April 19, 1966 A. R. BUCHHOLZ ETAL 3,246,658

COIN COUNTER PREDETERMINED COUNT CONTROL APPARATUS

Filed Oct. 31, 1963 5 Sheets-Sheet 1

Fig. 1

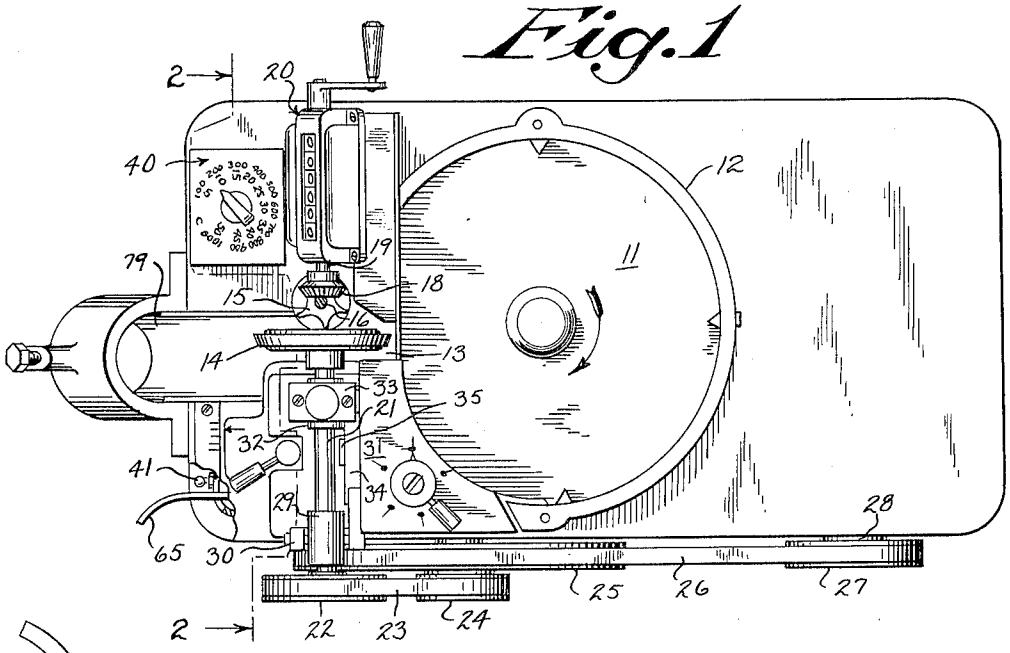
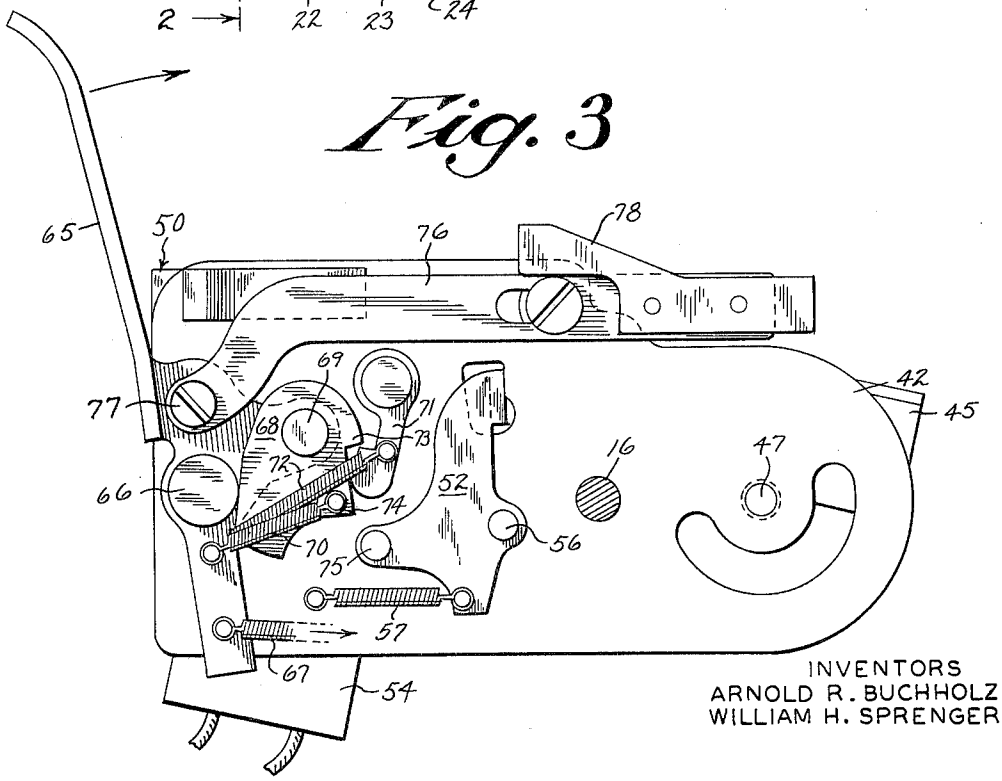


Fig. 3



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COIN COUNTER PREDETERMINED COUNT CONTROL APPARATUS

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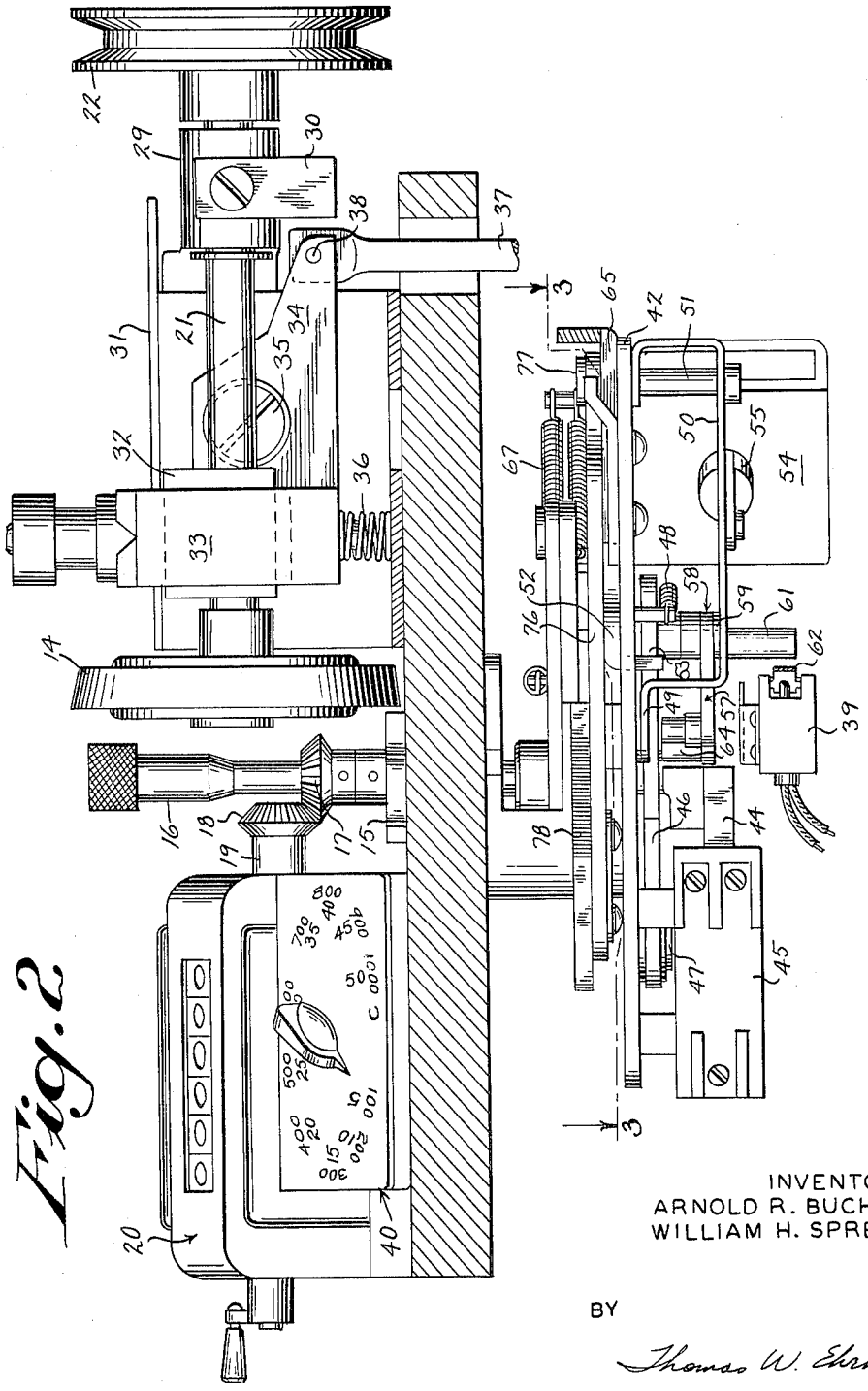


