July 30, 1935. S. CHIGER 2,009,385

APPARATUS FOR RECEIVING AND ISSUING BANK NOTES

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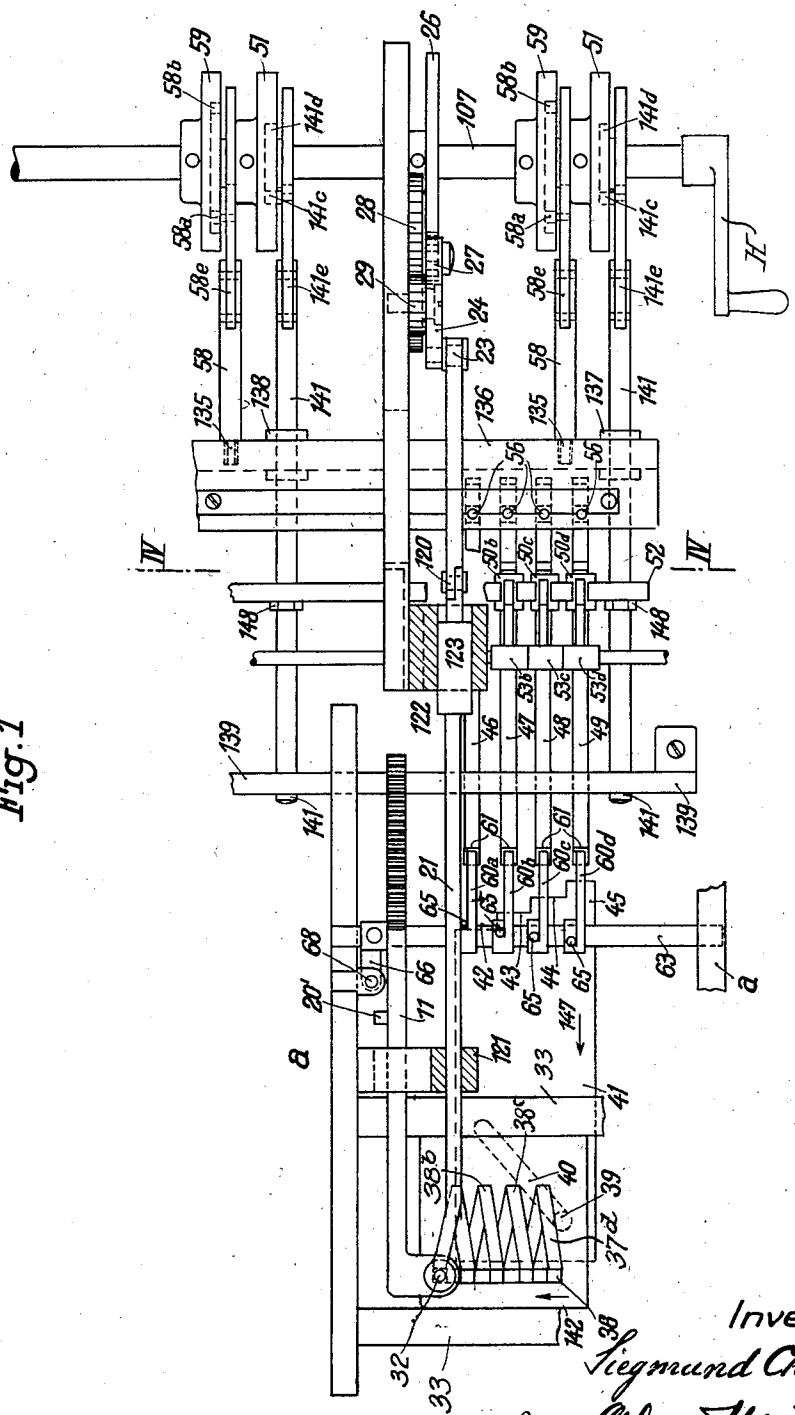

