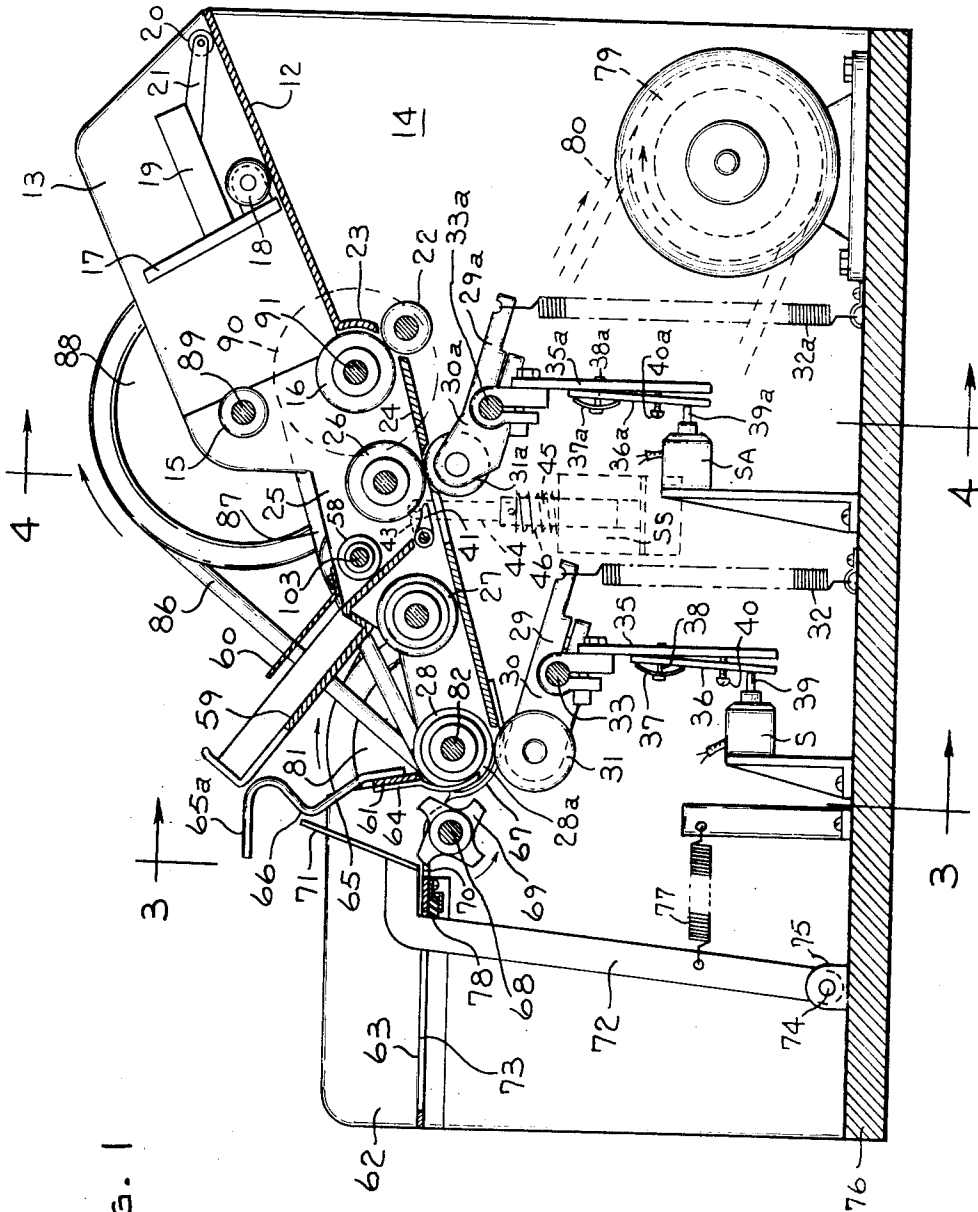


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