Fig. 2

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COIN COUNTER PREDETERMINED COUNT CONTROL APPARATUS

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Fig. 4

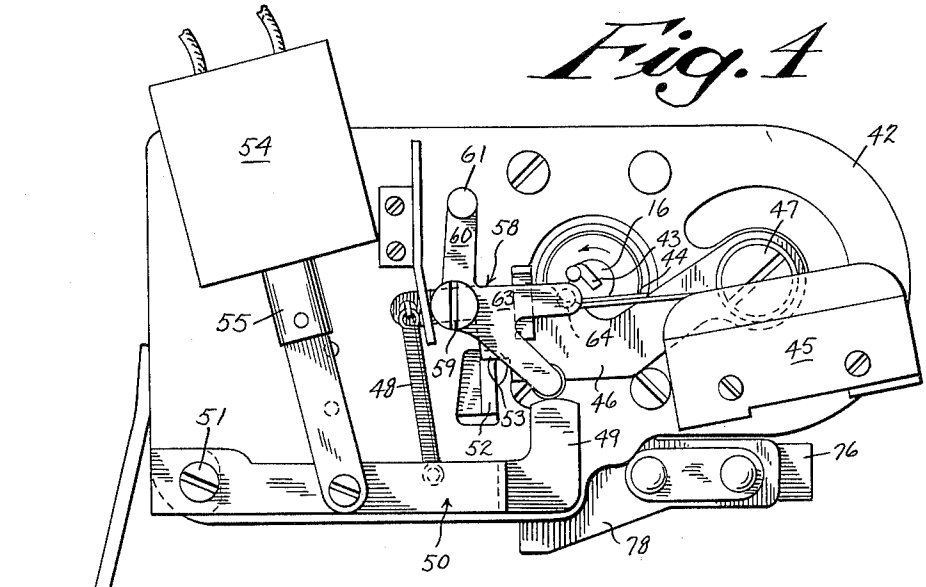
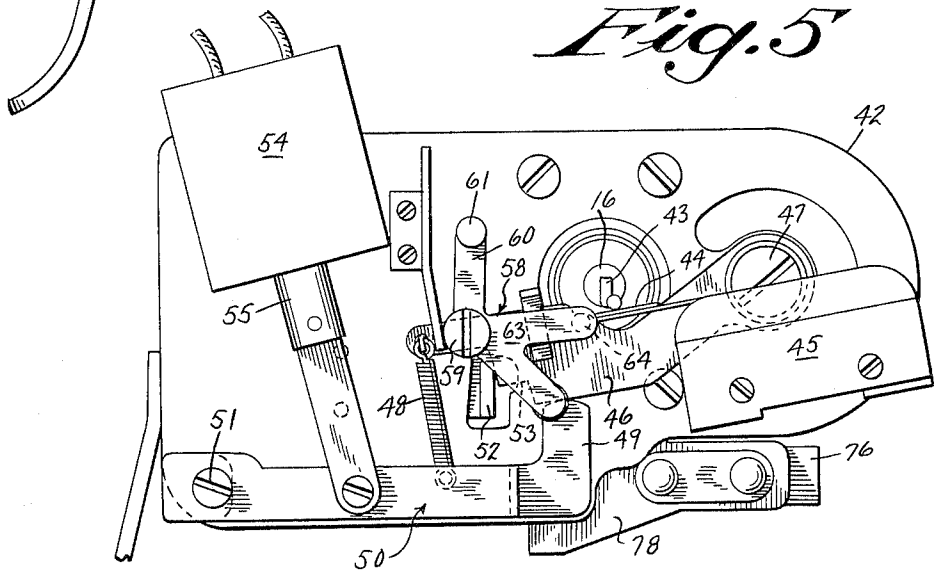


Fig. 5



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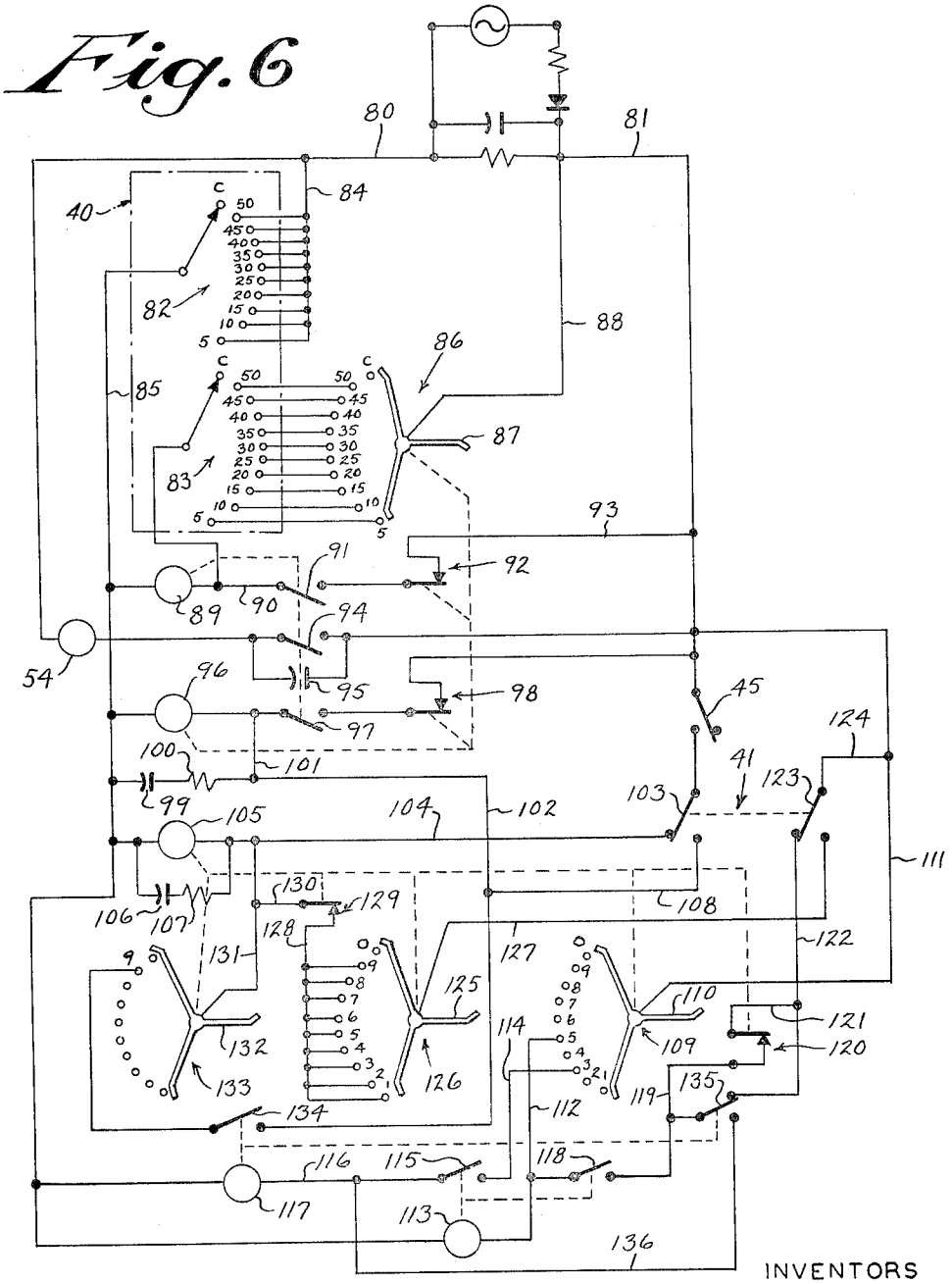
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COIN COUNTER PREDETERMINED COUNT CONTROL APPARATUS

