

Feb. 9, 1954

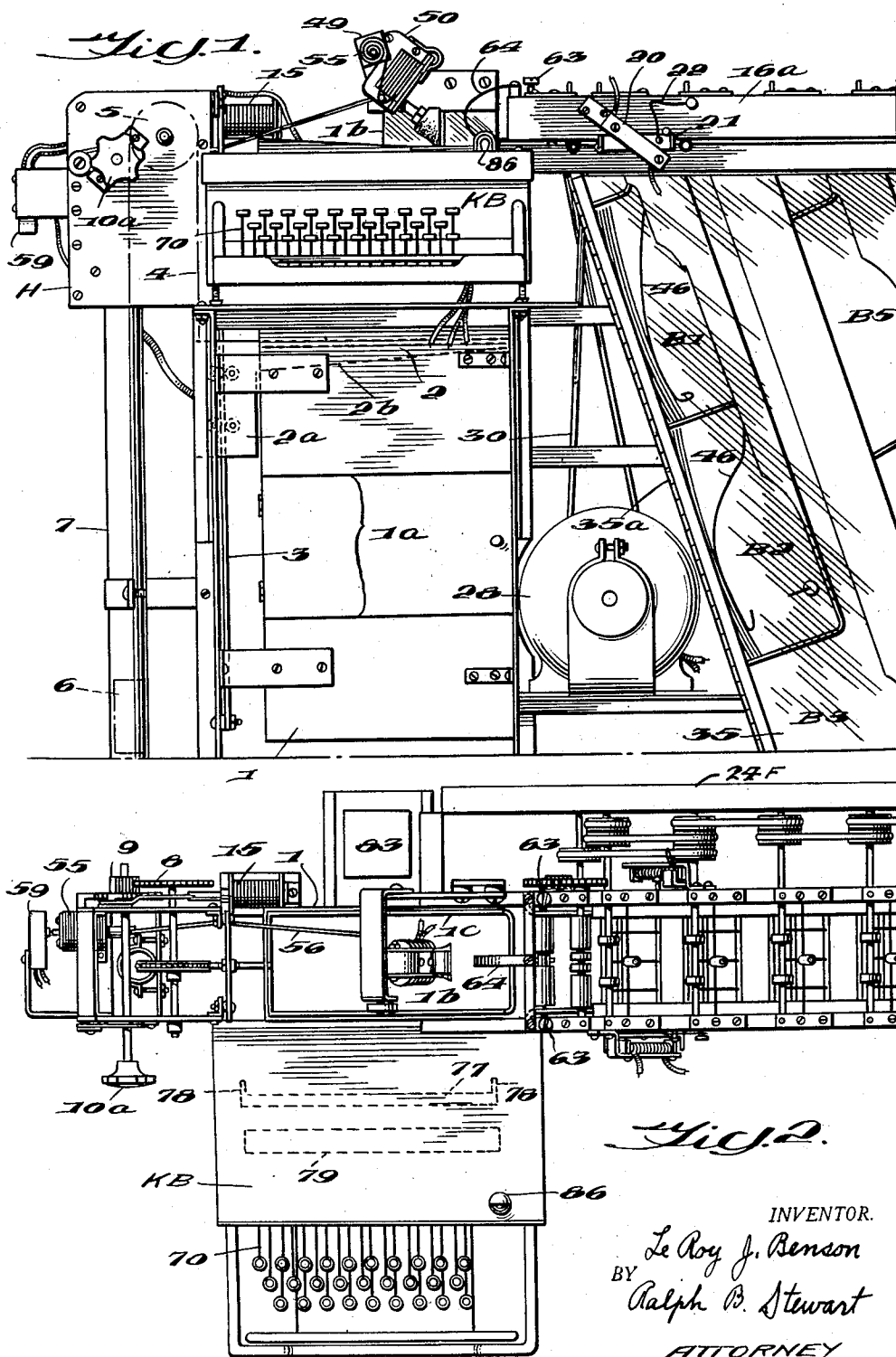
LE ROY J. BENSON

2,668,706

CHECK SORTING MACHINE

Filed April 11, 1952

4 Sheets-Sheet 1



Feb. 9, 1954