Fig. 1

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Fig. 2

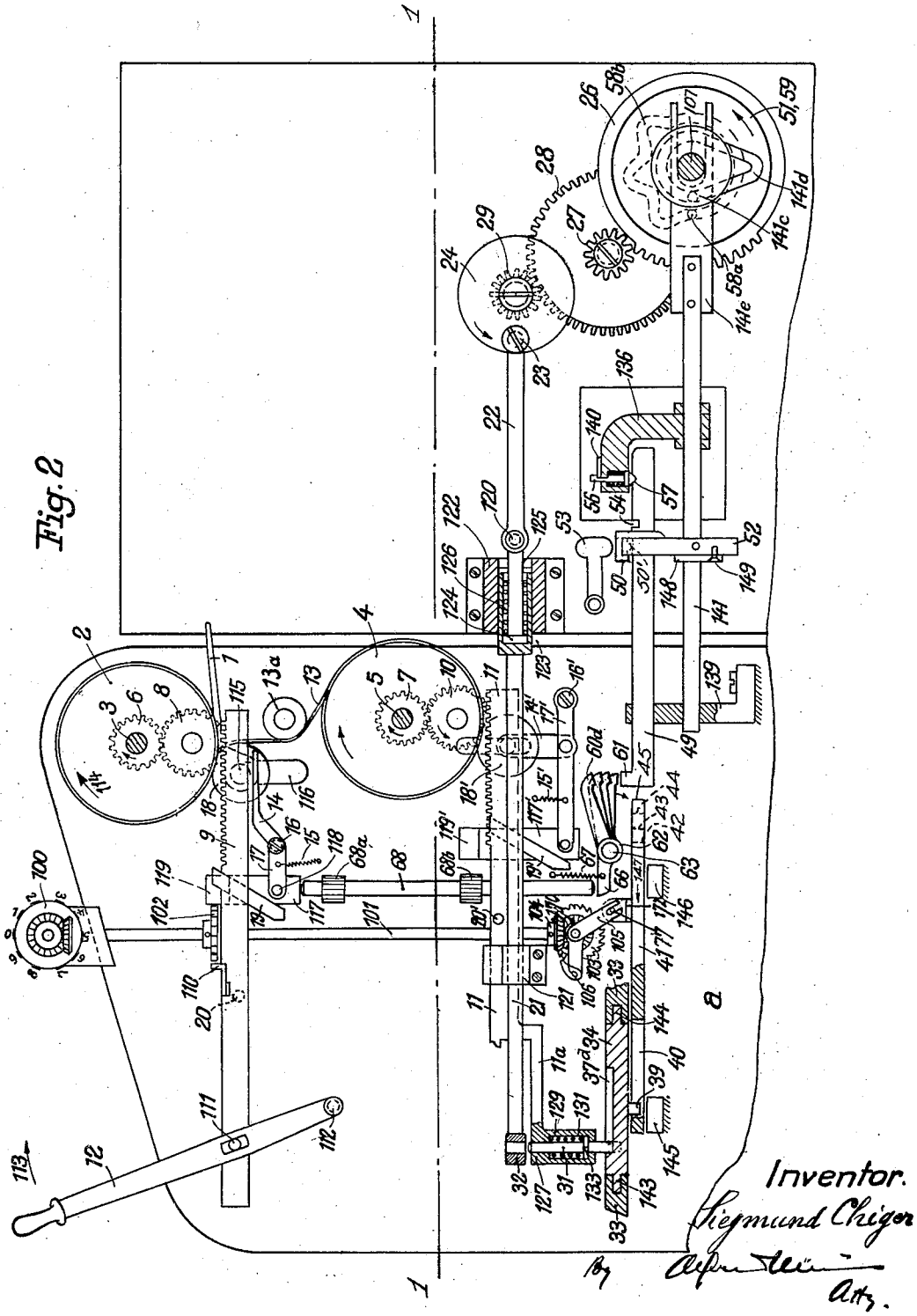

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Fig. 4

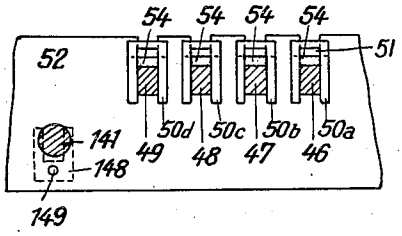
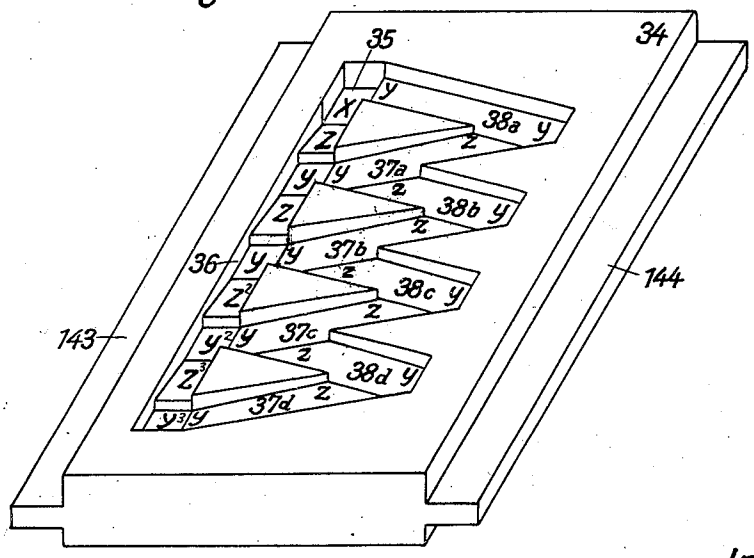


Fig. 3



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UNITED STATES PATENT OFFICE

2,009,385

APPARATUS FOR RECEIVING AND ISSUING BANK NOTES

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Application December 9, 1929, Serial No. 412,909

8 Claims. (Cl. 133—1)

This invention relates to improvements in machines for receiving and issuing money in the form of paper bills.

According to the invention, the bill receiving and issuing means of the machine comprises a pair of rollers on which are wound the end portions of a tape, respectively. To deliver a bill to the machine the bill is placed upon a table in juxtaposition to the so-called winding-on roller and this roller is rotated to wind a portion of the tape thereon, the bill being picked up by the tape and being wound on the said roller between adjacent convolutions of the tape. Conversely, to issue a bill from the machine the so-called winding-off roller is rotated to wind a portion of the tape thereon, this resulting in the unwinding of an equal portion of the tape from the winding-on roller and the consequent issuance or delivery of a bill upon the table. Numerous bills may be wound successively on the winding-on roller and ordinarily the winding-on roller carries numerous bills.

The general object of the invention is to provide, in connection with the means for actuating the winding-off roller, mechanism which is adjustable to predetermine the amount of tape wound on the winding-off roller from the winding-on roller by a single, complete operation of the actuating means for the winding-off roller, so that for a single, complete operation of said actuating means, one, two or any desired number of bills within predetermined limits may be caused to be issued from the winding-on roller.

With the foregoing and various other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the novel combination and arrangement of features as will be hereinafter more fully described, illustrated in the accompanying drawings, and defined in the appended claims.

In the drawings:

Figure 1 is a horizontal section through the machine, the section being taken approximately on the line 1—1 of Figure 2.

Figure 2 is a longitudinal section through the machine.

Figure 3 is a perspective view of a grooved plate constituting part of the means for coupling the winding-off roller actuating means with said roller, and

Figure 4 is a detail sectional view through the manually operable means for rendering the machine effective to issue bills from the winding-on roller.

Referring to the drawings in detail, it will be observed that the machine shown includes a pair of spaced side plates *a*, *a* between which are arranged the several different operating elements comprising the means for receiving and issuing bills.

Extending between and mounted at their ends in the plates *a*, *a* are upper and lower horizontally disposed shafts **3** and **5**, respectively, on which are mounted winding-on and winding-off rollers **2** and **4**, respectively, while wound at one end on the roller **2** and at its other end on the roller **4** is a tape **13**. From the roller **4** the tape **13** extends upwardly and across the rear side of a guide roller **13***a* and thence upwardly and across the front and top of a second guide roller **18** which is disposed substantially directly beneath the winding-on roller **2** so that the "mouth" of the space between that portion of the tape which extends over the top of the roller **18** and the convolution of the tape last wound on the roller **2**, opens forwardly towards a table **1**. Thus, assuming that a bill is placed on the table **1** and that the roller **2** is rotated in the direction of the arrow **114**, it is apparent that upon entering of the inner end of the bill in said "mouth" the bill will be picked up by the tape and wound therewith on the roller **2** between the last two convolutions of the tape. Conversely, it is apparent that if the tape is unwound from the roller **2**, the bill will be delivered upon the table **1**.

The shafts **3** and **5** are non-rotatable and the rollers **2** and **4** are rotatably mounted on said shafts, respectively. Also rotatably mounted on the shafts **3** and **5** are pinions **6** and **7**, respectively, which are connected with the rollers **2** and **4**, respectively, by ratchets (not shown) so that upon rotation of either pinion in the direction of the arrow thereon in Figure 2, corresponding rotation is imparted to the related roller, and so that reverse rotation of either pinion is ineffective to impart corresponding rotation to the related roller. In this connection the arrangement is such, as indicated, that rotation of the pinion **6** in a direction to impart rotation to the roller **2**, produces rotation of said roller in a direction to wind the tape **13** thereon, and rotation of the pinion **7** in a direction to impart rotation to the roller **4**, produces rotation of the latter roller in a direction to wind the tape thereon from the roller **2**.