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Fig. 6



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COIN COUNTER PREDETERMINED COUNT CONTROL APPARATUS

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Fig. 1

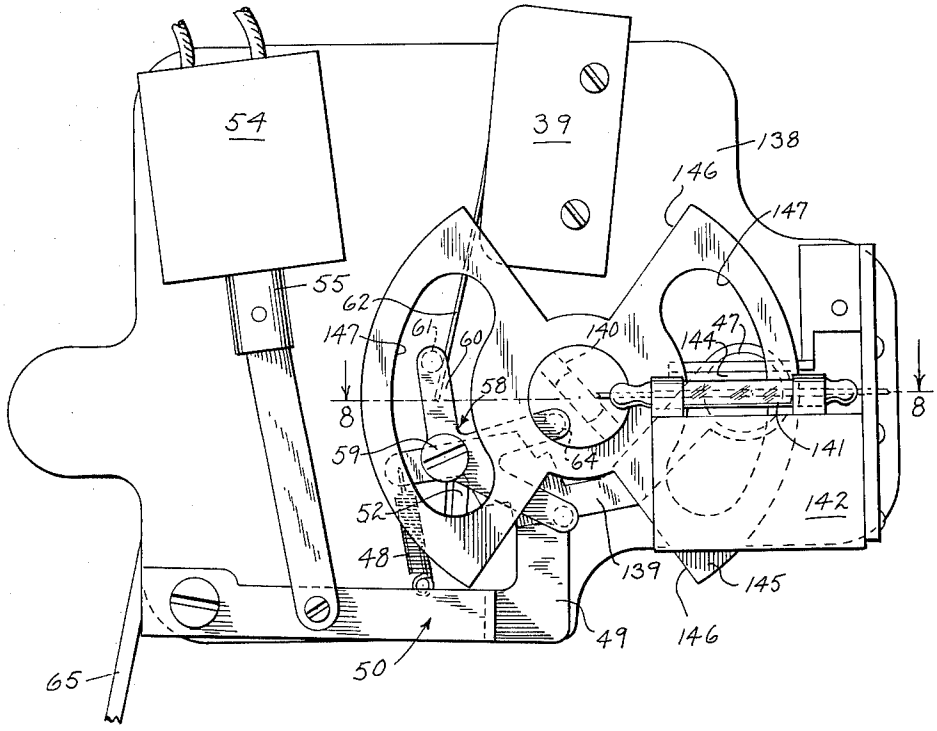
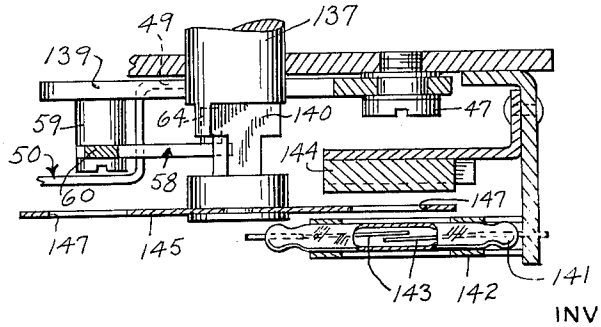


Fig. 8



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United States Patent Office 3,246,658 Patented Apr. 19, 1966

3,246,658

COIN COUNTER PREDETERMINED COUNT CONTROL APPARATUS

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Filed Oct. 31, 1963, Ser. No. 320,473
10 Claims. (Cl. 133—8)

This invention relates to a predetermined count control apparatus for coin counting machines, and more particularly to an improved electrically controlled apparatus for halting the flow of coins to be counted at the end of a predetermined count. The invention may further reside in such an electrically controlled apparatus in which the flow of coins is halted at the end of a predetermined count of a selectable range of relatively small numbers of coins and also at the end of a predetermined count of a selectable range of large numbers of coins.

Coin counting machines of the type considered herein are employed to count a predetermined number of coins of a given denomination for packaging of the coins in paper wrappers or in bags. To achieve the automatic counting of coins in batches containing predetermined numbers of coins it is necessary to positively halt the flow of coins to be counted when the predetermined count has been reached. Control mechanisms of the type shown in U.S. Letters Patent No. 2,645,234, issued June 14, 1953, to Arnold R. Buchholz for "Control Mechanism for Coin Counting Machines," and in a copending application of Arnold R. Buchholz for "Control Mechanism for Coin Counting Machines," Serial No. 182,169, filed March 26, 1962, now Patent No. 3,138,166, and assigned to the assignee of this invention, have been utilized for the function of halting the flow of coins at the end of a predetermined count by rendering inoperative a coin feed wheel which feeds coins past a counting station. Such control mechanisms have been wholly mechanical in their operation and relied upon ratchet wheels to mechanically register the count. In addition to halting the flow of coins at the end of a predetermined count of a range of small numbers of coins, usually ten to fifty for packaging in paper wrappers, such control mechanisms have been capable of halting the flow of coins at the end of a single large number of coins, usually one thousand coins for bagging operations.

It is one object of this invention to provide an improved electrically controlled predetermined count control apparatus for a coin counting machine, which apparatus includes electromechanical count registering means.

It is a further object of this invention to provide a predetermined count control apparatus capable of halting the flow of coins, alternately, at the end of a predetermined count of a selectable range of small numbers of coins and further at the end of a predetermined count of a selectable range of large numbers of coins.

It is another object of this invention to provide a predetermined count control apparatus which will control the counting of batches of coins in multiples of five from five to fifty and in multiples of one hundred from one hundred to one thousand.

It is also an object of this invention to provide such a control apparatus which includes settable count selector means for selecting predetermined counts within a range of small numbers of coins and a range of large numbers of coins together with range selector means to select the desired range of counts.

It is another object of this invention to provide such a control apparatus which includes high range count registering means which registers the count in multiples of five coins and a low range count registering means which registers the count in multiples of five coins and which is alternately responsive to the high range registering means to register the count in multiples of one hundred coins.

It is another object of this invention to provide means for recycling the high range count registering means following an incomplete count without the necessity of running through a large batch of coins.

It is another object of this invention to provide a reset mechanism for resumption of predetermined counts following the completion of a count, which reset mechanism requires a positive manual action by the operator to prevent accidental resetting.

It is another object of this invention to provide an improved coin counting mechanism using a dry reed count switch for high speed operation.

The foregoing and other objects will appear in the description to follow. In the description, reference is made to the accompanying drawings which form a part hereof and in which there is shown by way of illustration several specific forms in which this invention may be practiced. These forms will be described in sufficient detail to enable those skilled in the art to practice this invention, but it is to be understood that other embodiments of the invention may be used and that changes may be made in the embodiments described without departing from the scope of the invention. Accordingly, the following detailed description is not to be taken in a limiting sense and the scope of the present invention is best defined by the appended claims.

In the drawings:

FIG. 1 is a top plan view of a coin counting machine with which the count control apparatus of this invention may be employed;

FIG. 2 is a view in vertical section taken in the plane of the line 2—2 of FIG. 1;

FIG. 3 is a top plan view of a portion of the count control apparatus;

FIG. 4 is a bottom plan view of the portion of the count control apparatus of FIG. 3 and showing the same in one operating position;

FIG. 5 is a view similar to FIG. 4 showing the operating parts in other positions;

FIG. 6 is a diagrammatic view illustrating the electrical circuit of the count control apparatus of this invention;

FIG. 7 is a bottom view of an alternate count switch assembly; and

FIG. 8 is a view in vertical section of the count switch assembly of FIG. 7 taken in the plane of the line 8—8 of FIG. 7.

Referring to FIGS. 1 and 2, the predetermined count control apparatus of this invention is preferably used with a counting machine of the type which includes a continuously rotating disc 11 forming the bottom of a hopper defined by an upstanding annular flange 12 and from which coins are carried by centrifugal force through an adjustable gate opening to a discharge channel 13 where they are engaged by a rubber feed wheel 14 and are forced thereby to engage a star wheel 15 to rotate the star wheel 15. The star wheel 15 is mounted on a shaft 16 provided with a beveled gear portion 17 which meshes with a beveled gear 18 mounted on a shaft 19 for operating a conventional zero resettable counter 20.