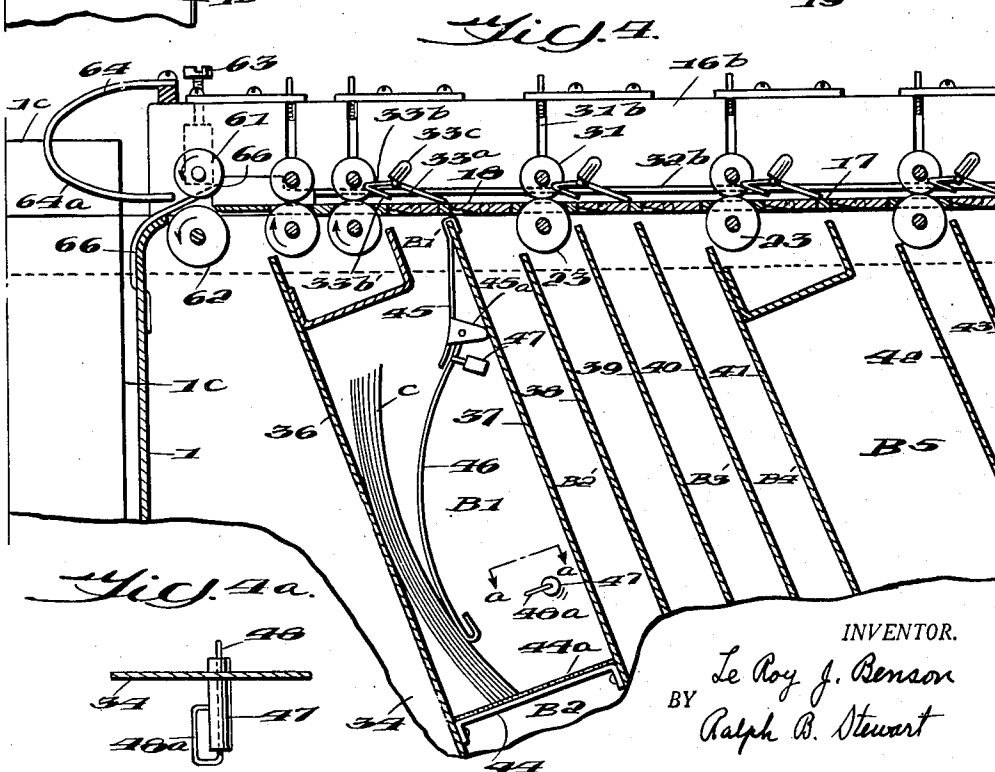
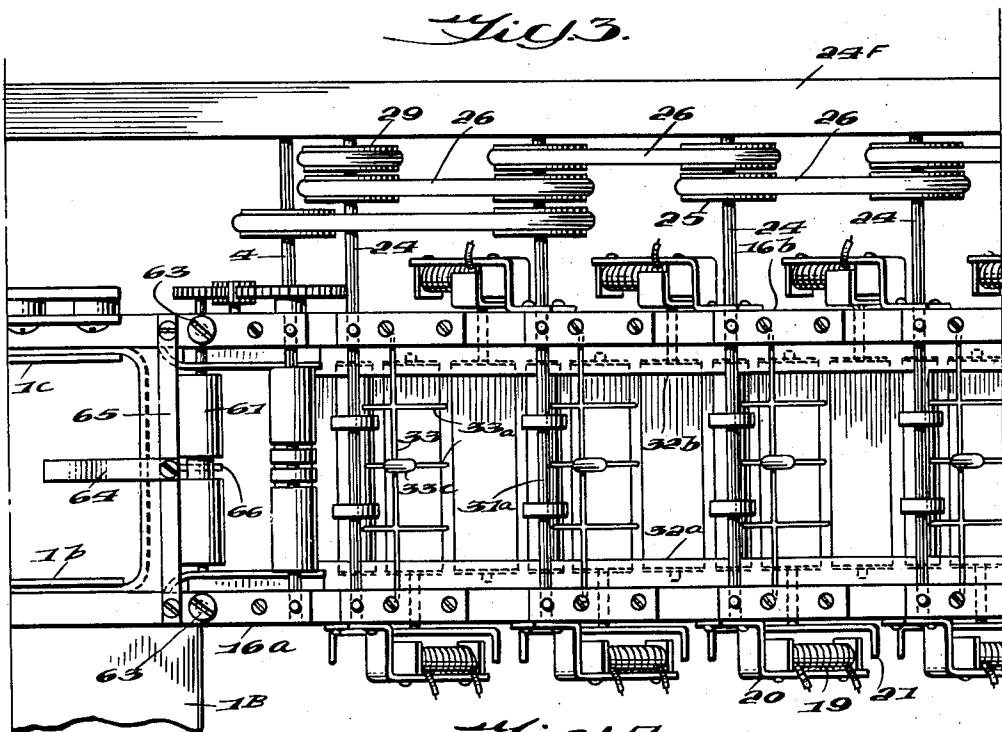
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CHECK SORTING MACHINE