Meshing with the pinion **6** is a pinion **8** with which is engaged a rack bar **9**. This rack bar is suitably mounted for sliding movement and is reciprocal through the instrumentality of a lever

12, which lever is pivoted at its lower end as at 112 and at an intermediate point is provided with a slot in which is disposed a pin 111 projecting from the rack bar 9, whereby the lever and said rack bar are operatively connected together.

The guide roller 18 is carried by a shaft 115 which is guided at its ends in vertical slots 116 in the side plates *a*, *a*, whereby said guide roller is mounted for vertical movement in accordance with increase and decrease of the effective diameter of the winding-on roller 2, said guide roller 18 being maintained constantly pressed upwardly against the tape wound on the winding-on roller 2 by means of a lever which is intermediately pivoted as at 16 and which includes the two arms 14 and 17, the former of which underlies the shaft 115 of the guide roller and the latter of which has connected therewith a spring 15 tending constantly to rotate the lever in a direction to elevate the arm 14 thereof, thereby to maintain the roller 18 pressed upwardly as stated.

A block 117 is disposed adjacent to the rack bar 9 and is suitably guided for vertical movement, as, for example, in a vertical slot 119 formed in the adjacent side plate *a*. The arm 17 of the aforementioned two-arm lever 14—17 is pivoted as at 118 to the block 117 whereby said block is elevated with increase in the effective diameter of the winding-on roller 2 and is moved downwardly by the spring 15 upon decrease in the effective diameter of the winding-on roller. Carried by the block 117 is a stop 19 with which is engageable a pin 20 carried by the rack bar 9 to limit movement of the rack bar forwardly or in a direction to effect winding of the tape 13 onto the roller 2. In this connection it is pointed out that the stop 19 is inclined as shown, or is otherwise so shaped and disposed on the block 117, that for any given effective diameter of the winding-on roller 2, said stop serves to restrict forward movement of the rack bar 9 to an amount which is exactly that required to rotate the winding-on roller through an angle to wind a single bill completely on said roller. In other words, the amount of angular movement of the roller 2 necessary to wind a bill completely thereon varies with the effective diameter of said roller, and the means described, comprising the guide roller 18, the two-arm lever 14—17, the block 117, the stop 19 and the pin 20 serves to predetermine the permissible amount of movement of the rack bar 9 in a direction to effect winding-on rotation of the winding-on roller so that for any given effective diameter of the roller 2 the amount of rotation imparted thereto by a single, complete forward stroke of the rack bar 9 is just sufficient to completely wind a single bill on said roller.

A rack bar 11 is operatively connected with the winding-off roller 4 through a pinion 10 in mesh with the pinion 7 and, as in the case of the rack bar 9, means are provided to predetermine the permissible amount of movement of the rack bar 11 in accordance with the effective diameter of the roller 4 so that for a single, complete stroke of said rack bar 11 in a direction to effect winding of the tape 13 onto the roller 4 and off of the roller 2, the amount of rotation imparted to the roller 4 is just sufficient to unwind an amount of the tape from the roller 2 to effect the issue of one bill therefrom. In other words, a roller 18' is engaged with the tape wound on the roller 4 and said roller 18' is mounted for vertical movement in the same manner as the roller 18; a lever 17' is pivoted at one end, as at 16', and at its other end is pivotally connected with a block 117', which block is slidably mounted for vertical movement in the same manner as the block 117; a link 14' connects the shaft of the roller 18' with the lever 17' intermediate the ends thereof, and a spring 15' connected to said lever 17' tends constantly to swing the same upwardly, thereby maintaining the roller 18' constantly pressed against the winding-off roller 4 and serving to elevate the block 117' upon decrease in the effective diameter of the winding-off roller. Conversely, said block 117' obviously is forced downwardly upon increase in the effective diameter of the roller 4. The block 117' carries an inclined stop 19' and the rack bar 11 carries a pin 20' for engagement with this stop to limit movement of said rack bar 11 forwardly or, in other words, in a direction to effect winding of the tape 13 onto the roller 4 from the roller 2. The inclination of the stop 19' or, in other words, its shape and disposition on the block 117', is such that for any given vertical position of said block as determined by the effective diameter of the winding-off roller 4, forward movement of the rack bar 11 is limited to an amount which is just sufficient to rotate the roller 4 to wind thereon enough tape from the roller 2 to effect the ejection of a single bill from the latter roller.

The means for reciprocating the rack bar 11 consists in part of a rod 21 which is slidably mounted, as at 121, 122, for reciprocation relative to said rack bar. In the inner end of the rod 21 is formed an opening 32, while slidable in a cylindrical formation 129 carried by an extension 11*a* of the rack bar is a vertically disposed pin 31 to be projected into said opening 32 to connect the rack bar and the rod for unitary reciprocation. On the pin 31 is a shoulder or collar 133, while within the cylindrical formation 129 and bearing against said shoulder or collar is a coil spring 131 which tends constantly to urge the pin 31 downwardly to operatively disconnect the rack bar 11 from the rod 21. If the upper end of the pin 31 is projected into the opening 32 the rack bar and its operating rod 21 are connected together and reciprocation of the rod results in reciprocation of the rack bar. On the other hand, if the pin 31 is depressed until its upper end no longer is engaged in the opening 32, the rod 21 is free to be reciprocated while the rack bar 11 remains stationary.

The rod 21 is provided at its forward end with a cylindrical formation 123, and slidably mounted in this formation is a rod 125 the forward end of which projects beyond the forward end of said formation. On the rear end of said rod 125 is a shoulder or collar 124, and between this shoulder or collar and the head or forward end of the cylindrical formation 123, within the latter, is a coil spring 126 which tends constantly to urge the rod 125 to its innermost limit of movement relative to the formation 123.

At 107 is designated a drive shaft which may be rotated by means of a crank handle H or in any other suitable manner and which carries a segmentally toothed disk 26 for cooperation with a pinion 27. Fixed with respect to the pinion 27 is a spur gear 28 which meshes with a pinion 29; while fixed with respect to the latter pinion is a crank disk 24 to which is pivoted, as at 23, a link 22 which also is pivoted, as at 120, to the forward end of the rod 125. Thus, rotation of the drive shaft 107 is effective to reciprocate the rod 21, in which connection it is pointed out that the extent of the toothed segment of the disk 26 and the gear ratio between the pinion 27 and the

crank disk 24 is such that for one complete rotation of the disk 26 several reciprocations are imparted to the rod 21. Also, it is pointed out in this connection that the cylindrical formation 123 of the rod 21, together with the rod 125 and the spring 126, provides a yieldably extensible connection between the crank disk 24 and the rod 21 to permit said crank disk to function to reciprocate said rod 21 when the latter is connected by the pin 31 with the rack bar 11 and when the stop 19' serves to restrict forward movement of the rack bar, the rod 125 moving forwardly within the cylindrical formation 123 against the spring 126 under such conditions.