The feed wheel 14 is mounted on an extending portion of a shaft 21 which carries a pulley 22 at its other end. The pulley 22 is connected by a belt 23 with a pulley 24 on a shaft carrying yet another pulley 25 connected by a belt 26 with a pulley 27 on a motor driven shaft 28. The shaft 21 is mounted in a rear bearing 29 pivotally supported within a yoke 30 securely affixed to a coin gate housing 31. The shaft 21 is further mounted in a front bearing 32 carried within a box 33 formed as an integral part of a tiltable support 34 mounted to turn on a pivot shaft 35. A compression spring 36 biases upwardly

against the bottom of the box 33 to urge the feed wheel 14 upwardly away from a coin engaging position.

The feed wheel 14 is rendered operative to feed coins to the star wheel 15 by a mechanism fully described in the aforementioned copending application of Arnold R. Buchholz, Serial No. 182,169, now Patent No. 3,138,166. The mechanism includes a continuous duty solenoid (not shown) which is normally energized when the counting machine is in operation. When the continuous duty solenoid is energized the mechanism causes a rod 37, which is mounted at its upper end on a shaft 38 carried by the tiltable support 34, to be moved upwardly to thereby move the feed wheel 14 to a coin engaging position. A normally closed switch 39 is connected to the circuit for the continuous duty solenoid. The predetermined count control apparatus hereinafter described operates to open the switch 39 to deenergize such continuous duty solenoid at the end of a predetermined count, but in the prior art and as shown in U.S. Letters Patent No. 2,378,828 instead of a tilting feed wheel 14 a clutch may be utilized between the pulley 22 and the shaft 21 and the count control apparatus hereinafter described is also applicable to controlling the operation of such a clutch.

A rotary predetermined count selector switch 40 is mounted on the top surface of the coin counting machine. The count selector switch 40 illustrated in the embodiment being described may be set at any one of eleven positions. Ten of the positions are settings for predetermined counts from five to fifty in increments of five coins. These same settings may be also used for predetermined counts of one hundred to one thousand in increments of a hundred by a range selector switch 41 mounted on the front face of the counting machine (see FIG. 1). The final setting of the count selector switch 40 is for a continuous count "C."

As will be more fully described hereafter, the count selector switch 40 operates upon a count registering circuit which is actuated and controlled by the passage of coins as indicated by the rotation of the shaft 16 mounting the star wheel 15. Specifically, the star wheel 16 is journaled through an opening in a frame 42 and terminates in a coin driven member in the form of a single tooth member 43 (see FIGS. 3–5). The single tooth member 43 makes one complete revolution for each five coins counted and, if unobstructed by parts later to be described, the single tooth member 43 will engage an arm 44 of a normally open count switch 45 supported on the underside of the frame 42 since the switch arm 44 normally lies in the path of travel of the single tooth member 43.

A blocking member 46 is pivotally mounted at one end on a shaft 47 secured to the frame 42, and the blocking member 46 is normally urged downwardly as viewed in FIGS. 4 and 5 by a spring 48 to an inoperative position. In its normal inoperative position, the blocking member 46 due to the action of the spring 48 is in contact with a bent end 49 of a shifting lever 50. The shifting lever 50 is pivotally mounted at one end on a pivot screw 51 secured to the frame 42.

In its normal inoperative position as shown in FIG. 5, the member 46 does not interfere with the rotation of the single tooth member 43. In its alternative operative position which is shown in FIG. 4, the member 46 lies in the path of travel of the single tooth member 43 and the member 46 is held in such operative position against the force of the spring 48 by a latch 52 which projects through an opening in the frame 42 and engages a shoulder 53 on the member 46. The member 46 is moved to this blocking position by the energization of a solenoid 54 having its plunger 55 pivotally connected to the shifting lever 50. That is, each time the solenoid 54 is energized the plunger 55 thereof is drawn inwardly to rotate the shifting lever 50 about its pivot 51 and thereby cause the bent end 49 to move the member 46 upwardly until the latch 52 engages the shoulder 53 of the blocking member 46.

As seen in FIG. 3, the latch 52 is pivotally supported on a shaft 56 mounted on the top side of the frame 42. The latch 52 is urged toward a latching position relative to the blocking member 46 by a spring 57.

A control member 58 is pivotally mounted on a shaft 59 supported by an extending end of the blocking member 46. The control member 58 is provided with three arms. One arm 60 mounts a pin 61 adapted to engage the switch arm 62 of the normally closed switch 39 (see FIG. 2). A second arm 63 mounts a pin 64 which is adapted to be engaged by the single tooth member 43 when the control member 58 has been carried to a receptive position by movement of the blocking member 46 to its blocking position. When the pin 64 is engaged by the single tooth member 43, the control member 58 will pivot about its shaft 59 causing the pin 61 of the arm 60 to engage the switch arm 62 and open the switch 39 to render the continuous duty solenoid (not shown) inoperative.

Referring to FIG. 3, a reset and count start lever 65 is pivotally mounted on the frame 42 on a shaft 66 and is normally urged to an inoperative position by a spring 67. The control lever 65 extends through an opening in the front face of the machine for manual operation by the machine operator. The control lever 65 pivotally mounts a latch release dog 68 on a shaft 69 and the dog 68 is urged toward abutting engagement with the shaft 66 by a spring 70, as shown in FIG. 3. A dog latch 71 is pivotally mounted on the frame 42 and is urged toward the dog 68 by a spring 72. The dog latch 71 is adapted to engage a projection 73 on the dog 68 until the dog 68 has been rotated sufficiently to release the dog latch 71. A finger projection 74 on the dog 68 is adapted to engage a pin 75 on the latch 52 to release the latch 52 from engagement with the blocking member 46 when the control lever 65 is actuated. That is, when the control lever 65 is moved to the right as viewed in FIG. 3, the dog 68 rotates with the control lever 65 until the finger projection 74 is engaged by the dog latch 71. Thereafter, as the control lever 65 continues to be moved, the dog 68 will rotate counterclockwise relative to FIG. 3 until the dog 68 has rotated sufficiently to disengage from the dog latch 71. Release of the dog 68 causes the dog to rotate suddenly toward the pin 75 to engage the pin 75 and rotate the latch 52 to release the blocking member 46. The action of the release mechanism is such that the control lever 65 must be moved through its entire limit of travel to cause the latch 52 to be released and a positive action is required by the operator to reset the counting apparatus.

A push lever 76 is mounted at one end on a shaft 77 carried by the control lever 65 and includes an outstanding portion 78. Coins leaving the star wheel 15 are carried through a discharge chute 79 to a discharge tube (not shown) which may be used to actuate a crank member having an arm which is engageable with the outstanding portion 78 of the push lever 76 to perform the same action as that performed by movement of the control lever 65, as shown in U.S. Patent No. 2,669,997, to Earl W. Quirk and Arnold R. Buchholz.

Referring to FIG. 6, the circuit illustrated therein, which includes the count selector switch 40, the count switch 48, and a count registering circuit controlled by the count switch 45 and operative through the count selector switch 40, is energized from an A.C. source which is rectified and filtered to provide D.C. current to a pair of input conductors 80 and 81. The rotary count selector switch 40 has two levels 82 and 83. Each of the levels includes ten contact positions corresponding to counts in multiples of five from five to fifty and an additional contact for continuous count. The ten contact positions further represent counts in multiples of one hundred from one hundred to one thousand. The contacts representing selected counts from five to fifty of the first level 82 of the count selector switch 40 are connected in common by a conductor 84 to the input conductor 80. The switch arm of the first level 82 is connected to a primary conductor 85.

The contacts corresponding to selected counts of five

to fifty of the second level 83 of the count selector switch 40 are connected to respective contacts in a single level of a regular count stepping switch 86. The stepping switch 86 is of known construction and of the type in which a wiper assembly 87 sweeps a plurality of contacts, with the wiper assembly 87 advancing after energization of a stepping switch solenoid. The wiper assembly 87 is connected by a conductor 88 to the input conductor 81.