Filed April 11, 1952

4 Sheets-Sheet 2



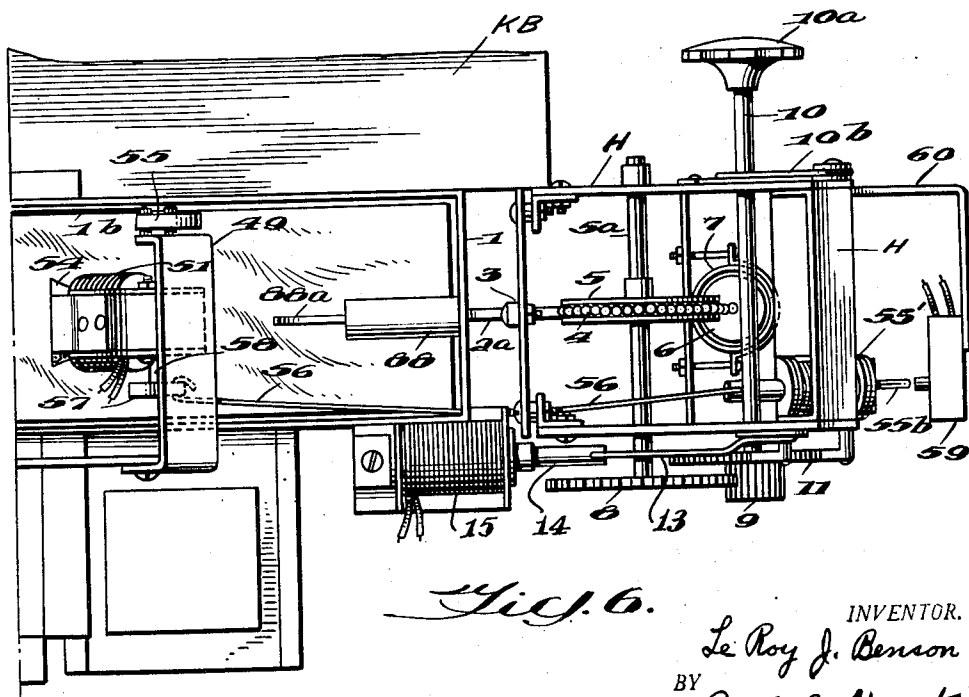
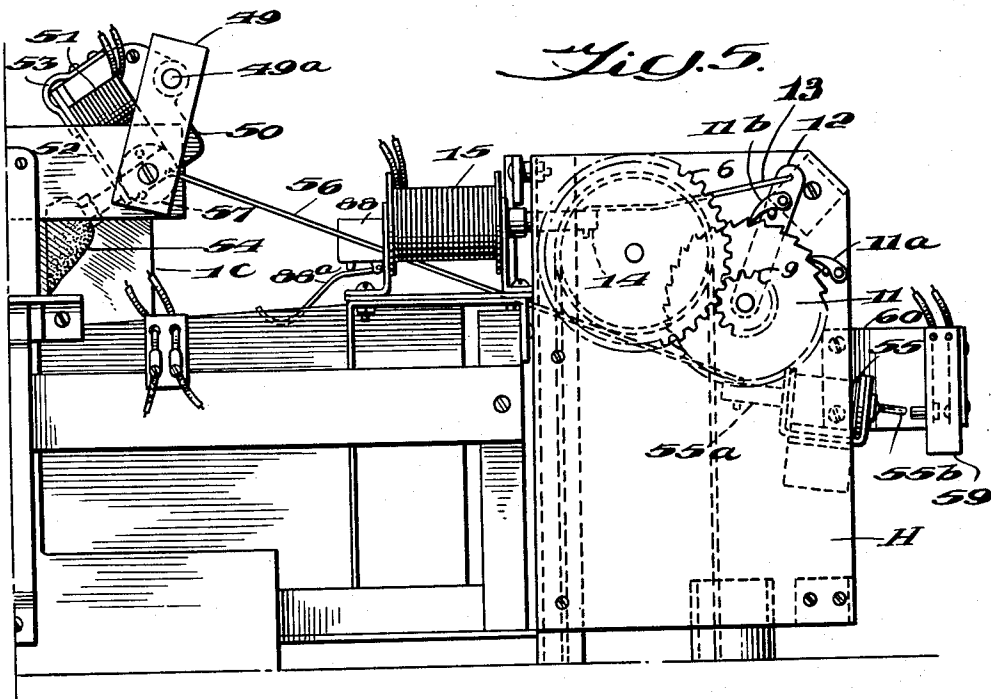
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4 Sheets-Sheet 3



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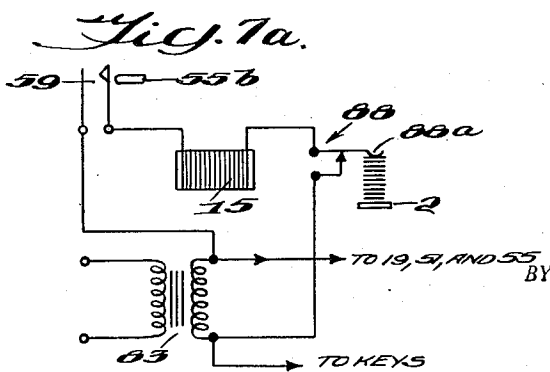
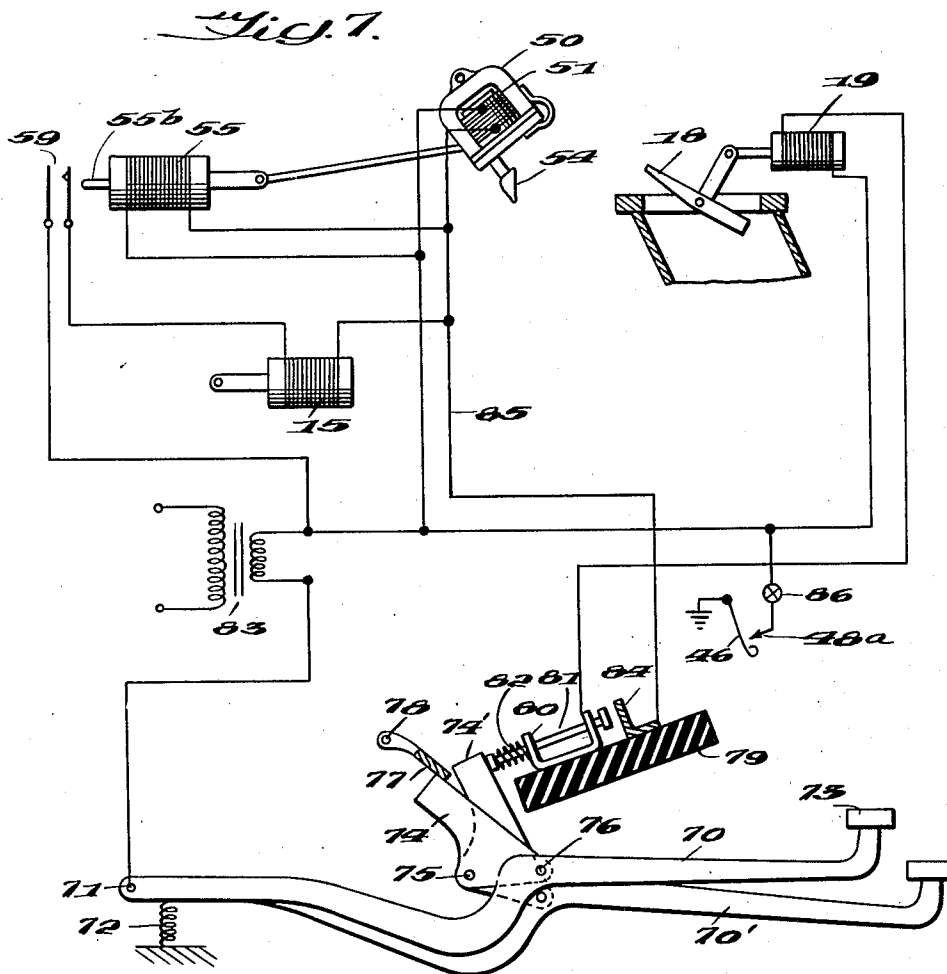
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CHECK SORTING MACHINE

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4 Sheets-Sheet 4



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2,668,706

CHECK SORTING MACHINE

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Application April 11, 1952, Serial No. 281,797

2 Claims. (Cl. 271—18)

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This invention relates to a sorting machine, and while it is designed especially for sorting checks, it is capable of use in sorting similar documents or articles such as vouchers, receipts, paper money and the like. Accordingly, in the following description, the term "check" is employed for convenience of description only and is not used by way of limitation.