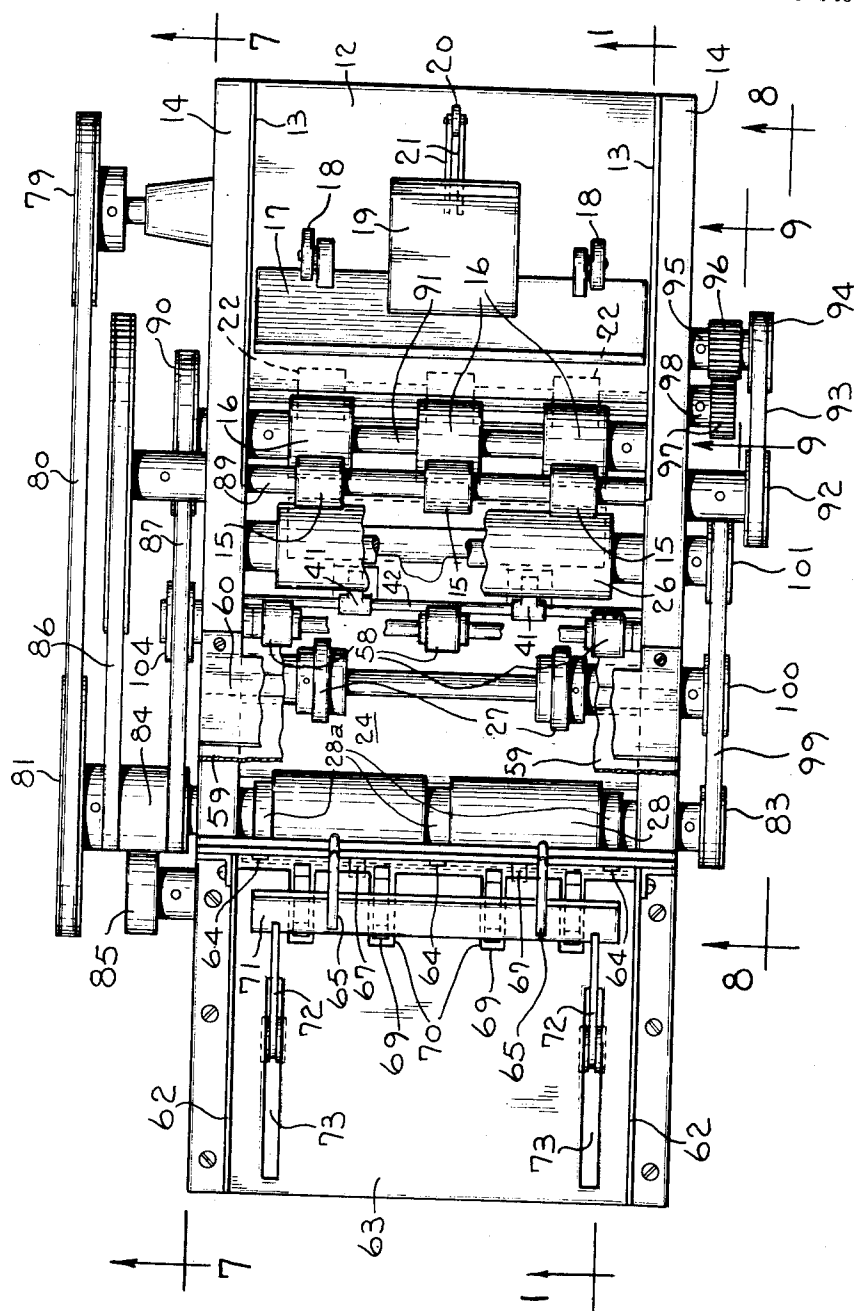
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CURRENCY COUNTING APPARATUS