The coil of a first relay 89 is connected at one side to the primary conductor 85. The second side of the relay 89 is connected by a conductor 90 to one side of a normally open switch 91 of such first relay 89. The other side of the relay switch 91 is connected to the movable arm of the normally closed off-normal switch contact 92 of the regular count stepping switch 86. As is known, each of the stepping switches includes a self-interrupter switch contact and an off-normal switch contact which are actuated by the solenoid of the stepping switch, the self-interrupter switch contact being actuated for each energization of the solenoid and the off-normal switch contact being actuated when the stepping switch has cycled to its starting position. The off-normal contact 92 is connected by a conductor 93 to the input conductor 81. The solenoid 54 whose function was previously described as that of shifting the blocking member 46, is connected at one side to the input conductor 80 and its other side is connected to the input conductor 81 through a normally open relay switch 94 of the first relay 89. The normally open relay switch 94 is bridged by a capacitor 95 to maintain the solenoid 54 energized for a limited period following the opening of the relay switch 94.

The solenoid 96 of the regular count stepping switch 86 is connected on one side to the primary conductor 85 and is connected on its other side to the input conductor 81 through a normally open relay switch 97 of the first relay 89 and the normally closed self-interrupter contacts 98 of the regular count stepping switch 86. A capacitor 99 and resistor 100 are connected in series with each other and in parallel with the stepping switch solenoid 96 by a conductor 101, and are also connected with the conductor 101 to a conductor 102.

The input conductor 81 is connected to the arm of the normally open count switch 45 which connects on its other side to the arm 103 of a first level of the double pole, double throw range selector switch 41. The switch arm 103 of the range selector switch 41 has two positions. In its position for the high range counts of from one hundred to one thousand, the switch arm 103 connects with a conductor 104 that leads to one side of a stepping switch solenoid 105 of an extended count stepping switch. The solenoid 105 is connected on its other side to the primary conductor 85. A capacitor 106 and a resistor 107 are connected in series across the solenoid 105. In the alternate position of the switch arm 103 of the range selector switch 41 for low range counts of from five to fifty, the normally open count switch 45 is connected to a conductor 108 which connects with the conductor 102.

An extended count stepping switch including the solenoid 105 has three levels of fixed contacts each with its own wiper assembly. A first level 109 has its wiper assembly 110 connected by a conductor 111 to the input conductor 81. The stepping switch has ten fixed contacts in each level with each contact representing a count of five coins and indicated by numerals "1" through "9" and "0." The contact "5" is connected by a conductor 112 to one side of the coil of a second relay 113 which is also connected to the primary conductor 85. The contact "3" of the first level 109 is connected by a conductor 114 to one side of a normally open relay switch 115 of the second relay 113. The other side of the relay switch 115 is connected by a conductor 116 to the coil of a third relay 117 which is also connected to the primary conductor 85. One side of a second relay switch 118 of the second relay 113 is connected to the conductor 112 and the other side is connected by a conductor 119 to the stationary contact of a normally closed off-normal contact 120 of the extended count stepping switch. The movable arm of the off-normal contact 120 is connected by a conductor 121 to a conductor 122 which in turn is connected in the high range count position of a switch arm 123 of the second level of the range selector switch 41. The switch arm 123 is connected by a conductor 124 and the conductor 111 to the input conductor 81.

In the low range count position of the switch arm 123, the wiper assembly 125 of a second lever 126 of the extended count stepping switch to the input conductor 81 through a conductor 127 and the conductor 124. With the exception of the zero contact of the second level 126, all fixed contacts are connected in common by a conductor 128 to the fixed arm of the self-interrupting contacts 129 of the extended count stepping switch. The movable arm of the self-interrupting contacts 129 is connected by a conductor 130 to a conductor 131 which leads from the conductor 104 to the wiper assembly 132 of the third level 133 of the extended count stepping switch. The contact "9" of the third level 133 is connected to one side of a normally open relay switch 134 of the third relay 117, the second side of the normally open relay switch 134 being connected to the conductor 102. The third relay 117 has a second relay switch 135 having two positions. In its normal position, the relay switch 135 connects the conductor 119 to the conductor 122 thereby by-passing the off-normal contacts 120 of the extended count stepping switch. In its alternate position, it connects the conductor 119 to a conductor 136 which in turn is connected to the conductor 116.

The operation of the coin counter with the predetermined count control apparatus of this invention is as follows:

With the switch 39 in its normally closed condition, the continuous duty solenoid discussed above will be energized to cause the rod 37 to be moved upwardly and thereby to rotate the tiltable support 34 counterclockwise, as viewed in FIG. 2, against the action of the spring 36 to cause the feed wheel 14 to be moved downwardly into coin engaging position. With the feed wheel 14 in coin engaging position, coins are fed from the hopper 12 to be engaged by the feed wheel 14 which forces the coins against the star wheel 15. As the star wheel 15 is rotated by the passage of coins, the single tooth member 43 is likewise rotated.

Assume that it is desired to count batches of five coins. The range selector switch 41 would be positioned at the low range count position in which the switch arm 103 closes with the conductor 108 and the switch arm 123 closes with the conductor 127. The count selector switch 40 would be positioned at the value 5 in which case the switch arms of the levels 82 and 83 thereof would engage the contacts "5". At the count of the first coin, the single tooth member 43 is rotated one-fifth of its total revolution to engage the switch arm 44 of the count switch 45 thereby closing the count switch 45. After the count of the first coin, the parts are in the position shown in FIG. 5. Closing of the count switch 45 completes a circuit to energize the solenoid 96 of the regular count stepping switch. Such circuit leads from the input conductor 81 through the closed count switch 45, the switch arm 103 of the range selector switch 41, conductor 108, conductor 102, conductor 101, the solenoid 96, primary conductor 85, the first level 82 of the count selector switch 40, and the conductor 84 to the input conductor 80.

Upon the passage of the second coin past the star wheel 15, the single tooth member 43 is rotated out of engagement with the switch arm 44 and the count switch 45 opens to disrupt the previously described energizing circuit of the solenoid 96. Upon the deenergization of such solenoid 96, the wiper assembly 87 of the regular count

stepping switch advances to bring one of its arms in contact with the contact "5" thereof. This action completes a circuit to energize the coil of the first relay 89. Such circuit leads from the input conductor 81 through conductor 88, the wiper assembly 87, the second level 83 of the count selector switch 40, the relay 88, primary conductor 85, the first level 82 of the count selector switch 40, and conductor 84 to the input conductor 80. Energization of the first relay 89 closes its normally open relay switches 91, 94 and 97.

The closing of the rleay switch 91 establishes a hold-in circuit for the first relay 88 through the relay switch 91 and the off-normal contacts 92 of the stepping switch so that the relay 88 is no longer dependent upon the position of the wiper assembly 87 for its energization.

Closing of the normaliy open relay switch 94 places the solenoid 54 across the input conductors 80 and 81 to energize the solenoid 54. This action causes the plunger 55 to be retracted thereby moving the shifting lever 50 inwardly against the blocking member 46 until the member 46 is latched by the latch 52. The blocking member 46 is thereby placed in the path of the single tooth member 43.

Closing of the normally open relay switch 97 completes an energizing circuit for the solenoid 96 through the switch 97 and the self-interrupting contacts 98. The energization of the solenoid 96 opens the self-interrupting contacts 98 and thereby deenergizes the solenoid 96 to cause the wiper assembly 87 to close with the contact "10". Deenergization of the solenoid 96 will again close the normally closed self-interrupting contacts 98 to again complete the circuit to energize the solenoid 96. Thus, in the well known manner the solenoid 96 is alternately energized and deenergized by the action of the self-interrupting contacts 98 until the wiper assembly 87 has recycled to its starting position at which time the off-normal contacts 92 of the regular count stepping switch will open. The opening of the normally closed off-normal contacts 92 opens the circuit to the coil of the first relay 89 which is then deenergized, and the relay switches 91, 94 and 97 will return to their normally open position to prevent further recycling of the regular count stepping switch 86.

The count of the third and fourth coins proceeds without incident. Upon the count of the fifth coin, the single tooth member 43 will rotate to contact the pin 64 of the arm 63 of the control member 58, which has been placed in coin engaging position by the shifting of the member 46. The control member 58 is thereby shifted and the pin 61 engages the switch arm 62 of the switch 39 to actuate the switch 39. The circuit to the continuous duty solenoid is then opened and the tiltable support 34 is permitted to rotate under the action of the spring 36 to remove the feed wheel 14 from a coin engaging position. Thus, when the fifth coin is counted the flow of coins will thereafter stop. Additionally, the single tooth member 43 is blocked from movement by the interfering blocking member 46.