This application is a continuation-in-part of my earlier application Ser. No. 157,820, filed April 24, 1950.

My invention is concerned with a sorting machine of the type having a bin for receiving a stack of checks to be sorted, the stack being supported upon a vertically-movable bottom or platform in the bin, a feeding device for removing the top check from the stack and feeding the check to a conveying guideway adjacent the stack, a keyboard arranged adjacent the stack and having a number of key-controlled devices for selecting and operating any one of a number of tiltable gates arranged at spaced stations along the length of the guideway and for simultaneously operating the feed devices to move the uppermost check into the conveying guideway. As the check is conveyed along the guideway and reaches the selected station, the tilted gate at the selected station will deflect the check downward into a suitable storage bin.

The present invention is concerned with the arrangement for feeding the checks from the top of the stack into the guideway, and also the arrangement for automatically elevating the stack.

Specific objects of the invention are:

(a) To devise an improved feeding device for removing the top check from the stack, the improved feeding device involving a friction element arranged to engage the top check on the stack and to be continuously vibrated at the frequency of the local power supply current, such as 25, 50 or 60 cycles per second.

(b) To provide an improved arrangement for automatically elevating the check stack to maintain the top of the stack in proper position for the operation of the check feeding device. In prior arrangements of this type, the check stack is moved upwardly into contact with a fixed stop and is pressed against the stop by spring pressure or other biasing force, but in my machine the top of the stack does not engage a fixed stop and no pressure or other force is exerted on the top check, except the force from the feeding element.

A preferred form of my invention is illustrated

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in the accompanying drawings in which Figure 1 is a side elevational view showing a portion of a check-sorting machine embodying my improved feeding device.

Figure 2 is a plan view of Figure 1;

Figure 3 is a plan view on an enlarged scale with respect to Figure 2 showing the details of the horizontal guideway of the machine;

Figure 4 is a sectional view of Figure 3 taken on a vertical plane just inside of the guideway wall 16a in Figure 3;

Figure 4a is a sectional view of Figure 4 taken along the line a-a;

Figure 5 is a rear elevational view of a portion of the machine showing the ratchet arrangement for elevating the check platform;

Figure 6 is a plan view of Figure 5;

Figure 7 is a diagram showing the electric control circuits embodied in the machine, and Figure 7a is a diagram showing a modification of Figure 7.

Referring to the drawing, the bin for receiving the stack of checks is shown at 1, and this bin is of rectangular cross-section and is supported in a vertical position by a suitable frame. The bin is provided with a movable bottom or platform 2 which is mounted upon a carriage 2a arranged for vertical sliding movement on a vertical rod 3. The platform 2 is supported in a horizontal position upon an arm 2b extending from the carriage 2a through a vertical slot formed in the rear end wall of the stack bin. A part of the front side wall of the bin shown at 1a in Figure 1 is formed as a hinged door through which access may be had to the bin for the purpose of placing a stack of checks upon platform 2. It will be understood, however, that the checks may be placed upon the platform through the upper open end of the bin if desired. A pair of plates of transparent material 1b and 1c are arranged against the inner faces of the rear and front side walls of the stack bin and project above the upper edge of the bin for a short distance as shown in Figures 1, 4 and 5. These plates effectively extend the height of the side walls without obstructing the vision of the operator in reading the data in the top check.

The carriage 2a of the movable platform 2 is counter-weighted by means of a suitable chain 4 passing over a pulley 5 adjacent to the other end of the bin and having attached to its free end a counter-weight 6 which is arranged for vertical sliding movement within a guide tube 7.

As shown in Figures 5 and 6, the pulley 5 is mounted upon a shaft 5a which is journaled

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within a suitable housing H arranged at the back end of the stack bin. Shaft 5a carries a gear 6 on one end thereof which meshes with a pinion 9 carried on the end of a shaft 10 which also is journaled in the housing H. The shaft 10 is provided at one end with an operating knob 10a and at the other end is provided with a ratchet wheel 11 which is engaged by a pawl 11a which is pivoted to the housing H. Pulley 5 is formed at its periphery to have positive driving engagement with chain 4, either by sprockets or sockets engaging the chain links.

Ratchet wheel 11 is also engaged by a second pawl 11b carried by a lever 12, one end of which is pivoted to the shaft 10. The upper end of lever 12 is connected by a link 13 to the plunger 14 of an electromagnet 15, and the arrangement is such that the platform 2 may be raised vertically by the repeated energization of magnet 15 which will operate the ratchet wheel 11 through successive steps, the wheel being held stationary after each step by the pawl 11a. The platform 2 may also be raised and lowered manually by shifting the shaft 10 axially thereof so as to move the ratchet wheel 11 out of engagement with pawls 11a and 11b, and by turning the shaft 10 by hand, the platform may be raised or lowered as desired. The pinion 9 is made of greater width than the gear 8 to permit the shaft 10 to be moved axially for this purpose. A suitable spring 10b secured to the housing H cooperates with a pair of notches in the shaft 10 to hold the shaft in either position of axial adjustment.