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5 Sheets-Sheet 2



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CURRENCY COUNTING APPARATUS

5 Sheets-Sheet 3

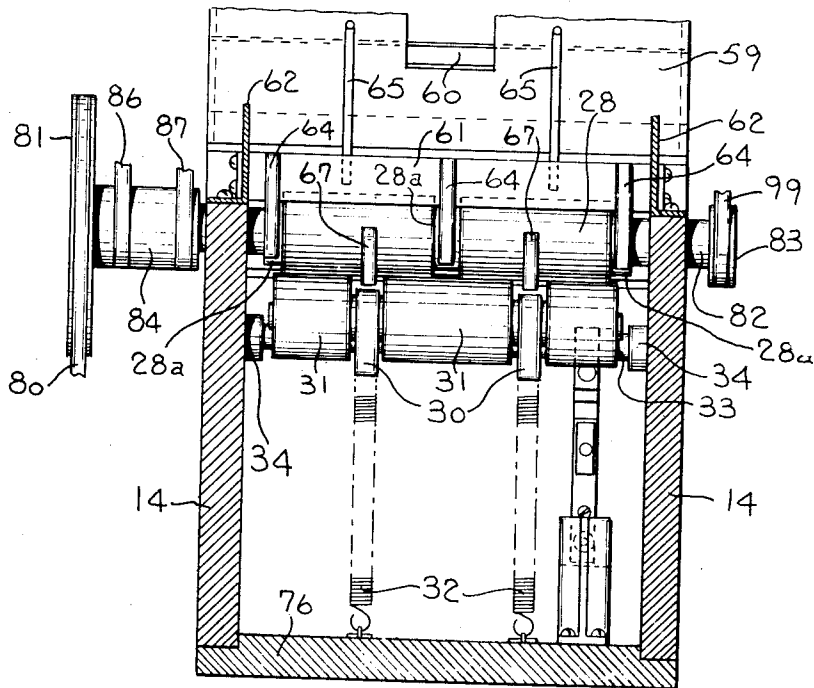


FIG. 3

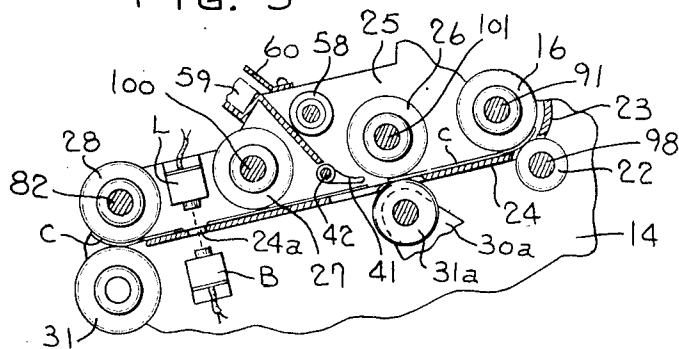


FIG. 10

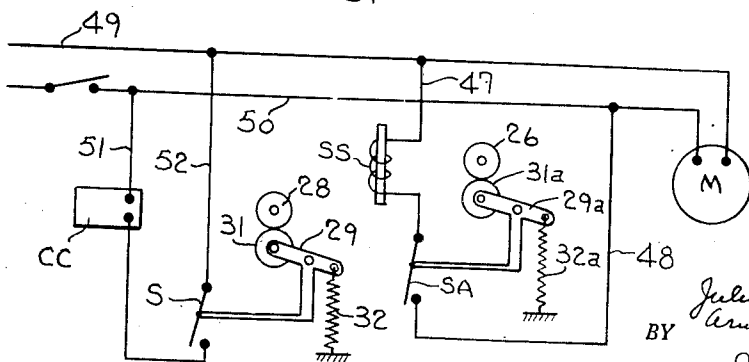


FIG. 11

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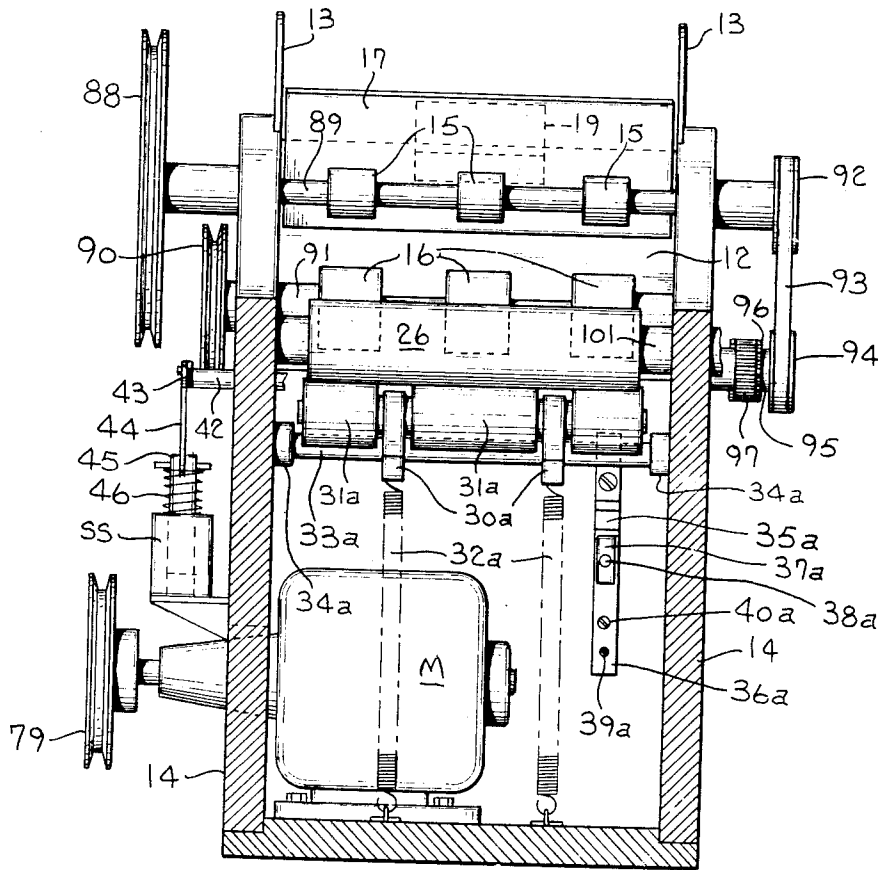