Before another batch of five coins can be counted, it is necessary to reset the mechanism. This may be done manually by shifting the control lever 65 from its normal position against the action of the spring 67 or by tilting a discharge tube to force a crank member arm against the outstanding portion 78 of the push lever 76. Both methods yield the same result in that, as previously described, the dog 68 is rotated and latched and then released by the dog latch 71 so that the finger projection 74 will engage the pin 75 of the latch 52 to release the latch 52 from engagement with the shoulder portion 53. The blocking member 46 returns to its normal position under the action of the spring 48 and carries with it the control member 63. With the blocking member 46 in its non-interfering position, the switch 39 is returned to its normally closed condition thereby energizing the continuous duty solenoid to again place the feed wheel 14 into a coin engaging position. Additional counts of batches of five coins can then proceed as described.

If it is now desired to count batches of ten coins, the count selector switch 40 is set for a count of ten. Upon the counting of the first coin, the count switch 45 closes and completes the circuit to the solenoid 96 of the regular count stepping switch. The count of the second coin opens the count switch 45 to deenergize the solenoid 96 and the stepping switch advances one step to position the wiper assembly 87 in contact with the contact "5." However, since the second level 83 of the count selector switch 40 is in contact with the contact "10" no circuit is completed to energize the first relay 89. The count of the third, fourth and fifth coins proceeds without incident.

Upon the count of the sixth coin the count switch 45 again closes to again complete the circuit to the solenoid 96 of the regular count stepping switch. Upon the count of the seventh coin the count switch 45 opens deenergizing the solenoid 96 and the wiper assembly 87 of the stepping switch 86 advances to the contact "10." A circuit is now completed through the wiper assembly 87 and the second level 83 of the count selector switch 40 to energize the first relay 89. Energization of the first relay 89 has the same effect as that previously described for the predetermined count of five. That is, the solenoid 54 is energized to shift the blocking member 46, and the stepping switch 89 recycles to zero. Thus, at the count of the tenth coin the normally closed switch 39 is again opened to stop the feed of the coins and the single tooth member 43 is thereafter blocked from further rotation by the member 46. Reset of the mechanism is accomplished as hereinbefore described.

Counting in batches of fifteen to fifty coins proceeds in a similar manner as that described for predetermined counts of five and ten coins with a circuit being completed through the solenoid 53 to position the control member 63 for engagement by the single tooth member 43 at the end of the predetermined count to halt the flow of coins. Such energization of the solenoid is accomplished during the count of the last five coins in the selected batch.

Let it now be assumed that it is desired to count batches of one hundred coins. The range selector switch 41 is first switched to its alternate, high range position in which the switch arm 103 connects with the conductor 104 and the switch arm 123 connects with conductor 122. The count selector switch 40 is set at the position for predetermined counts of five or one hundred. Upon the count of the first coin, the count switch 45 closes thereby completing a circuit through the solenoid 105 of the extended count stepping switch. Such circuit leads from the input conductor 81 through the closed count switch 45, the switch arm 103 of the range selector switch 41, conductor 104, the solenoid 105, the primary conductor 85, the first level 82 of the count selector switch 40, and conductor 84 to the input conductor 80. The subsequent passage of the second coin will open the count switch 45 thereby deenergizing the solenoid 105 of the extended count stepping switch with the result that each of the three wiper assemblies 110, 125 and 132 of the stepping switch will advance to their respective contact "1." In the same manner, upon the count of the seventh, twelfth, and seventeenth coins the wiper assemblies will advance to their contacts "2," "3," and "4," respectively.

The count of the twenty-first coin again closes the count switch 45 to energize the solenoid 105. The twenty-second coin counted will open the count switch 45, deenergize the solenoid 105, and each of the three wiper assemblies 110, 125, and 132 of the extended count stepping switch will advance to the contacts "5." When the wiper assembly 110 of the first level 109 advances to the contact "5," a circuit is completed to the coil of the second relay 113. Such circuit leads from the input conductor 81 through conductor 111, the wiper assembly 110, conductor 112, the coil of the relay 113, the primary

conductor 85, and the first level 82 of the count selector switch 40 to the input conductor 80. Energization of the relay 113 closes the normally open relay switches 115 and 118. Closure of the relay switch 118 completes a hold-in circuit for the coil of the second relay 113 and such circuit includes conductor 124, the switch arm 123 of the range selector switch 41, conductor 122, conductor 121, the off-normal contacts 120 of the extended count selector switch, conductor 119, and the now closed relay switch 118. An alternate hold-in circuit is provided by the relay switch 135 which bridges the off-normal contacts 120 to keep the coil of the second relay 113 energized when the stepping switch cycles through zero and opens the normally closed off-normal contacts 120.

Upon the count of each fifth coin thereafter the extended count stepping switch will advance one step. Upon the count of the sixty-first and sixty-second coins the count switch 45 will be closed and then opened to energize and deenergize the solenoid 106 thereby stepping the wiper assemblies to the contacts "3" for the second time. When the wiper assembly 110 of the first level 109 of the extended count stepping switch is in contact with the contact "3" thereof, a circuit is completed to energize the coil of the third relay 117. Such circuit leads from the input conductor 81 through conductor 111, the wiper assembly 110, conductor 114, the now closed relay switch 115 of the second relay 113, conductor 116, the coil of the relay 117, the primary conductor 85, and through the first level 82 of the count selector switch 40 to the input conductor 80. The normally open relay switch 134 closes, and the relay switch 135 closes to its alternate position in which it connects with the conductor 136 to thereby provide a hold-in circuit for the coil of the third relay 117. Such hold-in circuit includes conductor 124, the switch arm 123, conductors 122 and 121, the off-normal contacts 120 of the extended count stepping switch, conductor 119, the relay switch 135, and conductors 136 and 116.

The count continues as heretofore described until the ninety-first and ninety-second coins are counted. After the count of the ninety-second coin, the wiper assemblies of the extended count stepper switch will advance to the contacts "9." When the wiper assembly 132 of the third level 133 of such stepping switch makes contact with the contact "9," a circuit is established to energize the solenoid 96 of the regular count stepping switch upon the next closing of the count switch 45. Such circuit leads from the input conductor 81 through the count switch 45, the switch arm 103, conductor 104, conductor 131, the wiper assembly 132, the closed relay switch 134, conductor 102, conductor 101, the solenoid 96, the primary conductor 85, the first level 82 of the count selector switch 40, and conductor 84 to input conductor 80. Then, upon the count of the ninety-sixth coin, the count switch 45 closes to energize the solenoid 96 through the circuit just described and further energizes the solenoid 105 of the extended count stepping switch in the manner heretofore described. When the ninety-seventh coin is counted both stepping switches advance. The extended count stepping switches will advance to contact "0" and the off-normal contacts 120 will open to open the circuit to the coils of the relays 113 and 117. The wiper assembly 87 of the regular count stepper switch will be in contact with the contact "5" whereby a circuit is completed to energize the coil of the first relay 89. The results of the energization of the relay 89 are the same as for the count of five previously described and the action continues as for a count of five. That is, the blocking member 46 with the control member 63 are shifted into the path of the single tooth member 42 so that the count of the one-hundredth coin will halt the flow of coins.

For counting of batches of more than one hundred coins, the action is similar to that described for a predetermined count of one hundred. That is, the regular count stepping switch will advance one step during the count of the last five coins of each hundred coins counted. When the advance of the regular count stepping switch places the wiper assembly 87 in contact with a fixed contact corresponding to the selected count, a circuit is completed through the count selector switch 40 to energize the first relay 89 for halting the flow of coins at the end of the predetermined count.

It will be seen from the above description that the predetermined count control apparatus comprises a low range count registering circuit including the regular count stepping switch and a high range count registering circuit including the extended range stepping switch, together with a range selector switch for alternately directing the count switch to the low range and high range registering circuits. The high range registering circuit registers the count in multiples of five coins and signals the count of each one hundred coins to the low range registering circuit by actuating the regular count stepping switch. The low range registering circuit registers the count in multiples of five coins and, in response to high range registering circuit, also registers the count in multiples of one hundred coins. A circuit is completed through the regular count stepping switch and the count selector switch to cause energization of the solenoid 54 during the count of the last five coins of the predetermined count.