The means whereby the machine may be "set" or adjusted to cause a predetermined number of bills to be issued or ejected from the winding-on roller 2 upon imparting a single, complete rotation to the drive shaft 107, and whereby the machine first tests, by initial rotation of said drive shaft, whether the roller 2 carries as many bills as it is desired to issue, and prevents the issue of any bills in the event the roller 2 does not carry as many bills as it is desired to issue, will now be described in detail.

In a supporting bar 139 disposed below the roller 4 is slidably mounted the rear end of a reciprocal rod 141, the forward end of which is provided with a plate 141e which is forked as shown and slidably engaged with the drive shaft 107 adjacent to a disk 51 fixed on said drive shaft. In the disk 51 is formed a cam groove 141d, while projecting from the plate 141e into said cam groove is a pin 141c. The cam groove 141d extends through an angle of approximately 180 degrees cencentric to the shaft 107. Consequently, during rotation of said shaft through this angle the rod 141 remains at rest. On the other hand, the cam groove 141d extends from the ends of the concentric portion thereof into substantially V-shape as illustrated in Figure 2 so that during the remainder of a complete revolution of the shaft 107 the rod 141 is moved first rearwardly and then forwardly.

Slidably mounted on the rod 141 or in any other suitable manner for rearward and forward movement, is a cross beam 136 having a rearwardly directed top portion in which is mounted a plurality of laterally spaced vertically disposed pins 56 the lower ends of which are of wedge or cone shape and extend below the under side of said beam top portion. A strip 140 is mounted on the beam 136 and extends into notches in the sides of the pins 56 whereby the latter are retained in assembly with the beam and at the same time are mounted for vertical movement relative to the beam, while coil springs associated with said pins tend constantly to project the latter downwardly and to permit them to rise under upward pressure exerted thereagainst.

A plate 52 is mounted on the rod 141 and is secured thereto for reciprocation therewith as, for example, by means of a forked clip 148 attached to the plate as at 149 and engaging side grooves in the rod, as illustrated in Figure 4. The plate 52 is provided with a plurality of laterally spaced recesses opening through its upper edge, and in said recesses are slidably supported the forward ends of a plurality of laterally spaced, longitudinally extending pusher bars illustrated in the present instance as being four in number and designated as 46, 47, 48 and 49, respectively. These pusher bars are additionally supported for longitudinal sliding movement by the support 139, and each pusher bar at its rear end is provided with an upwardly directed lug 61. In addition, each bar is provided with a recess 54 and with a V-shaped notch 57 opening through its upper edge, the notch to be engaged by the lower end of the related pin 56, and the recess to be engaged by a lug 50' carried by a related clip 50 slidably mounted for vertical movement in the related recess of the plate 52. Normally the pins 56 engage the notches 57 and the clips 50 are elevated and thereby are disengaged from the recesses 54 so that reciprocation of the cross bar 136 serves to reciprocate the pusher bars and so that the pusher bars are not reciprocated by the rod 141 and the plate 52. On the other hand, when any given clip 50 is depressed to engage its lug in the recess 54 of the related pusher bar, such pusher bar is coupled through the plate 52 with the rod 141 for reciprocation by and with said rod, and any reciprocal movement of the cross bar 136 relative to the rod 141 results in the pin 56 being wedged upwardly out of its notch 57 and riding on the upper edge of the pusher bar.

The cross bar 136 has rigidly connected therewith, as at 135, the rear end of a rod 58 which rod, at its forward end is provided with a forked plate 58e slidably engaged with the drive shaft 107. Fixed on the drive shaft 107 adjacent to the plate 58e is a disk 59 having formed therein a cam groove 58b, while projecting laterally from the plate 58e into said cam groove 58b is a pin 58a. The cam groove 58b extends concentrically with respect to the shaft 107 through an angle of approximately 180 degrees, and this concentric portion of said cam groove is disposed approximately diametrically opposite the concentric portion of the cam groove 141d in the disk 51. Consequently, during approximately that one-half of a complete rotation of the drive shaft when the concentric portion of the cam groove 58b is cooperating with the pin 58a the cross bar 136 is held against reciprocal movement and the rod 141 is moved first rearwardly and then forwardly by the V-shaped portion of the cam groove 141d cooperating with the pin 141c. On the other hand, during approximately that one-half of a complete revolution of the drive shaft when the concentric portion of the cam groove 141d is cooperating with the pin 141c the rod 141 and the plate 52 are held against reciprocation and three short reciprocations are imparted to the cross bar 136 due to the remaining portion of the cam groove 58b being comprised by three successive V-shaped formations as illustrated in Figure 2 of the drawings.

Disposed in the horizontal plane of the pusher bars 46–49, rearwardly thereof, is a plate 41 which is suitably supported, as indicated at 145, 146, for rearward and forward sliding movement and which is provided with a diagonally extending slot 40. Moreover, as indicated in Figure 1 of the drawings, said plate 41 is provided at its forward end with a series of steps 42, 43, 44 and 45 which are related, respectively, to the pusher bars 46, 47, 48 and 49 and which are disposed, respectively, successively in advance of or forwardly of one another.

A pair of spaced, transversely extending, grooved guide bars 33 are mounted above the plate 41 and between said bars is slidably mounted for movement transversely of the unit a plate 34, said plate having ribs 144 engaging the grooves of said guide bars. Depending from the plate 34 into the diagonal slot 40 of the plate 41 is a pin 39. Consequently, assuming that the plate 41 is disposed forwardly and that the pin 39 is engaged

in the rear end portion of the slot 40, it is apparent that rearward movement of the plate 41, as indicated by the arrow 147 in Figure 1, is effective to shift the plate 34 transversely of the unit in a direction as indicated by the arrow 142 in Figure 1. On the other hand, when the plate 41 has been moved rearwardly and the plate 34 has thereby been moved in the direction of the arrow 147, it is apparent that movement of the plate 34 in the opposite direction is effective to move the plate 41 forwardly.

In the top of the plate 34 is formed a system of grooves as illustrated in detail in Figure 3 of the drawings. First, there is an elongated groove 36 which extends longitudinally with respect to the direction of sliding movement of the plate and which is disposed adjacent to the rear edge of the plate in vertical alinement with the pin 31 carried by the arm 11a of the rack bar 11 when said rack bar is disposed at its most rearward limit of movement. This groove 36, at what will be termed its inner end, has a depth x such as to permit the pin 31 to be projected to its limit of downward movement by the spring 131 when said inner end portion of said groove is alined with said pin. When the pin 31 is at its limit of downward movement its upper end is disposed below the headed rear end of the rod 21 having the opening 32 therein. Consequently, when the plate 34 is disposed in its normal position; i. e., at its outermost limit of movement, as determined by engagement of its depending pin 39 with the rear end of the slot 40 in the plate 41, and the inner end of the groove 36 thereby underlies the pin 31, assuming the rack bar 11 to be at its most rearward limit of movement, the rod 21 and the rack bar 11 are not coupled by said pin.