FIG. 4

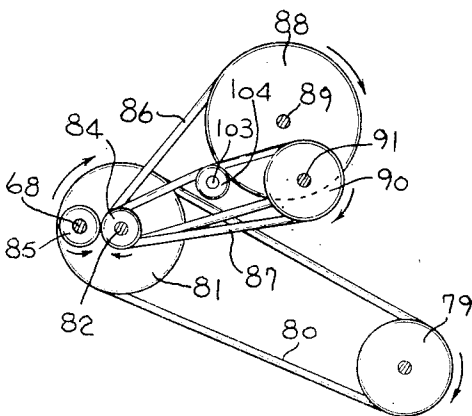
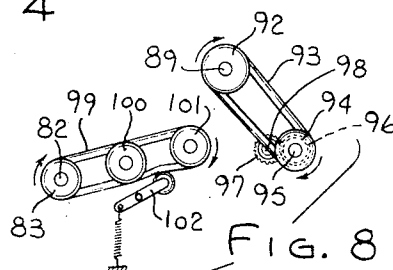


FIG. 7



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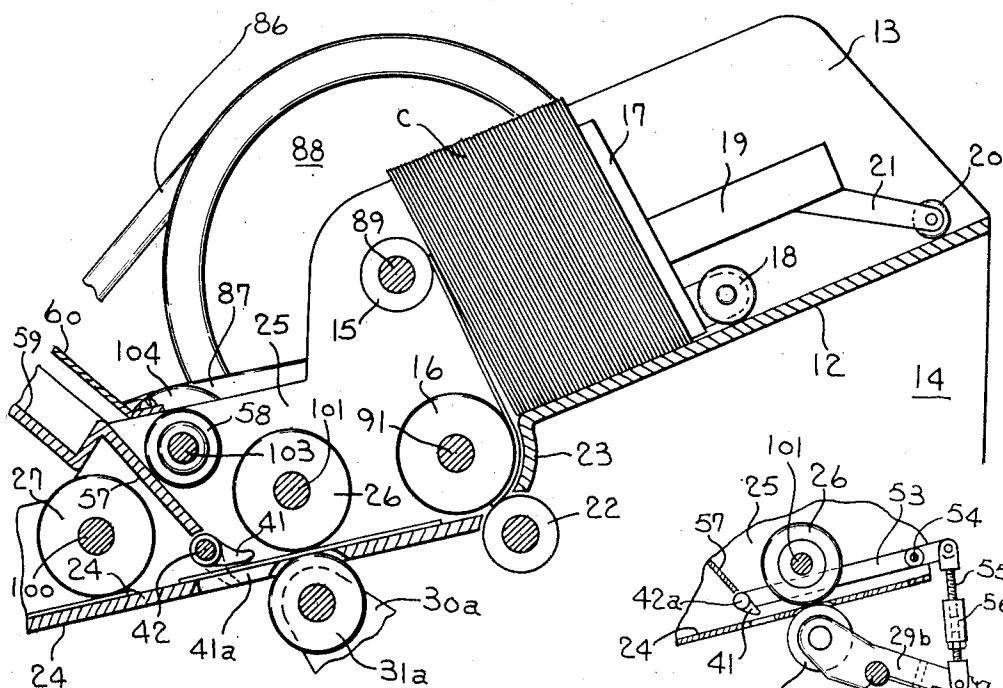