At the front end of the stack bin 1 is arranged a horizontally extending guideway formed by a pair of side walls 16a and 16b and a bottom wall 17 arranged substantially in the plane of the upper open end of the stack bin 1. At spaced points along the guideway, the bottom wall is provided with transverse openings in which are mounted a number of pivoted gates 18 which normally are positioned horizontally to close the openings but which may be tilted about their longitudinal centers to an inclined position to intercept a check traveling along the guideway, and to deflect the check downwardly through the opening. These pivoted gates may be operated by suitable electric devices such as the electromagnets 19 shown in Fig. 3. These magnets are supported on brackets 20 on the outside of the guideway walls, and each magnet has an armature 21 secured at its center to the outer end of the pivot axle of its associated gate. Each armature is provided at its ends with laterally extending portions which project over the ends of the magnet when the armature is aligned with the magnet. As shown in Fig. 1 (where only one magnet is shown), the brackets 20 and magnets 19 are supported at an angle to the horizontal, while the armatures 21 are normally maintained in horizontal position by a suitable biasing spring 22. Thus the gate is normally held closed. When the magnet 19 is energized, the armature 21 swings around its axis into alignment with the magnet 19 against the force of spring 22 and thereby opens the gate attached to the armature.

As shown in Figure 3, the magnets for alternate gates are arranged on opposite sides of the guideway to conserve space. The horizontal guideway is also provided with transverse slots in the bottom wall thereof at convenient points between the gates 18 for receiving conveying rolls 23 which are carried on shafts 24 journaled in the side walls of the guideway and having one end thereof extending beyond the sidewall as shown

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in Figure 3 for carrying driving pulleys 25 which are driven by belts 26. The outer ends of shafts 24 may be journaled in a frame member 24f. All of the drive rolls are driven from a common source of power such as the motor 28 (Figure 1) which is connected to the pulley 29 on one of the roll shafts 24 by means of a drive belt 30. Preferably the rolls are maintained in continuous operation while the machine is in use.

Mounted above each drive roll 23 is an idler roll 31 which may be solid throughout its length or which may be formed in short spaced sections as shown in Figure 3. Rolls 31 are provided with shafts 31a the ends of which extend into vertical slots 31b formed in the side walls of the guideway. These slots may contain springs for pressing downwardly on the ends of shaft 31a but I find that satisfactory operation is obtained without such springs, and in most cases, the rolls 31 simply rest upon the drive rolls 23 under their own weight.

A pair of narrow strips 32a and 32b are arranged horizontally over the ends of gates 18 and are spaced above the bottom wall 17 of the guideway to permit of proper tilting of the gates. These strips serve to prevent the corners of the checks from curling upward as they are being conveyed along the guideway.

Arranged on the trailing side of each pair of rolls 23—31 is a hold-down device formed of a piece of resilient wire 33 arranged transversely of the guideway and having the ends thereof inserted into sockets formed in the side walls of the guideway above the strips 32a and 32b. The wire 33 is provided with a number of rearwardly extending arms 33a the ends of which rest lightly upon a stationary part of the bottom wall 17 of the guideway. The wire 33 is also provided with forwardly extending arms 33b arranged to extend substantially in a horizontal direction and having the end portions thereof bending backwardly and downwardly as shown at 33b' in Fig. 4. When the gate 18 below the hold-down device is tilted upwardly, the forward edge of the gate is free to pass above the end of the inclined arm portion 33b' and this portion serves to deflect the check downwardly and away from the front edge of the tilted gate. Each hold-down device is provided with a biasing weight 33c which normally holds the rearwardly extending arms 33a in light yielding contact with a fixed portion of the bottom wall of the guideway positioned directly in front of one of the tilting gates. By this arrangement, the rearwardly extending arms 33a serve to direct the check below the front edge of the gate positioned immediately to the rear of the device when that gate is open. Any of the hold-down devices may be removed from the guideway by buckling the wire 33 enough to remove one end from its socket.

Positioned below the horizontal conveying guideway is a series of storage bins for receiving the checks that are discharged downwardly through the various gate openings. These storage bins are constructed in a stacked arrangement, as shown in Figs. 1 and 4, in which all of the bins have a common back wall 34 and a common front wall 35, preferably formed of transparent material, such as glass or sheet plastic, and hinged along one edge as shown at 35a to provide access to the bins. If desired, the common front wall of the bins may be formed of a series of hinged sections. The bin spaces are formed between the back and front walls by means of a plurality of parallel plates represented at 36—43, inclusive,

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arranged transversely between the back and front walls and being inclined to the vertical by approximately 25°. As shown in the drawing, plate 36 forms the front wall of a number of bins, B1, B2, B3 and B4, arranged in vertically stacked relation. In a similar manner, plate 41 forms the back wall for a like number of vertically stacked bins, B5, etc., and this arrangement of groups of bins is repeated to provide any desired number of bins. The bottoms of the individual bins are formed by transverse plates 44, and each bottom wall is provided with a roughened upper surface to prevent the checks C from sliding over the surface, and this may be accomplished in various ways such as by covering the bottom wall with a sheet of sand paper as shown at 44a in Fig. 4. Each storage bin is provided with an individual chute which extends upwardly from the upper right hand corner of the bin to a position immediately below one of the pivoted gates 18, for example, the chute for bin B2 is formed between plates 37 and 38 and is represented at B2'. In a like manner, the chute for bin B3 is formed between plates 39 and 40 and is shown at B3'. The space between plates 38 and 39 is a dead space and is not used.