The bottom of the groove 36, from the depth x at the inner end thereof, is inclined upwardly and towards the outer end of said groove, as indicated at 2, and then drops abruptly to a depth y. However, the depth y is less than the depth x by an amount such that when the depth y underlies the pin 31 the latter is held sufficiently elevated to engage at its upper end in the hole 32 of the rack bar 11. Thus, upon inward movement of the plate 34 from its outermost position, the inclined bottom portion z of the groove 36 acts by a wedging or cam action to project the pin 31 upwardly into the hole 32, and then, even though the pin drops over the shoulder between the depths z and y to the depth y, the upper end of the pin still is maintained engaged in the hole 32 because of the depth of the groove at y being less than the depth at x. From the innermost depth y the bottom of the groove again is inclined upwardly and outwardly, as indicated at z', and then drops abruptly to a second depth y' which is the same as the depth y. Similarly, from the depth y' the bottom of the groove is inclined upwardly and outwardly, as indicated at $z2$ to a third depth $y2$ which is the same as the depths y and y', and from the depth $y2$ the bottom of the groove again is inclined upwardly and outwardly, as indicated at $z3$ to a depth $y3$ which is the same as the depths y, y' and $y2$.

From the depths y, y', $y2$ and $y3$, grooves 37a, 37b, 37c and 37d, respectively, extend towards the front edge of the plate 34 and at inclinations towards the inner edge thereof. In addition, a groove 38a extends from the forward end of the groove 37a rearwardly and at an inward inclination to the depth x of the groove 36, and three other grooves 38b, 38c and 38d extend from the forward ends of the grooves 37b, 37c and 37d, respectively, rearwardly and at inward inclinations into the grooves 37a, 37b and 37c, respectively, substantially at the points where the latter grooves enter the groove 36. The groove 38 is of a uniform depth corresponding to the depths y, y', $y2$ and $y3$ of the groove 36 so that a shoulder exists at the forward side of the groove 36 where the groove 38a enters said groove at the depth x. On the other hand, the rear ends of the grooves 37a, 37b, 37c and 37d are of the same depth as the depths y, y', $y2$ and $y3$ of the slot 36, and the bottoms of said grooves 37a, 37b, 37c and 37d are inclined upwardly and forwardly so that at their forward ends said grooves have depths corresponding to the least depths of the portions z, z', $z2$ and $z3$ of the groove 36. Conversely, the grooves 38b, 38c and 38d at their outer ends are of depths corresponding to the depths y, y', $y2$ and $y3$ of the groove 36, and at their inner ends are of depths corresponding to the portions of least depth of the depths z, z', $z2$ and $z3$ of the grooves 36, the bottoms of said grooves 38b, 38c and 38d being inclined upwardly and rearwardly. Consequently, there is a continuous shoulder at each side of each of the grooves 37a, 37b, 37c and 37d, as well as at each side of each of the grooves 38a, 38b, 38c and 38d, and when any portion of any one of either set of said grooves is disposed in underlying relationship to the pin 31, said pin is held sufficiently elevated to engage in the hole 32 of the extension 11a of the rack bar 11, only the depth x of the groove 36 being sufficiently great to permit the pin 31 to drop out of the hole 32.

When the pin 58a is disposed in the concentric portion of the cam groove 58b and the pins 56 are engaged in the notches 57 of the respective pusher bars 46, 47, 48 and 49, the rear ends of said pusher bars are disposed in transverse alinement with each other forwardly of the forwardmost step 45 of the plate 41, and when said pusher bars are disposed in this normal relationship the lugs 61 thereof directly underlie the forward ends of four related pawls 60a, 60b, 60c and 60d, respectively, which pawls are loosely mounted on a transversely extending shaft 63 for free rotation relative thereto.

The hub 62 of each pawl 60a, 60b, 60c and 60d is cut away as illustrated in Figure 1 to provide a shoulder 64, and on the shaft 63 are four pins 65, one related to each pawl, for cooperation with the shoulders 65, respectively, to limit downward swinging movement of the pawls and to elevate the latter upon counter-clockwise rotation being imparted to the shaft 63 as viewed in Figure 2. The pins 65 are, as shown, angularly spaced apart about the shaft 63 whereby the pawls 60a, 60b, 60c and 60d are held with their free ends spaced successively above one another so that upon clockwise rotation of the shaft 63 as viewed in Figure 2, first the pawl 60a engages its related pusher bar 46, next the pawl 60b engages its related pusher bar 47, next the pawl 60c engages its related pusher bar 48 and, finally, the pawl 60d engages its related pusher bar 49.

Fixed to and extending rearwardly from the shaft 63 is an arm 66, and connected with this arm is a spring 67 which tends constantly to rotate the arm and thereby the shaft in a clockwise direction to permit the pawls 60a, 60b, 60c and 60d to drop into engagement with their related pusher bars. However, rotation of the shaft 63 by the spring 67 is controlled by a vertical rod 68 which is slidably mounted in guides 68a, 68b and which rests at its lower end on the arm 66 and at its upper end against the bottom of

the block 117. In this connection, when the roller 2 is devoid of bills the block 117 is disposed in its lowermost position and acts through the rod 68 on the lever arm 66 to hold the shaft 63 in a position in which all four of the pawls are held elevated above their respective pusher bars. On the other hand, when a single bill is wound on the roller 2 the effective diameter of said roller is slightly increased and the block 117 is elevated by an amount to permit only the first pawl 60*a* to drop into engagement with its related pusher bar 46, the other pawls being still held elevated above their related pusher bars. Similarly, when a second bill is wound on the roller 2 the effective diameter of said roller again is slightly increased and the block 117 is further elevated by an amount to permit the second pawl 60*b* to drop into engagement with its related pusher bar 47, the pawls 60*c* and 60*d*, however, still being held elevated above their related pusher bars 48 and 49. In the same way, when a third bill is wound on the roller 2 the third pawl 60*c* is permitted to drop into engagement with its related pusher bar 48, but the pawl 60*d* still is held elevated above its related pusher bar 49, and when a fourth bill is wound on the roller 2 the fourth pawl 60*d* is permitted to drop into engagement with its related pusher bar 49. Any bills in excess of four wound on the roller 2 does not affect the operation of the pawls 60*a*, 60*b*, 60*c* and 60*d*, but when the number of bills on the roller 2 is reduced to four, the removal of one additional bill resulting in the reduction of the number to three, results in depression of the arm 66 by an amount to elevate the pawl 60*d* to an extent to render said pawl incapable of cooperation with its pusher bar 49. Similarly, the successive removal of the three remaining bills on the roller 2 successively renders the pawls 60*c*, 60*b* and 60*a* incapable of cooperation with their related pusher rods.