Should the supply of coins from a particular source be insufficient to complete any batch count of one hundred to one thousand and it is desired to change the batch count of a new source of coins from say one hundred to two hundred, it is not necessary to supply the deficient quantity of coins to recycle the apparatus. Rather, by switching the range selector switch 41 to the low count range and supplying sufficient coins to complete the low count, the entire apparatus may be recycled. Thus, at the most forty-nine coins will be required to recycle.

As an example of the recycling in the extended count range, let it be assumed that the count selector switch 40 has been set for a count of two hundred coins and that the range selector switch has been accordingly set for the high range batch count. Let it further be assumed that only twelve coins out of the batch of two hundred have been counted and that the supply of coins from a particular source has been depleted. Now, if it is desired to count another quantity of coins in batches of one hundred, the count selector switch 40 would be positioned for a count of one hundred which is also the position of the switch for a count of a batch of five coins. The range selector switch 41 would be placed for the low range count. As soon as the range selector switch 41 is switched to the low range, a circuit is completed through the solenoid 105 of the extended count stepping switch which will cause such stepping switch to recycle through the medium of the self-interrupter contacts 129. The circuit leads from the input conductor 81 through conductor 111, conductor 124, switch arm 123, conductor 127, the wiper assembly 125 of the second level 126, conductor 128, the self-interrupter contacts 129, and conductor 130 to one side of the solenoid 105. The other side of the solenoid 105 is connected to the input conductor 80 through the primary conductor 85, the first level 82 of the count selector switch 40 and conductor 84.

Since twelve coins have been counted, no occurrence will take place until four additional coins are fed past the star wheel 15. When the fourth additional coin passes the star wheel 15, the count switch 45 will close thereby energizing the solenoid 96 of the regular count stepping switch. The passage of the fifth additional coin will open the count switch 45, deenergize the solenoid 96, and cause the stepping switch to advance to have its wiper assembly 87 make contact with the contact "5." Since this is also the setting of the count selector switch 40, a circuit is completed to energize the relay 89 with the results that follow being the same as for a predetermined count of five. Thus, at the count of the eighth additional coin, the flow of coins is stopped in the manner previously described and the regular count stepping switch 86 recycles to zero. The predetermined count control

apparatus is now ready for counting in batches of one hundred coins simply by moving the range selector switch 41 to the extended range position.

If it is desired to count coins continuously and only determine the total number of coins in a given batch, the count selector switch 40 is set for continuous count. Setting the count selector switch 40 for continuous count removes the possibility of energizing the stepping switches and the solenoid 54. The number of coins counted will be indicated on the counter 20.

FIGS. 7 and 8 illustrate another embodiment of a count switch mechanism particularly useful for high speed operation of the coin counting machine. The count switch assembly of FIGS. 7 and 8 is employed with a star wheel having ten points rather than with the five point star wheel 15 previously considered. The ten point star wheel is again mounted on a shaft 137 that is journaled in a supporting frame 138. The frame 138 mounts the switch 39, the solenoid 54, the shifting lever 50, as well as the reset lever 65 and associated equipment including the latch 52 for latching a blocking member 139 and releasing the blocking member 139 after a predetermined count has been completed to permit the count of an additional batch of coins. The blocking member 139 is pivotally mounted on the shaft 47 supported on the frame 138, and is similar to the blocking member 46 in that it supports the control member 58. The function and operation of the solenoid 54, the shifting lever 50, the blocking member 139, the control member 58, and the latch 52 are identical to that described for the embodiment of FIGS. 1–5.

The shaft 137 is formed at its lower end with a portion of reduced cross section defining a coin driven member 140 characterized by having a rectangular cross section (see FIGS. 7 and 8). The arm 63 of the control member 58 and its pin 64 lie in the path of travel of the lateral ends of the coin driven member 140. However, when the member 139 is in its normal inoperative position, as it is illustrated in FIG. 7, the control member 58 is rotated by the coin driven member 140 an insufficient amount to close the switch 39. Only when the control member 58 has been carried to a fully receptive position by shifting the member 139 to its operative position will the coin driven member 140 rotate the control member 58 a sufficient amount to cause the switch arm 62 to close the switch 39 and halt the flow of coins.

Counting of each batch of five coins passing the ten point star wheel is accomplished by a count switch in the form of a dry reed switch 141 mounted on a suitable insulated support 142 secured to the frame 138. The reed switch 141 has normally open contacts 143 which are closed by the influence of a permanent magnet 144 mounted directly above and spaced from the dry reed switch 141. A shield 145, formed of a magnetically conductive material such as steel and supported on the lower end of the shaft 137 for rotation with the shaft 137, extends into the space between the magnet 144 and the reed switch 141. As seen in FIG. 7, the shield 145 is generally circular in shape with oppositely disposed window segments 146 removed therefrom. When the shield 145 is so positioned as to place the void window segments 146 between the magnet 144 and the reed switch 141, the magnet 144 will close the contacts 143 of the reed switch 141. However, when the shield 145 is so positioned as to place the solid portions thereof between the magnet 144 and the reed switch 141, the shield 145 prevents the magnet 144 from acting upon the reed switch 141 and the contacts 143 of the reed switch remain open. The shield 145 may be provided with cutouts as at 147 to reduce its weight.

The shield 145 along with the shaft 137 makes one complete revolution for each ten coins counted. The window segments are of a dimension to each lie between the magnet 144 and reed switch 141 during the count of two coins. With the ten point star wheel, each window segment therefor includes an angle of about 72°. The shield 145 is so positioned on the shaft 137 relative to the coin driven member 140 that one window segment is positioned between the magnet 144 and the reed switch 141 after the passage of the second coin and the third coin of a batch and the other window segment is positioned between the magnet 144 and the switch 141 after the passage of the seventh coin and the eighth coin. Therefore, reed switch 141 is closed once for each five coins counted and performs the same function as the count switch 45 which it would replace.

In the embodiments described an established quantity of five coins is the basic unit of the predetermined count. Of course, an established quantity other than five coins may be employed as the basic unit for operation of a predetermined count control apparatus in accordance with the present invention.

We claim:

1. In a coin counting machine having a driven coin feeding wheel and means for rendering said wheel operative to feed coins during a count, the combination of a predetermined count control apparatus comprising a coin driven member, a count switch actuated by said coin driven member once for each five coins counted, a count selector switch settable for predetermined counts in multiples of five coins, control means for said first named means adapted when actuated to render said first named means inoperative, said control means being shiftable from a normal inoperative position to an operative position in which said control means is placed in the path of travel of said coin driven member for actuation thereby, solenoid controlled means for shifting said control means to said operative position when said solenoid is energized, a source of electric current, and count registering circuit means responsive to said count switch to register the count in multiples of five coins and adapted to complete a circuit from said source of electric current through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count, whereby said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins.

2. In a coin counting machine having a hopper, means for discharging coins from said hopper, a star wheel operated by contact of discharged coins, a driven coin feeding wheel engaging the coins for forcing the same past the star wheel, and means for rendering said coin feeding wheel operative during a count, the combination of a predetermined count control apparatus comprising a support plate, a coin driven member journaled in said plate and rotatable with said star wheel, a count switch having a switch arm in the path of travel of said coin driven member for actuation by said coin driven member once for each five coins counted, a count selector switch settable for predetermined counts in multiples of five coins, a blocking member pivotally supported on said plate and shiftable from a normal inoperative position to an operative position in which said blocking member lies in the path of travel of said coin driven member, a control member for said second named means adapted when actuated to render said second named means inoperative, said control member being pivotally supported on said blocking member and being engageable by said coin driven member when said blocking member is in said operative position for actuation by said coin driven member, a solenoid controlled shift member for shifting said blocking member to said operative position when said solenoid is energized, said shift member being pivotally supported on said plate, a source of electric current, and count registering circuit means responsive to said count switch to register the count in multiples of five coins and adapted to complete a circuit from said source of electric current through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count, whereby

said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins.