FIG. 5

FIG. 12

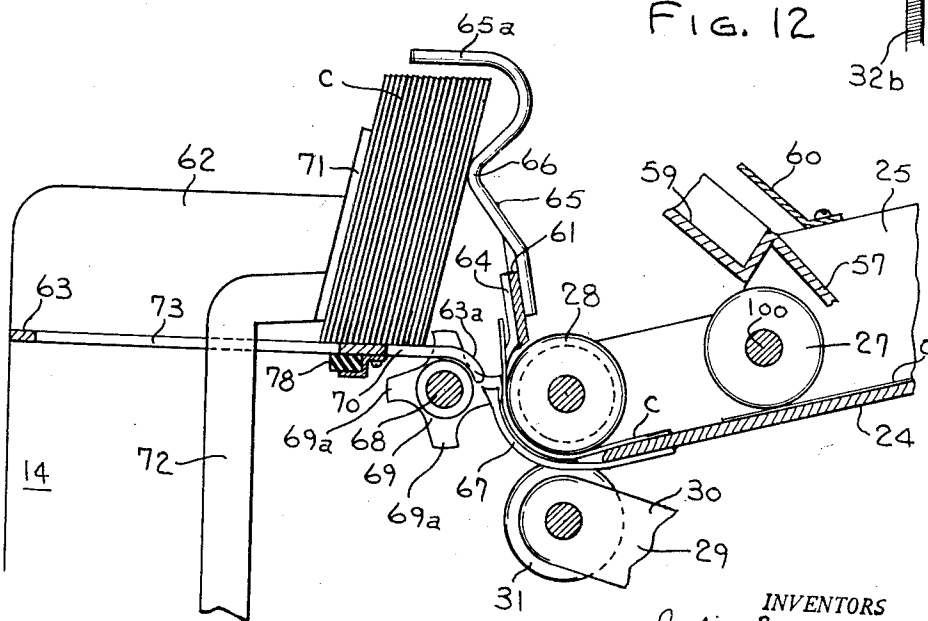


FIG. 6

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CURRENCY COUNTING APPARATUS

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Application March 1, 1954, Serial No. 413,294

7 Claims. (Cl. 235—92)

The invention relates to currency counting apparatus. The main object of the invention is to provide an apparatus for the expeditious counting of currency such as silver certificates, bank notes, and the like, and in particular an apparatus in which the currency may be supplied for counting in the form of a stack, separated for counting and then delivered as a stack or pile of juxtaposed currency.

The invention further consists in the several features hereinafter set forth and more particularly defined by the appended claims.

In the drawings:

Fig. 1 is a detailed vertical sectional view taken on the line 1—1 of Fig. 2;

Fig. 2 is a plan view of counting apparatus embodying the invention, parts being broken away;

Fig. 3 is a vertical sectional view taken on the broken line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view taken on the broken line 4—4 of Fig. 1;

Fig. 5 is an enlarged vertical sectional view of the front end of the apparatus;

Fig. 6 is an enlarged vertical sectional view of the delivery end of the apparatus;

Fig. 7 is a vertical sectional view taken on the broken line 7—7 of Fig. 2;

Fig. 8 is a detailed side elevation view looking along the line 8—8 of Fig. 2;

Fig. 9 is a detailed vertical sectional view taken on the line 9—9 of Fig. 2;

Fig. 10 is a vertical sectional view through the counting section of the apparatus showing certain modifications;

Fig. 11 is a circuit diagram;

Fig. 12 is a detailed vertical sectional view showing certain modifications.

The apparatus in general comprises a front end section in which the currency is received in stacked form and separated, a counting section, and a delivery or collecting section.

Referring to Figs. 1 and 2, the receiving section includes a compartment including an inclined table 12 and side walls 13 secured to the side frame members 14 of the apparatus, the compartment adapted to receive the currency C arranged in stacked form as shown in Fig. 5, with the currency units resting at their lower edges lengthwise across the table 12. Spaced sets of separator rollers 15 and 16 are mounted at the lower end of the table 12 and form a movable front stop for the stack. A backing or follower plate 17 is disposed in the compartment so as to move along said table and is provided with a spaced set of rollers 18 running on the table, a weight 19, and a roller 20 running on the table and carried by arms 21 secured to the back end of said weight. The weighted follower acts on the back of the stack of currency to hold it in operative relation with the rollers 15 and 16 and advance it along the table 12. The rollers 16 cooperate with a set of rollers 22 to feed a single

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piece of currency to the counting section. All the rollers 15, 16, and 22 are continuously rotated by their shafts as hereinafter described and are preferably of rubber, the rollers 16 preferably being formed of sponge rubber.