Each storage bin is provided with a removable hold-down device for retaining the checks in properly stacked relation. One such device is shown in detail in Figure 4 but it will be understood that each bin is equipped with a similar device. Each device is formed of a removable bracket 45 preferably formed of an elongated strip of sheet metal having a hook at its upper end which is hooked over the upper edge of the back wall of the chute of the bin and extends downwardly along the chute in contact with the back wall of the chute, and the lower end of the strip extends into the bin and is curved at its lower end to direct the checks against the front wall of the bin, as shown in Figure 4. The lower end of the bracket strip 45 is provided with a pair of parallel ears 45a which extend rearwardly from opposite edges of the bracket strip and engage the rear wall of the bin. A curved hold-down wire 46 has its upper end positioned between the ears 45a and is pivotally supported by these ears in suitable pivot bearings, and the wire 46 is yieldingly urged towards the front wall of the bin by a suitable biasing means such as the weight 47 attached to the wire 46 in a position which tends to rotate the wire about its pivot support.

Each bin is also provided with a signal circuit for energizing a suitable signal when the bin becomes full. One suitable arrangement is illustrated in Figures 4 and 4a and comprises an insulating sleeve 47 projecting through the rear wall of each storage bin near the bottom thereof and near the back wall. A conducting wire 48 is passed through the sleeve 47 as the inner end thereof is bent into the form of a loop as shown in 48a in Figure 4a. This loop is arranged in the path of movement of the hold-down wire 46, and when the hold-down wire comes in contact with loop 48a a circuit is completed to energize a suitable signal as described hereinafter.

The preferred form of feed device for feeding the top check from the stack in the stack bin 1 to the horizontal conveying guideway is illustrated in Figures 1, 2, 5 and 6, and is also shown diagrammatically in Figure 7. This device is supported in spaced relation above the top of the stack bin on a suitable bracket, such as the inverted L-shaped bracket 49. Pivotaly mounted

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within this bracket on a horizontal axis 49a is an electric vibrator of suitable construction. The type of vibrator illustrated is commonly employed in vibrator massage machines and is formed of an E-shaped magnetic structure 50 having a magnetized winding 51 surrounding the central leg thereof and having a vibratory armature 52 extending across the two outer legs and being resiliently supported at one end by means of a spring element 53, the free end of the armature being held in spaced relation to the adjacent outer leg of core 50. The free end of armature 52 carries a friction element 54 formed of a suitable friction material, such as rubber. In the example illustrated, the friction element is formed from the rubber cup of a massage machine but the cup is cut away along a diagonal plane so that the friction element is of wedge shape with the apex directed generally downwardly. A suitable biasing spring 55' is provided at one end of the pivotal axis of the vibrator 50 and is connected between bracket 49 and the axle 49a so that it normally tends to rotate the vibrator in a counter-clockwise direction as shown in Figure 1 (and in clock-wise direction in Figure 5) and normally holds the friction element 54 in an elevated position with respect to the top of the stack of checks. By rotating the vibrator about its axis in the opposite direction from the biased direction the friction element 54 may be brought into contact with the top check and, if the vibrator is operating at this time, the friction element 54 will quickly remove the top check from the stack and feed it towards the conveying guideway. It will be noted that the element 54 is vibrated downwardly with a substantial component of motion towards the conveying guideway, and when the vibrator is operating at the frequency of the usual power supply source, the top check is removed from the stack very quickly. In fact, the action appears to be the same as if the top check were thrown or projected from the stack towards the guideway.

The arrangement for operating the feeding device from its off position to its operative position includes an electro-magnet 55 mounted within housing H, as shown in Figs. 2, 5 and 6, and having a reciprocable plunger 55a which is connected by means of a resilient link 56 to the vibrator at a point below its pivotal axis. The link 56 preferably is formed of a length of resilient wire, and this link is connected to the vibrator by a non-rigid connection embodying a disc 57, preferably formed of hard fiber, and mounted for free rotation upon an arm 58 extending laterally from the lower outer leg of the vibrator. The link 56 is connected to the disc 57 by being passed through a hole formed in the disc near its outer periphery. This type of connection permits the vibrator to be pulled down into operative position by tension applied through the link 56 from plunger 55a but does not transmit any force from the vibrator to the magnet armature 55a. After the armature 55a reaches the limit of its working stroke, any force that might result from the continued motion of the vibrator due to its momentum will not be transmitted through the wire link 56, because the disc 57 will simply rotate about its pivotal axis to allow for the further movement of the vibrator unit without transmitting any appreciable force to the magnet plunger.

A normally open electric switch 59 is supported to the rear of magnet 55 on a bracket 60 and is arranged to be operated to closed position by an

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extension 55b of the magnet plunger when the magnet is energized.

Normally only the top check from the stack within bin 1 will be fed by the vibrator to the conveying guideway, but occasionally two checks may stick together and feed forward. For the purpose of preventing more than one check from being fed to the conveying guideway for each operating cycle of the machine, I provide a special device at the front end of the guideway to return to the stack bin all checks except the top check. This arrangement involves a pair of oppositely driven rolls 61 and 62 arranged one above the other but out of contact. One of these rolls, for example the upper roll 61, is supported upon vertically movable bearings which may be adjusted by suitable means such as screws 63 to vary the separation between the two rolls. This separation is adjusted in accordance with the thickness of the checks being sorted so that only one check can pass between the two rolls. As shown in Fig. 4, roll 62 is driven in a reverse direction from the direction of rotation of conveying rolls 23 and the cooperating roll 61, and this is for the purpose of driving rearwardly all checks that are fed forward except the top check. All of the conveying rolls 23, and rolls 61 and 62 are preferably formed to have a surface of semi-hard rubber somewhat harder than the tread on automobile tires and not as hard as a typewriter platen. I find that satisfactory operation is obtained by driving the reverse roll 62 at a speed of about 800 revolutions per minute and the upper roll 61 at a speed of about 2400 revolutions per minute.