When the pin 141*c* is engaged in the concentric portion of the cam groove 141*d* and the rod 141 therefore is in its forwardmost position, the clips 50, which normally are elevated as aforesaid, are disposed beneath related manually operable members 53 by means of which said clips may be depressed. Moreover, when the rod 141 and the plate 52 are disposed in their forwardmost positions, and when the pin 58*a* is disposed in the concentric portion of the cam groove 58*b*, which represents the forwardmost position of the cross bar 136 and the forwardmost positions of the pusher bars 46, 47, 48 and 49, assuming that the pins 56 are engaged in the notches 57, the rear, transversely alined ends of the pusher bars are disposed forwardly of the forwardmost step 45 of the plate 41 by an amount equal to the crank throw represented by any one of the V-shaped formations of the cam groove 58*b*, and the recesses 54 in the tops of the pusher bars are disposed like amounts forwardly of the lugs of the clips 50.

Now, assuming that four or more bills are wound on the roller 2; that the block 117 and the rod 68 therefore are elevated sufficiently to permit all four of the pawls 60*a*, 60*b*, 60*c* and 60*d* to drop into engagement with the lugs 61 of the pusher bars 46, 47, 48 and 49, respectively; that the plates 41 and 34 are in their forwardmost and outermost positions, respectively; that the rack bar 11 and the rod 21 are in their rearmost positions with the pin 31 disposed at its bottom in the depth *x* at the inner end of the groove 36 of the plate 34 and with its upper end alined with the hole 32 but completely withdrawn therefrom; that the pin 141*c* is disposed in the lead end of the concentric portion of the cam groove 141*d*; that the rod 141 and the plate 52 therefore are in their forwardmost positions; that the pin 58 is disposed in the trailing end of the concentric portion of the cam groove 58*b* in readiness to cooperate with the first of the V-shaped formations of said cam groove upon initial rotation of the shaft 107; that the cross bar 136 therefore is in its foremost position; that the pins 56 are engaged in the notches 57 of the pusher bars 46, 47, 48 and 49 holding said pusher bars in their forwardmost positions; and that the clips 50 are elevated, the operation of the mechanism, further assuming that it is desired to effect the ejection or issue of four bills from the roller 2, is as follows: First, the shaft 107 is rotated through an angle of approximately 180 degrees. During this rotation the rod 141 and the plate 52 remain stationary due to the cooperation of the concentric portion of the cam groove 141*d* with the pin 141*c*, but the cross bar 136 is reciprocated a number of times corresponding to the number of V-shaped portions of the cam groove 58*b*. In this connection, only a single reciprocation of the cross bar 136 is required, but provision is made for reciprocating said bar a number of times for the sake of safety in assuring correct operation of the mechanism. As the pusher bars 46, 47, 48 and 49 are moved rearwardly by the cross bar 136 the recesses 54 in said bars are brought into positions underlying and in alinement with the lugs of the clips 50 and the rear transversely alined ends of said bars are brought to positions in which the rear end of the bar 49 contacts or substantially contacts with the forwardmost step 45 of the plate 41. The free or forward ends of the pawls 60*a*, 60*b*, 60*c* and 60*d* are provided with hook formations as shown, and upon rearward movement of the pusher bars said pawls drop downwardly until their hook formations engage the forward sides of the lugs 61, the amount of rearward movement of the pusher bars being just sufficient to permit this action to occur. The pusher bars then are restrained against forward movement, and, therefore, upon subsequent forward movement of the cross bar 136 the pins 56 ride upwardly out of the grooves 57 and travel forwardly along the tops of the pusher bars, leaving the latter in their rearwardly disposed positions. Next, the member 53 related to the clip 50 which is related to the pusher bar 49 is manually depressed to engage the lug of said clip in the recess 54 of said pusher bar 49, thereby to couple the pusher bar 49 with the plate 52 and, through said plate, with the rod 141. The adjustment for ejection of four bills from the roller 2 having thus been made, the final 180 degrees of rotation is imparted to the shaft 107. The initial effect of this latter 180 degrees of rotation of said shaft is to move the rod 141 and the plate 52 rearwardly, and also to move the pusher bar 49 rearwardly due to said pusher bar being coupled with said plate. As the pusher bar 49 is moved rearwardly it pushes at its rear end against the step 45 of the plate 41 and, therefore, the plate 41 is moved rearwardly, thereby imparting inward movement to the plate 34 as indicated by the arrow 142. Upon initial movement of the plate 34 the inclined bottom portion *z* of the groove 36 acts to lift the pin 31 and to project the upper end thereof into the opening 32 of the rod 21, thereby coupling the rack bar 11 with said rod, and as

further inward movement of the plate **34** takes place the portions *y*, *z'*, *z2*, *y2*, *z3* and *y3* successively pass beneath the pin **31** and maintain said pin elevated with its upper end engaged in the opening **32**. In this connection it is pointed out that the crank throw represented by the V-shaped portion of the cam groove **141***d* and the length and angularity of the slot **40** in the plate **41** are such that the rearward movement imparted to the plate **41** by the pusher rod **49** is sufficient to move the plate **34** to its innermost position. Consequently, upon completion of rearward movement of the plate **41** and inward movement of the plate **34**, the outer end portion or depth *y3* of the groove **36** underlies the pin **31**.

The foregoing operations are completed as the pin **141***c* is forced to the apex of the V-shaped portion of the cam groove **141**, and as the second stage of the second 180 degrees of rotation of the drive shaft **107** takes place, the rod **141** and the cross bar **136** are returned to their forward or starting positions and the gear segment of the disk **26** operates through the pinion **27**, the spur gear **28**, the pinion **29**, the crank disk **24** and the connecting rod or link **22** to impart four reciprocations to the rod **21**. First the rod **21** is moved forwardly, which causes the pin **31** to travel forwardly through the forwardly and inwardly inclined groove **37***d*, thereby causing the plate **34** to be returned one step outwardly. As forward movement of the rod **21** is completed the forward end portion of the groove **38***d* is brought directly below the pin **31** and said pin is projected by the spring **131** into the forward end portion of said groove **38***d*. Rearward movement of the rod **21** then occurs and the pin **31** is moved rearwardly through the groove **38***d* which, as aforesaid and as shown is inclined rearwardly and inwardly. The plate **34** therefore is returned a second step outwardly. Similarly, by succeeding forward and rearward movements of the rod **21** the pin **31** is caused to successively traverse the grooves **37***c*, **38***c*, **37***b*, **38***b*, **37***a* and **38***a*, thereby returning the plate **34** in successive steps towards its outermost or starting position, until, finally, the last groove **38** is traversed and the pin drops into the depth *x* of the groove **36**, whereupon the pin **31** is retracted from the opening **32** and the rack bar **11** and the rod **21** are uncoupled. As the plate **34** is moved outwardly the pin **39** thereof cooperates with the inclined slot **40** in the plate **41** to return the latter plate step-by-step to its forward or starting position, and, of course, with each reciprocation of the rack bar **11** the roller **4** is rotated an amount to wind thereon from the roller **2** an amount of tape sufficient to cause one bill to be unwound from the roller **2** and delivered onto the shelf **1**. Thus, since coupling of the pusher rod **49** with the plate **52** and rod **141** results in the plate **34** being moved to its innermost position upon the second 180 degrees of rotation being imparted to the shaft **107**, it is apparent that the pin **31** remains engaged in the opening **32** during four complete reciprocations of the rod **21** and the rack bar **11**, so that four bills are caused to be unwound and delivered from the roller **2** during one complete cycle of operation of the unit.