The rollers 15 are of smaller diameter than the rollers 16 so that they have a lower surface speed than these rollers and are driven at a slower speed and act to start the movement of the first unit of the stack down in between the rollers 16 and a guide flange 23 into the nip of the feed rollers 16 and 22 which then advance it to the counting section. Since the speed of the rollers 16 is greater than that of the rollers 15, the forward unit of the stack is carried away while the next unit in the stack is being acted on by the rollers 15 to start its movement to the rollers 16 and 22. The rollers 22 rotate at a slower speed than the rollers 16, so that if two units should get into the nip between the rollers 16 and 22, the rollers 22 will tend to hold back the unit with which it is in contact. Thus the currency units are removed from the stack one at a time and carried to the counting section, but if for any reason two units of the stack instead of one are advanced by the rollers 16 and 22, means hereinafter described are provided for removing any two or more units before they could be counted as a single unit.

The counting section includes a trough formed by an inclined platform 24 and side walls 25 along which the separated units are advanced by a series of spaced rollers 26, 27, and 28, the rollers 27 being preferably formed of sponge rubber and the rollers 26 and 28 being of metal, preferably steel. The distance between these rollers is somewhat less than the width of the bill or note being handled so that this unit of currency is continuously fed along the platform 24. All of the rollers 26, 27, and 28 are power driven and rotate at the same speed. While traveling through this section the currency units may be counted by any suitable counter mechanism, preferably an electrically operated counter whose operation is controlled by means sensitive to the passage of a single unit of currency. Two such means have been shown, one a mechanically operated circuit closer and the other an electric eye operated closer.

Referring to Fig. 1, the counter control switch S is operated by a pivoted lever 29 sensitive to the passage of a single unit of currency along the platform 24. Lever 29 is in effect a bell crank lever including spaced arms 30 carrying rollers 31 biased to contact engagement with the roller 28 by springs 32 and secured to a shaft 33 pivotally mounted in bearings 34 on the frame of the machine and including an arm 35 clamped to the shaft 33 and carrying a switch actuating member 36. Member 36 is adjustably secured to the arm 35 by a spring plate 37 and its bolt 38 engaging one end thereof so that its free end may be adjusted to different positions relative to the switch actuator button 39 by a set screw 40.

The position of member 36 relative to the button 39 is so adjusted that when a single unit of currency passes between the roller 28 and the rollers 31, the lever 29 will swing counter clockwise an amount sufficient to relieve the pressure of member 36 on the button 39 and permit the switch S to close. In Fig. 10, the electric eye unit acts to close the switch S as a single unit of currency is passing by, the units indicated being a light source L and a photo-electric cell B which furnishes the current for operating the tube circuit (not shown) for operating the switch S, the platform 24 in this instance having an opening 24a to permit passage of light.

As previously noted, to prevent more than one unit of currency passing to the counter controlling means, means are provided for diverting two or more units of currency from the counting section if they should be simultaneously fed thereto. This means includes a diverter of more than single currency units and means sensitive to more

than one currency unit for controlling said diverter. Referring to Figs. 1, 2, 5, 11, and 12, the diverter includes spaced fingers 41 mounted on an oscillatory shaft 42, journaled in the frame, and movable from the full line position shown in Fig. 5 to the dotted line diverter position through openings 41a in the platform 24. The fingers 41 may be oscillated by a solenoid. In Figs. 1 and 4 the shaft 42 carries a crank arm 43 operatively connected by a link 44 with the plunger 45 of a solenoid SS. A spring 46 acts to hold the plunger 45 and its associated parts in an inoperative position. When energized, the plunger 45 pulls down on the link 44 and crank 43 to swing the shaft 42 and fingers 41 to operative position. Solenoid SS is under the control of a normally open switch SA which is operated by a thickness sensitive means similar to lever 29 and its associated parts and includes a bell crank lever 29a formed by spaced arms 39a carrying rollers 31a biased to contact engagement with the roller 26 by springs 32a and secured to a shaft 33a pivotally mounted in bearings 34a on the side frame members 14 and including an arm 35a clamped to a shaft 33a and carrying a switch actuating member 36a which is adjustably secured to the arm 35a by a spring plate 37a and its bolt 38a engaging one end thereof so that its free end may be adjusted to different positions relative to a switch button 39a of the switch SA by a set screw 40a. The position of the member 36a relative to the button 39a is such that in case the rollers 26 and the rollers 31a are separated by a greater amount than the thickness of a single unit of currency, then the normally open switch SA will be allowed to close and be energized by current received through conductors 47 and 48 connecting its coil across the supply lines 49 and 50 for the motor M as indicated in Fig. 11 which also shows the electrically operated counter CC connected across the supply lines by conductors 51 and 52, the conductor 52 including the normally open counter control switch S.