For the purpose of directing the top check between the pair of rolls 61 and 62, a U-shaped spring member 64 formed of a relatively narrow strip of thin spring material is arranged with its arms extending horizontally, the upper arm being mounted at its end upon the cross-bar 65 supported upon the upper edges of the side walls of the guideway, and the lower arm extending inwardly towards the roll 61. This spring prevents the check from being deflected upwardly and forms a guiding surface for directing the check between the two rolls. For a similar purpose, a second spring member 66 formed of a narrow strip of very thin spring material is arranged below the arm 64a of spring 64 and extends from the edge of the stack bin into the space between rolls 61 and 62 and forms a lower guiding surface for directing the check between the two rolls. As shown in Fig. 4, the spring member 66 extends into a groove formed at the center of the roll 61 without making contact with the roll. By this arrangement, the check being fed from the stack is brought into contact with the forwardly rotating roll 61, and this roll then feeds the check forward to the first pair of conveying rolls 23—31. The reverse roll 62 is also provided with a circular groove formed at the center thereof, opposite the resilient finger 68, and into which the finger is pressed when a check passes between the pair of separating rolls.

For the purpose of selectively operating the various gates at the different gate stations, a suitable keyboard KB is arranged along the front side of the stack bin 1 as shown in Figures 1 and 2. Preferably the keyboard is of conventional construction commonly used in typewriters, and is arranged so that the stack bin is directly behind the keyboard, and the operator is normally in a position to read the signature and other identifying data on the check. Usually, there

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would be one storage bin for each key, and where the sorting is made alphabetically there will be at least 26 bins, each bin being assigned to a key representing one letter of the alphabet.

The individual key arrangement is shown diagrammatically in Figure 7 where only two keys have been shown for illustration. According to the usual construction, each key is formed of a horizontal lever 70 pivotally supported at one end on an axis 71 and having suitable biasing means represented by the spring 72 for normally holding the lever in a horizontal position. The free end of each lever is provided with a finger piece 73. Each lever 70 is connected with a second lever 74 which is mounted to tilt about a fixed pivot 75 and is pivotally connected to the lever 70 at a point near its middle, see point 76. When the lever 70 is depressed to the position shown at 70', the lever 74 is tilted about the axis 75 into position 74'. The levers 74 when used in a typewriter are of much longer length but are cut short for use in my invention. A latch bar 77 is arranged transversely above the upper ends of levers 74 and is mounted for swinging movement about a horizontal axis 78. The arrangement is such that when a lever 70 is depressed and the lever 74 is rotated in a clockwise direction, the locking bar 77 is tilted upwardly until the upper end of lever 74 passes below the lower edge of the locking bar 77 and into position shown at 74'. When the depressed key is released, the lower edge of latch bar 77 prevents the lever 74 from returning from its position 74' to its original position 74.

Arranged transversely of the keys 70, and positioned above the keys and in front of levers 74, is a bar of insulating material 79 which supports a plurality of U-shaped brackets 80, one bracket being provided for each key and arranged within the plane of movement of the corresponding lever 74. A conducting plunger 81 is supported for sliding movement by the bracket 80 and is normally urged towards the upper end of lever 74 by a spring 82. Each bracket 80 is connected to one terminal of the operating magnet 19 which operates the gate 18 which is assigned to the particular key associated with the bracket. The connection between the magnet and the gate 18 is shown diagrammatically in Figure 7 and does not correspond to the specific arrangement shown in the other figures of the drawing. The other terminal of magnet 19 is connected to the live terminal of a secondary winding of a suitable step-down transformer 83 which is energized from the usual source of alternating current for house-lighting, the other terminal of the secondary winding being grounded to the keyboard as shown at 71. The arrangement is such that as a key is depressed and the lever 74 moves into position 74', this lever engages the plunger 81 and thereby completes the energizing circuit for the magnet 19. If the key is released, the latch bar 77 prevents the lever 74 from returning to its normal position, and thereby maintains magnet 19 in an energized condition until a different key is depressed, whereupon latch bar 77 releases the previously latched lever 74 and it returns to its normal position. It will be understood that the various brackets 80 associated with different keys are connected to individual magnets 19 for operating different gates assigned to the respective keys.

Mounted upon bar 79 and extending transversely across the outer ends of plungers 81, in spaced relation thereto, is a conducting bar 84.

This bar is connected by connection 85 to one terminal of the winding of feeder-operating magnet 55; the other terminal of this magnet winding being connected to the live secondary terminal of the transformer 83. The arrangement is such that by further depression of a key below the position shown at 70, the plunger 31 would move into contact with the bar 84 and will thereby energize the operating magnet of the feed device.

The energizing winding 51 of the vibrator may be connected in parallel with the magnet 55 and will be energized simultaneously with magnet 55 by the closing of the circuit, but winding 51 may be energized continuously through a separate circuit if desired. The energizing circuit for the magnet 15 which elevates platform 2 in steps is also completed through connection 86 and through the normally open switch 59 which is arranged to be moved to closed position by the plunger extension 55b of magnet 55.

Switch 59 is positioned with respect to the plunger extension 55b so that the plunger must operate through its full stroke in order to close the switch 59. Accordingly, each time the key is depressed and released, magnet 55 would be energized and will close switch 59 to energize the magnet 15 which will operate the ratchet wheel 11 one step and thereby elevate the platform by one step. This operation will continue until the stack of checks on the platform reaches the proper elevation below the vibrating feeder. When the stack has reached the proper elevation, the stroke of the magnet plunger 55a will be limited by the engagement of the friction element 54 with the top of the stack, and switch 59 will remain open until enough checks have been removed from the top of the stack so the feeder will close switch 59 on the next stroke of the plunger 55a whereupon the stack will be elevated one step.