If it had been desired to effect the issue of three instead of four bills the operation would have been the same as recounted in the foregoing with the exception that the pusher bar **48** instead of the pusher bar **49** would have been coupled by the related clip **50** with the plate **52** and the rod **141**. In that event, only the pusher rod **48** would have been moved rearwardly by the rod **141** and the plate **52**, and the plate **41** would have been moved only three-fourths of its complete range of movement rearwardly due to the lost motion spacing of the rear end of the pusher rod **48** from the step **44** of the plate **41**. This, in turn, would have resulted in the plate **34** being moved only three-fourths of its complete range of movement inwardly and bringing of the step or depth *y2* of the groove **36** beneath the pin **31**. Thus, upon subsequent reciprocation of the rod **21** the pin **31** would have cooperated only with the grooves **37***c*, **38***c*, **37***b*, **38***b*, **37***a* and **38***a* and, therefore, upon completion of three reciprocations of the rod **21** and the rack bar **11** the pin **31** would have dropped into the depth *x* and only three bills would have been delivered from the roller **2**.

If it had been desired to effect the delivery of two bills the clip **50** related to the pusher bar **47** would have been depressed to couple this pusher bar with the rod **141**. In that event, only the rod **47** would have been moved rearwardly and the plate **41** would have been moved therewith only one-half of its complete range of movement rearwardly due to the lost motion spacing of the rear end of the pusher rod **47** from the step **43**. This, in turn, would have resulted in the plate **34** being moved only half-way inwardly and bringing of the step as depth *y'* of the groove **36** beneath the pin **31** so that upon subsequent reciprocation of the rod **21** and the rack bar **11** only the grooves **37***b*, **38***b*, **37***a* and **38***a* would have cooperated with said pin **31**. Consequently, upon completion of two reciprocations of the rod **21** and the rack bar **11** the pin **31** would have dropped into the depth *x* and only two bills would have been delivered from the roller **2**.

Similarly, if it had been desired to effect the delivery of only a single bill from the roller **2**, only the pusher rod **46** would have been coupled with the rod **141**. In that event, only the rod **46** would have been moved rearwardly and the plate **41** would have been moved therewith only one-fourth of its complete range of movement rearwardly due to the lost motion spacing of the rear end of the rod **46** from the step **42** of the plate **41**. This, in turn, would have resulted in the plate **34** being moved only one-fourth of its complete range of movement inwardly and bringing of the step or depth *y* of the groove **36** beneath the pin **31** so that upon subsequent reciprocation of the rod **21** and the rack bar **11** only the grooves **37***a* and **38***a* would have cooperated with said pin **31**. Consequently, upon completion of a single reciprocation of the rack bar **11** the pin **31** would have dropped into the depth *x* and only a single bill would have been delivered from the roller **2**.

So long as the roller **2** carries four or more bills, all of the pawls **60***a*, **60***b*, **60***c* and **60***d* are free to cooperate with their related pusher bars and any one of said pusher bars may be coupled with the rod **141** so that any desired number of bills up to four may be issued upon a complete cycle of operation of the machine. If, on the other hand, the roller **2** carries only three bills the pawl **60***d* will be held elevated and when the pusher bars **46**, **47**, **48** and **49** are initially moved rearwardly only the pusher bars **46**, **47** and **48** will be engaged and held in their rearwardly moved positions by the related pawls **60***a*, **60***b* and **60***c*, the pusher rod **49** returning to its forward position with the cross bar **136**. The recess **54** of the pusher bar **49** therefore will be disposed forwardly of the lug of the related clip

and said clip cannot be depressed to couple said pusher bar 49 with the rod 141. Consequently, it is not possible to adjust the mechanism to effect the issue of four bills if the roller 2 carries less than four bills. Similarly, since the pawls 60c, 60b and 60a are successively maintained elevated as the number of bills carried by the roller 2 is reduced to two, one and none, respectively, it is not possible to adjust the mechanism to issue three bills if the roller 2 carries only two bills; to adjust the mechanism to issue two bills if the roller 2 carries only one bill, or to adjust the mechanism to issue a single bill if the roller 2 is devoid of bills. The mechanism thus tests initially whether the roller 2 carries as many bills as the operator may desire to have delivered therefrom.

Always, with return of the plate 34 to its outermost position, the plate 41 is returned to its forwardmost position, so that upon completion of each cycle of operation of the mechanism the parts are restored to normal position. In this connection it is pointed out any suitable means, such as the means illustrated in German Patent No. 300,455 of September 11, 1917, may be employed to actuate the clips 50 and to effect elevation of any given clip 50 upon rearward and subsequent return movement of any given pusher bar by the rod 141. Also, it is pointed out that while the drawings illustrate in the present instance means whereby a maximum of only four bills may be caused to be issued upon one complete cycle of operation of the mechanism, it is manifest that by increasing the number of pusher bars, pawls, steps on the plate 41, grooves in the plate 34, etc., provision may be made for issuing more than four bills by a single cycle of operation of the mechanism.

In connection with the winding of bills onto the roller 2 and the unwinding of bills therefrom, a feature of the invention resides in the provision of counting means to indicate, on the one hand, the total number of bills wound on said roller and, on the other hand, the total number of bills unwound or issued from said roller. A register device known in itself and not, in itself, forming any part of the invention, is designated as 100 and is mounted to be actuated by rotation of a vertically disposed shaft 101. On the shaft 101 is a ratchet wheel 102, while on the rack bar 9 is a pawl 110 which cooperates with said ratchet wheel to rotate the shaft 101 through one step of angular movement each time said rack bar is advanced. Thus, for each bill wound on the roller 2 the register device 100 is actuated to raise by one the indication of the total number of bills wound on said roller.