As a mechanical means for operating the fingers 41 in case more than one unit of currency passes the roller 26, the shaft 42a that carries these fingers is mounted on the outer end of an oscillatory lever 53 which is pivoted intermediate its ends at 54 on the frame and operatively connected by a link 55 with a lever 29b, pivoted at 33b and carrying rollers 31b similar to the rollers 31a, said lever 29b being normally moved by a spring 32b to bring roller 31b into contact with the roller 26. The link 55 includes an adjustable turnbuckle connection 56 between its parts whereby the position of the lever 53 and its fingers 41 may be set so that movement of a single unit of currency between the rollers 26 and 31b will not move the fingers into diverting position but movement of the roller 31b by more than one unit of currency at a time will be sufficient to move the fingers 41 to a diverting position.

Plural units of currency on being diverted upwardly from the platform 24 pass up along an inclined guide plate 57 between said plate and rotating rollers 58 by which these rejected units are carried into a tray 59 that may have a deflector cover plate 60.

Referring to Figs. 1, 2, and 6, the collector mechanism includes a plate 61 extending across the machine and cooperating with side plates 62 and a bottom plate 63 to form a stack receiving space. At immediately spaced points the plate 61 has three stripper fingers 64 secured thereto which extend down and partially around the roller 28 and into annular grooves or recesses 28a in the roller 28. Plate 61 also carries a pair of spaced holder fingers 65, each preferably shaped as shown to provide an inwardly extending guide projection 66. A pair of spaced guide and back stop fingers 67 are suitably mounted to extend up and partly around the front side of the roller 28 and are spaced therefrom and from the strippers 64 a short distance in front of the same. A rotary shaft 68 carries a plurality of spaced toothed members or kickers 69, whose teeth have a nipping relation with the roller

28, said members working in slots 70 in the bottom plate 63. A yieldably mounted back stop for the collected currency is provided by a transversely disposed plate 71 mounted on the outer ends of spaced arms 72 working in slots 73 in plate 63 and pivotally mounted at their lower ends on pins 74 mounted in brackets 75 on a base plate 76, said arms and plate being normally urged toward the right as viewed in Figs. 1 and 6 by springs 77. The innermost position of the plate 71 is determined by a yieldable (rubber) stop block 78 adapted to be engaged by the arms 72 whereby the upper end of the plate 71 is spaced a short distance in front of the projections 66. The front portions 63a of the bottom plate 63 are curved down preferably to a position adjacent the stop fingers 67 as shown in Fig. 6.

With this arrangement as the rotating roller 28 carries the unit of currency along with it away from the platform 24, this unit is carried up between said roller and the stop fingers 67 and between said roller and the ends of the teeth 69a of the members 69 as indicated in full in Fig. 6. Then when the tail end or lower edge of the currency unit passes the members 69, a tooth thereof acts to push or kick the currency unit upwardly so that its upper portion passes up between the plate 71 and projections 66 until its upper edge hits the stop portions 65a of the fingers 65, thus, depositing the currency unit in the stack receiving space. After one or more currency units have been carried up and deposited in this manner in superimposed relation with the plate 71, the toothed members 69 in revolving act on the lower edges of these units to press them and the yieldable back including plate 71 towards the left as viewed in Fig. 6 to make room for other units carried up between the last deposited unit and the fingers 65. In this way a stack of currency units is collected in the stack receiving space from which they may be removed by hand or by suitable mechanism. The upper ends of the back stop fingers 67 act to prevent any currency unit elevated by the members 69 from dropping back against the roller 28.