A signal lamp 86 is mounted on the keyboard KB at a location convenient to be seen by the operator, and this lamp is connected as shown in Figure 7 to be energized from the secondary winding 83 whenever one of the hold-down wires 46 makes contact with the fixed contact 48a arranged within a storage bin.

The operation of my machine is believed to be apparent from the foregoing description, but a brief summary of the operation is as follows:

It will be assumed that a stack of checks has been placed in position upon the platform 2. The platform is elevated to feeding position by the repeated depression of any key, preferably the key which will make the proper selection for the top check on the stack. After the stack is at proper elevation for the feeding, the operator determines from the top check the appropriate key for sorting the check and, upon pressing that key, the gate assigned to that key is first moved to an open position and then by the further downward movement of the key, the vibrator magnet 51 and the operating magnet 55 of the feeding device both are energized to effect the feeding of the top check towards the conveying guideway where it is guided between the separating rolls 61 and 62, and from there it is conveyed along the guideway by rolls 23 and 31. If more than one check is conveyed forward by the feeding device the reverse operating roll 62 will prevent all but the top check from passing between rolls 61 and 62, and only one check will be fed to the open gate for each operation of a selecting key. The check is conveyed along the guideway until it reaches the selected gate where it is de-

flected downwardly into the appropriate chute leading to the storage bin assigned to the selected key. It will be noted that the latch bar 77 operates to maintain the selected magnet 19 energized until a different key is depressed, and this avoids the unnecessary operation of any particular gate if it should happen that a series of successive checks are selected for storage in the same bin.

As the checks pass downwardly through an open gate, the inclined arrangement of the chutes and storage bins makes it possible for the checks to be stacked properly within each bin without the assistance of any moving mechanical parts, and solely through the operation of gravity upon the check. Referring to Figure 4, as each check enters the storage bin at the upper right hand corner thereof it is deflected towards the front wall by the strip 45, and the momentum of the check due to its downward movement is sufficient to drive the check downwardly against the bottom wall 44 between the previously stacked checks and the hold-down wire 46. By providing a roughened surface on the bottom wall, the checks remain stacked in a generally vertical position; otherwise in the absence of such roughened surface there is a tendency for the checks to slide over the bottom wall and to become stacked in bent or curved condition.

Due to the fact that my machine does not employ fixed stops for engaging the top of the stack of checks carried by platform 2, the machine is adapted for the sorting of various sizes of checks which could be stacked within the stack bin, whereas in machines that do use fixed stops, the operation is limited to checks having a size falling within certain narrow limits.

For the purpose of obtaining access to various parts of the machine, it is convenient to construct the conveying guideway as a unit structure which can be removed from the top of the combined bin and chute structure. Also it is convenient to form the side-walls of the chute into two separable parts, one part carrying the upper rolls 21 and the other part carrying the driven rolls 23. This arrangement permits the upper rolls to be removed readily in case a check becomes caught in the guideway or in any of the gates.

By arranging the storage bins in repeated groups of vertically stacked bins, the length of the guideway is reduced to a minimum for any given number of bins, and by providing a conveying speed of sufficiently high value, it is possible to convey a check from the stack in the stack bin to the gate at the extreme end of the guideway within the time required for an operator to read the identifying data on the next check in the stack and to press the proper key. Thus, the speed of operation is limited only by the time required for the operator to read the check and select the proper key. The operation of any particular key is very simple, since it involves a momentary depression of the key to its lowermost position followed by an immediate release.

In Figure 7a I have shown a modified arrangement for controlling the operation of the stack elevating means. In this arrangement the stepping magnet 15 is energized from directly across the secondary winding of transformer 83 through switch 59. In addition, a normally closed limit-switch 88 is connected in series with the energizing circuit of magnet 15, and the limit-switch is mounted on the stack bin near the top thereof, as shown in Figures 5 and 6, in a position so that its

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actuating member 88a will be engaged by the top of the stack as it moves upwardly. Thus, when the top of the stack reaches a pre-determined level, determined by the position of switch 88, the circuit of the stack elevating device would be interrupted and will not be closed again until a sufficient number of checks have been removed from the top of the stack to permit the switch 88 to close. With this arrangement, the switch 88 will normally be set in a position so that switch 59 will be operated to closed position on each operation of the feeding mechanism. If the contacts of switch 88 should become stuck together, switch 59 will prevent the stack from being elevated beyond a higher limit than the limit set by switch 88, it being understood that the actuating member 88a of the switch 88 is resiliently flexible, and will permit the top of the stack to rise to a position where the switch 59 would be prevented from closing. The switch 88 may be of the micro-switch type which requires very little pressure for its operation. It will be understood that the remaining parts of the control system not shown in Figure 7a are connected as in Figure 7.

While switch 59 has been shown as arranged to be operated by the plunger of magnet 55, it will be understood that this switch may be arranged to be controlled by any other movable part of the check feeding arrangement.

I claim:

1. A device for feeding checks or similar articles from the top of a stack comprising, a friction member, means normally supporting said

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member in elevated position above the top of said stack, means for moving said member downwardly, into contact with the top of said stack, and means for vibrating said member when in contact with said stack at a frequency within the range of 25 to 60 vibrations per second and with a component of movement transversely of the axis of said stack.

2. A device for feeding checks or similar articles from the top of a stack of such articles comprising, an elongated rigid member mounted above said stack with one end thereof located immediately above the top of the stack, a yieldable friction element carried by said one end of said member in a position to engage the top of the stack, and means for continuously vibrating said member at a rate of a plurality of vibrations per second, said member being mounted to move said friction element into contact with the top of said stack during each vibration thereof and with a component of movement transversely of the axis of said stack.

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