3. In a coin counting machine having a driven coin feeding wheel and means for rendering said wheel operative to feed coins during a count, the combination of a predetermined count control apparatus comprising a plate, a coin driven member journaled in said plate, a count switch actuated by said coin driven once for each five coins counted, a count selector switch settable for predetermined counts in multiples of five coins, a blocking member pivotally supported on said plate and shiftable from a normal inoperative position to an operative position, a shiftable latch supported on said plate and engageable with said blocking member to retain the same in said operative position, a control member for said first named means adapted when actuated to render said first named means inoperative, said control member being pivotally supported on said blocking member and being engageable by said coin driven member when said blocking member is in said operative position for actuation by said coin driven member, solenoid controlled means for shifting said blocking member to said operative position when said solenoid is energized, a source of electric current, count registering circuit means responsive to said count switch to register the count in multiples of five coins and adapted to complete a circuit from said source of electric current through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count whereby said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins, and reset means for releasing said latch means to have said blocking member return to said inoperative position whereby said control member is released from engagement with said coin driven member and said coin feeding wheel is rendered operative by said first named means to begin a new count.

4. A predetermined count control apparatus in accordance with claim 4 wherein said reset means includes a manually operable reset lever pivotally supported on said plate for rotation through a limited arc, a dog pivotally supported on said reset lever at a point spaced from the pivotal support of said reset lever and spring biased for rotation with said reset lever, said dog having a finger projection adapted to engage said latch to shift the same and release said blocking member, and means restraining said dog to cause said dog to rotate in a direction opposite to the rotation of said reset lever until said reset lever nears the end of said limited arc whereby said dog is thereafter released to engage said latch.

5. In a coin counting machine having a driven coin feeding wheel and means for rendering said wheel operative to feed coins during a count, the combination of a predetermined count control apparatus to render said first named means inoperative at the end of a count to halt the flow of coins, said control apparatus comprising count selector means settable for predetermined counts in multiples of an established small quantity of coins and for predetermined counts in multiples of an established larger quantity of coins that is a multiple of said established small quantity of coins, a coin driven member, a count switch actuated by said coin driven once for each of said established small quantity of coins counted, control means for said first named means adapted when actuated to render said first named means inoperative, said control means being shiftable from a normal inoperative position to an operative position in which said control means is placed in the path of travel of said coin driven member for actuation thereby, solenoid controlled means for shifting said control means to said operative position when said solenoid is energized, count registering means responsive to said count switch and comprising a low range count registering circuit and a high range count registering circuit, and range selector means for alternately directing said count switch to said low range and high range registering circuits, said high range count registering circuit being adapted in response to said count switch to register the count in multiples of said established small quantity of coins and to signal the count of each of said established larger quantity of coins to said low range count registering circuit, said low range count registering circuit being adapted in response to said count switch to register the count in multiples of said established small quantity of coins and in response to said high range count registering circuit to register the count in multiples of said established larger quantity of coins and being further adapted to energize said solenoid during the count of the last of said established small quantity of coins of the predetermined count.

6. In a coin counting machine having a driven coin feeding wheel and means for rendering said wheel operative to feed coins during a count, the combination of a predetermined count control apparatus comprising a coin driven member, a count switch actuated by said coin driven member once for each five coins counted, a count selector switch settable at a plurality of positions representing predetermined counts in multiples of five coins and at such settings also representing predetermined counts in multiples of one hundred coins, control means for said first named means adapted when actuated to render said first named means inoperative, said control means being shiftable from a normal inoperative position to an operative position in which said control means is placed in the path of travel of said coin driven member for actuation thereby, solenoid controlled means for shifting said control means to said operative position when said solenoid is energized, a source of electric current, count registering means responsive to said count switch and comprising a low range count registering circuit and a high range count registering circuit, and a range selector switch for alternately directing said count switch to said low range and high range registering circuits, said high range count registering circuit being adapted in response to said count switch to register the count in multiples of five coins and to signal the count of each one hundred coins to said low range registering circuit, said low range registering circuit being adapted in response to said count switch to register the count in multiples of five coins and in response to said high range registering circuit to register the count in multiples of one hundred coins and being further adapted to complete a circuit from said source through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count, whereby said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins.

7. In a coin counting machine having a driven coin feeding wheel and means for rendering said wheel operative to feed coins during a count, the combination of predetermined count control apparatus comprising a coin driven member, a count switch actuated by said coin driven once for each five coins counted, a count selector switch settable at a plurality of positions representing predetermined counts in multiples of five coins and at such settings also representing predetermined counts in multiples of one hundred coins, a pivotally supported blocking member shiftable from a normal inoperative position to an operative position, a control member for said first named means adapted when actuated to render said first named means inoperative, said control member being pivotally supported on said blocking member and being engageable by said coin driven member when said blocking member is in said operative position for actuation by said coin driven member, solenoid controlled means for shifting said blocking member to said operative position when said solenoid is energized, a source of electric cur-

rent, count registering means responsive to said count switch and comprising a low range count registering circuit including a low range stepping switch and a high range count registering circuit including a high range stepping switch, and a range selector switch for alternately directing said count switch to said low range and high range registering circuits, said high range stepping switch being actuated by the closure of said count switch to register the count in multiples of five coins and to complete a circuit to actuate said low range stepping switch once for each one hundred coins counted, said low range stepping switch being actuated by the closure of said count switch to register the count in multiples of five coins and being alternately actuated in response to said high range stepping switch to register the count in multiples of one hundred coins, said low range stepping switch being further adapted to complete a circuit from said source through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count, whereby said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins.

8. A predetermined count control apparatus in accordance with claim 7 wherein said range selector switch completes a circuit from said source to said high range stepping switch to recycle the same when said range selector switch directs said count switch to said low range registering circuit.

9. In a coin counting machine having a driven coin feeding wheel and means for rendering said wheel operative to feed coins during a count, the combination of a predetermined count control apparatus comprising a coin driven member, a reed count switch, a magnet spaced from said count switch and adapted to actuate said count switch, a shield of magnetically conductive material mounted on said coin driven member for movement therewith in the space between said magnet and said count switch to shield said count switch from said magnet to prevent actuation of said count switch, said shield having a portion removed to form a window so positioned in the shield that the window lies between said magnet and said count switch once during each five coins counted whereby said count switch is actuated once for each five coins counted, a count selector switch settable for predetermined counts in multiples of five coins, control means for said first named means adapted when actuated to render said first named means inoperative, said control means being shiftable from a normal inoperative position to an operative position in which said control means is placed in the path of travel of said coin driven member for actuation thereby, solenoid controlled means for shifting said control means to said operative position when said solenoid is energized, a source of electric current, and count registering circuit means responsive to said count switch to register the count in multiples of five coins and adapted to complete a circuit from said source of electric current through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count, whereby said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins.

10. In a coin counting machine having a hopper, means for discharging coins from said hopper, a star wheel operated by contact of discharged coins, a driven coin feeding wheel engaging the coins for forcing the same past the star wheel, and means for rendering said coin feeding wheel operative during a count, the combination of a predetermined count control apparatus comprising a support plate, a coin driven member journaled in said plate and rotatable with said star wheel, a reed count switch, a magnet spaced from said count switch and adapted to actuate said count switch, a generally circular shield of magnetically conductive material mounted on said coin driven member and rotatable therewith in a plane between said count switch and said magnet to shield said count switch from said magnet to prevent actuation of said count switch, said shield having at least one portion removed to form a window segment so positioned about the periphery of said shield that said window segment lies between said magnet and said count switch once during each five coins counted whereby said count switch is actuated once for each five coins counted, a count selector switch settable for predetermined counts in multiples of five coins, a blocking member pivotally supported on said plate and shiftable from a normal inoperative position to an operative position, a control member for said second named means adapted when actuated to render said second named means inoperative, said control member being pivotally supported on said blocking member and being engageable by said coin driven member when said blocking member is in said operative position for actuation by said coin driven member, a solenoid controlled shift member for shifting said blocking member to said operative position when said solenoid is energized, said shift member being pivotally supported on said plate, a source of electric current, and count registering circuit means responsive to said count switch to register the count in multiples of five coins and adapted to complete a circuit from said source of electric current through said count selector switch to energize said solenoid during the count of the last five coins of the predetermined count, whereby said control means is actuated by said coin driven member at the end of the predetermined count to render said first named means inoperative and thereby halt the flow of coins.

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