The mechanism for driving the various rollers previously mentioned will now be described. Referring to Figs. 1 to 4 and 7 to 9, the shaft for the motor M carries a pulley 79 connected by a belt 80 with a pulley 81 on a shaft 82 on which the rollers 28 are mounted. Shaft 82 carries a pulley 83 and also a brass driver cylinder 84 adapted to frictionally engage at its mid-part with a rubber roller 85 on the shaft 68 and grooved to take belts 86 and 87. Belt 86 connects driver 84 with a pulley 88 on the shaft 89 carrying the rollers 15. Belt 87 connects driver 84 with a pulley 90 on the shaft 91 carrying the rollers 16. It is to be noted that the pulley 88 is much larger than the pulley 90 so that shaft 89 rotates slower than shaft 91, and consequently the rollers 15 rotate slower than the rollers 16 which in addition are larger than the rollers 15 to further increase the speed differential between these sets of rollers. Shaft 89 carries a pulley 92 connected by a belt 93 with a pulley 94 on a lay shaft 95 which carries a gear 96 meshing with a gear 97 on the shaft 98 that carries the rollers 22. The pulley 83 on shaft 82 is connected by a belt 99 with pulleys 100 and 101 on the shafts for the roller 26 and the rollers 27, the belt 99 being engaged by a spring urged tensioning lever 102. The shaft 103 for the rollers 58 carries a pulley 104 that is engaged by the belt 87.

As the operation of each of the sections of the apparatus has been described in detail, further description thereof is not deemed necessary.

We desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the appended claims.

What we claim as our invention is:

1. In a currency counting apparatus, the combination of a counting section having means for feeding separated units of currency therethrough, a compartment for re-

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ceiving currency units as a stack, means for removing currency units, one at a time, from said stack and delivering said units to said counting section, a delivery compartment for receiving said currency units from said counting section including a yielding mounted back support, and toothed rotary means for pushing the counted currency units, one at a time, into said delivery compartment to form a stack and acting to move said movable back support and the stacked currency to make way for other currency units as the stack builds up in said delivery compartment.

2. In a currency counting apparatus, the combination, of a counting section having means for feeding separated units of currency therethrough, a compartment for receiving currency units as a stack, rotary roller means for removing said currency units, one at a time, from said stack and delivering said units to said counting section, a delivery compartment for receiving said currency units from said counting section, and stack forming means for said delivery compartment including a currency edge engaging rotary currency elevator and guide means for a currency unit cooperating with said elevator.

3. In a currency counting apparatus, the combination of a counting section having means for feeding separated units of currency therethrough, a compartment for receiving currency units as a stack, means for removing said currency units, one at a time, from said stack and delivering said units to said counting section, a delivery compartment for receiving said currency units from said counting section including a movable back support, means for pushing the counted currency units, one at a time, into said delivery compartment to form a stack, and back stop fingers associated with said pushing means to prevent back movement of a currency unit moved by said pushing means.

4. In a currency counting apparatus, the combination of a counting section having means for feeding separated units of currency therethrough, a compartment for receiving currency units as a stack, means for removing said currency units, one at a time, from said stack and delivering said units to said counting section, a delivery compartment for receiving said currency units from said counting section, a feed roller to carry said units to said delivery section, strippers for removing said units from said feed roller and guiding them into said delivery section, guide means for the removed units cooperating with said strippers, and means for pushing the counted currency units, as removed from said feed roller, one at a time, into said delivery compartment.

5. In a currency counting apparatus, the combination

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of a counting section having means for feeding separated units of currency therethrough, a compartment for receiving currency units as a stack, means for removing currency units, one at a time, from said stack and delivering said units to said counting section, a delivery compartment for receiving said currency units from said counting section, means for deflecting currency units from said counting section upwardly into said delivery section, and rotary means associated with said deflecting means and engageable with a long side edge of a currency unit for pushing the counted currency units, one at a time, into said delivery compartment to form a stack.

6. In a currency counting apparatus, the combination of a counting section having means for feeding separated units of currency therethrough, a compartment for receiving currency units as a stack, smooth faced spaced rollers forming the front end of said compartment and engageable with a side of the foremost currency unit, means for positively rotating said rollers at different speeds to remove currency units, one at a time, from said stack, means cooperating with one of said rollers to feed the currency units, one at a time, to said counting section, a delivery compartment for receiving said currency units, and means for delivering the counted currency units, one at a time, into said delivery compartment.

7. In a currency counting apparatus, the combination of a counting section having means for feeding separated units of currency therethrough, a compartment for receiving currency units as a stack, a pair of upper and lower rollers forming the front end of said compartment and engageable with a side of the foremost currency unit, means for positively rotating the upper roller at a slower speed than said lower roller to remove currency units, one at a time, from said stack in the direction of the lower roller, and means including a driven feed roller having a cooperative relation with said lower roller to insure the feed of the currency units, one at a time, to said counting section, a delivery compartment for receiving said currency units, and means for delivering the counted currency units, one at a time, into said delivery compartment.

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