endless means.

26. A collating machine as in claim 25 in which the means to move the movable release means includes a solenoid connected with the movable release means to

move the latter to releasing position, a second solenoid connected with this removable release means to move the latter away from releasing position, a switch connected with each solenoid, and control means driven by the drive mechanism to operate the switches.

27. A collating machine as in claim 26 in which the control means includes a plate having a first series of switch contactor receiving means providing a switch contact receiving means for each clamping means and a second series of contactor receiving means providing a contactor receiving means for each clamping means, and at least one switch contactor for each series of contactor receiving means.

28. A collating machine as in claim 25 including pivot means pivotally supporting the clamping means on the mounting means, a lever having a track follower connected with the clamping means, and a tilt track carried by the main frame and adjacent the movement of the clamping means and extending from adjacent the pick-up position to the opening means for the clamping means and engaged by the track follower to tilt the clamping means on the mounting means and to hold the clamping means.

29. A collating machine comprising a main frame, storage means carried by the main frame having a plurality of pockets and movable to bring the pockets successively to pick-up position, a depositing platform, endless means extending between the storage means and the depositing platform and return, a plurality of spaced brackets, means carried by the endless means, a clamping mechanism mounted in each bracket means each including sheet clamping means, means to close the clamping means at a pocket at pick-up position of the storage means, means to open the clamping means at the depositing platform, mounting means for each clamping mechanism pivotally mounting the latter in the bracket means including a shaft extending from each end of the mounting means and pivotally mounted in the bracket means, means to pivot the clamping mechanism from rearwardly extending to forwardly extending position including a cam follower plate secured to a shaft, a pair of cam followers carried by the cam follower plate spaced from each other and from the shaft, a first cam track between depositing position and pick-up position and receiving one of the cam followers, a gap in the first cam track, a second cam track spaced from the first and extending on each side of the gap and receiving the other cam follower, and driving mechanism operatively connecting the storage means and the endless means.

30. A collating machine as in claim 29 including an upwardly extending abutment at the end of the gap of the first cam track.

31. A collating machine as in claim 29 including means pivotally mounting the clamping means on the mounting means, a tilt track follower carried by the clamping means, and a tilt track extending from adjacent the storage means to the gap in the first track and engaged by the tilt track follower.

32. A collating machine as in claim 29 including means mounting the clamping means on the mounting means for lateral movement thereon to at least two lateral positions, means to retain the clamping means in lateral position, and shaft means between the storage means and the depositing platform to shift the clamping means alternately to each lateral position.

33. A collating machine as in claim 32 including control means connected with the shift means to selectively operate the latter.

34. A collating machine as in claim 32 in which the retaining means is a shift means lock, and means at the shift means to release and restore the shift lock means before and after respectively of the shifting of the clamping means.

35. A collating machine as in claim 29 including means mounting the clamping means on the mounting means for movement thereon from a central position to one of two lateral positions each side of central position, centering means between the depositing platform and the storage means to restore the clamping means to central position, means to retain the clamping means in each position, and means between the storage means and the depositing platform to shift the clamping means alternately to each lateral position.

36. A collating machine as in claim 35 including control means connected with the shift means to selectively operate the latter.

37. A collating machine as in claim 35 in which the retaining means is a shift locking means, means at the shift means to release and restore the shift locking means before and after shifting of the clamping means, and means at the centering means to release and restore the shift locking means before and after respectively of the centering of the clamping means.

38. A collating machine for sheets and the like comprising a main frame, storage means carried by the main frame having a plurality of pockets, mounting means mounting the storage means for movement to bring the pockets successively to pick-up position where a sheet is removed from a pocket, a depositing platform spaced from the storage means, a plurality of clamping mechanisms each including sheet clamping means, endless means mounting the clamping mechanisms in spaced relation and for movement from adjacent the depositing platform to pick-up position adjacent the storage means and return, means to close the clamping means at a pocket at pick-up position, opening means to open the clamping means at the depositing platform, mounting means for one of the parts including the sheet clamping means and the oepning means mounting the part for movement to and from one of two positions, and means to shift the two position part to and from each of its positions to deposit a series of one or more sheets alternately in relatively spaced overlying relation on the depositing platform.

39. A collating machine for sheets and the like comprising a main frame, storage means having a plurality of pockets, mounting means mounting the storage means on the frame for movement to bring the pockets successively to pick-up position where a sheet is removed from a pocket, a depositing platform spaced from the storage means, endless means mounted on the main frame for movement from adjacent the depositing platform to pick-up position adjacent the storage means and return, a plurality of clamping mechanisms carried in spaced relation on the endless means and each including sheet clamping means which open and close and mounting means mounting its clamping means on the endless means, means to close the clamping means at a pocket at pick-up position, mechanism to deposit sheets in position on the depositing platform including opening means to open the clamping means at the depositing platform and abutment means engaging an edge of the sheets, mounting means carried by the frame to mount the opening means, one of said mounting means mounting its means for movement to and from one of two positions, means to retain the two position part in each of its two positions and means connected with said two position means to shift the same to and from each position to deposit a series of one or more sheets alternately in relatively spaced overlying relation on the depositing platform.

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