On the lower end of the shaft 101 is a bevel gear 104, while loose on a transverse shaft underlying the shaft 101 is a bevel gear 170 in mesh with the gear 104. Fixed to the gear 170 is a ratchet wheel 103, and cooperating with said ratchet wheel is a pawl 106 which is carried by one of the arms of an intermediately pivoted lever 105. The other arm of said lever extends downwardly and is forked at its free end, and is operatively engaged with a pin 77 carried by an ear 172 on the plate 41. Consequently, for each step of rearward movement of the plate 41 the shaft 101 is rotated through one step of angular movement and the register device 100 is actuated to raise by one the indication of the total number of bills issued from the roller 2.

I claim:

1. In a machine of the character described, a bill holder, a member movable to operate said holder to dispense bills therefrom, an actuator for said member, clutch means between said member and said actuator tending constantly to assume a position disconnecting said member from said actuator, and clutch controlling means comprising a plate having a normal position and a formation which, in the normal position of said plate, permits the clutch to assume its disconnecting position, said plate being shiftable and having a series of other formations whereby shifting of the plate from its normal position actuates said clutch to couple said actuator with said member and to maintain a coupling status of said clutch until the plate is returned to its normal position, said series of formations being arranged so that the clutch means, by movement with the coupled actuator and member to dispense bills from said holder, returns said plate to its normal position, said series of formations further being arranged to require different amounts of movement of the coupled actuator and member to return the plate to its normal position, depending upon the amount of shifting of the plate from its normal position.

2. In a machine of the character described, a bill holder, a member reciprocal to operate said holder to dispense bills therefrom, a reciprocal actuator for said member, clutch means between said member and said actuator tending constantly to assume a position disconnecting said member from said actuator, and clutch controlling means comprising a plate having a normal position and a formation which, in the normal position of said plate, permits the clutch to assume its disconnecting position, said plate being shiftable and having a series of other formations whereby shifting of said plate from its normal position actuates said clutch to couple said actuator with said member and maintains a coupling status of said clutch until the plate is returned to its normal position, said series of formations being arranged so that the clutch means, by reciprocation with the member and actuator, cooperates therewith to return the plate to its normal position and so that different numbers of reciprocations of the member and its actuator and clutch are required to return the plate to its normal position, depending upon the amount of shifting of the plate from its normal position.

3. A machine as set forth in claim 2 including a rotatable driving element for the actuator, and a connection between the actuator and said driving element, whereby a single complete rotation of the latter imparts a plurality of reciprocations to the actuator.

4. A machine as set forth in claim 2 including a drive shaft, a connection betwen said drive shaft and the actuator whereby a single complete rotation of said shaft imparts a plurality of reciprocations to the actuator, and a plurality of manually settable means between said drive shaft and the clutch control plate to utilize initial partial rotation of said drive shaft to impart different predetermined amounts of movement to said control plate away from its normal position.

5. A machine as set forth in claim 2 including a drive shaft, a connection between said drive shaft and the actuator whereby a single complete rotation of said shaft imparts a plurality of reciprocations to the actuator, a lineally movable member connected with the clutch control plate and operable by movement in one direction to shift said control plate away from its normal position, said lineally movable member having a series of step formations, a series of pusher bars

one related to each step formation, a common operator for said pusher bars operatively connected with said drive shaft and reciprocal within a fixed range by initial partial rotation of said drive shaft, and means for selectively coupling said pusher bars with said common operator so as to utilize initial partial rotation of the drive shaft to impart different predetermined amounts of movement to said control plate away from its normal position.

6. In a machine of the character described, a bill holder, a member reciprocal to operate said holder to dispense bills therefrom, a reciprocal actuator for said member, said actuator having an opening, a pin carried by said member for projection into the opening in said actuator to couple said actuator with said member, spring means tending constantly to move said pin to a position uncoupling said actuator from said member, a pin control plate having a normal position and a recess to accommodate said pin when said plate is in its normal position thus to permit said spring means to move said pin to its uncoupling position, said plate being shiftable in a direction at right angles to the direction of reciprocation of said member and actuator and having a cam groove extending in the direction in which said plate is shiftable which cam groove is effective upon shifting of said plate from its normal position to project said pin into the opening in said member, said plate further having a series of interconnected cam grooves extending from said first mentioned cam groove and arranged to be successively traversed by said pin when the same is reciprocated with said actuator and member, said series of cam grooves leading to the recess in said plate and being effective to maintain the pin projected into the opening in said member and further being disposed so that the pin, by reciprocation with the actuator and member, cooperates therewith to return the plate to its normal position, said series of cam grooves communicating with the first mentioned cam groove at points spaced along the latter so that the number of reciprocations of the member and actuator to return the plate to its normal position is dependent upon the amount of shifting of the plate from its normal position to require more or less of the grooves of the series to be traversed by the pin.

7. In a machine of the character described, a bill holder, a member reciprocal to operate said holder to dispense bills therefrom, a reciprocal actuator for said reciprocal member, a pin carried by said member for coupling said actuator thereto, spring means tending constantly to move said pin to a position uncoupling said actuator from said member, a pin control plate having a normal position, said plate having a recess to accommodate said pin when said plate is in its normal position thus to permit said spring means to move said pin to its uncoupling position, means whereby shifting of said control plate from its normal position projects said pin to couple said actuator with said member, and plate carried means for cooperation with said pin whereby subsequent reciprocation of said actuator and pin returns said plate to its normal position, said plate carried means being constructed and arranged to require different numbers of reciprocations of said actuator to return said plate to its normal position, depending upon the amount of shifting of said plate from its normal position.

8. In a machine of the character described, a bill holder, a member reciprocal to operate said holder to dispense bills therefrom, a reciprocal actuator for said member, a pin carried by said member for projection into engagement with said actuator to couple the actuator with said member, said pin when coupling said member and actuator being reciprocal therewith, means tending constantly to move said pin to a retracted position disconnecting said actuator from said member, a pin control plate having a normal position and having a recess which, in the normal position of said plate, permits said pin to assume its uncoupling status, said plate being longitudinally shiftable in a direction at right angles to the direction of reciprocation of the pin with said member and actuator and having a longitudinally extending groove leading from said recess, the bottom of said groove being composed of a series of steps effective when the plate is shifted from its normal position to project said pin, said plate also having a series of grooves one leading diagonally from each step of said first mentioned groove and further having a second series of diagonally extending grooves one of which leads to the recess from the groove of the first series nearest said recess and the others of which connect the grooves of the first mentioned series, respectively, said two series of grooves having inclined sides and bottoms so that upon shifting of the plate to bring any particular one of the first mentioned series of grooves into alinement with the pin subsequent reciprocation of the pin with the member and actuator causes the pin to successively traverse the grooves of the two series leading to the recess thus to return the plate to its normal position, the bottoms of the two series of grooves being effective to maintain the pin projected until the plate is restored to its normal position.

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