

Aug. 27, 1957

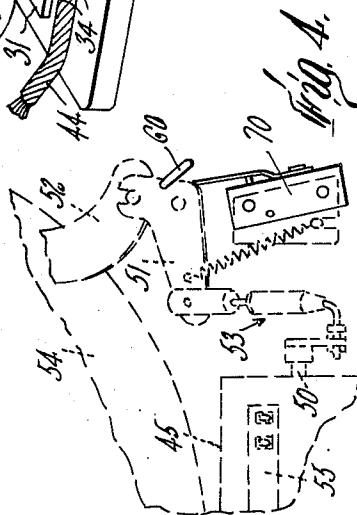
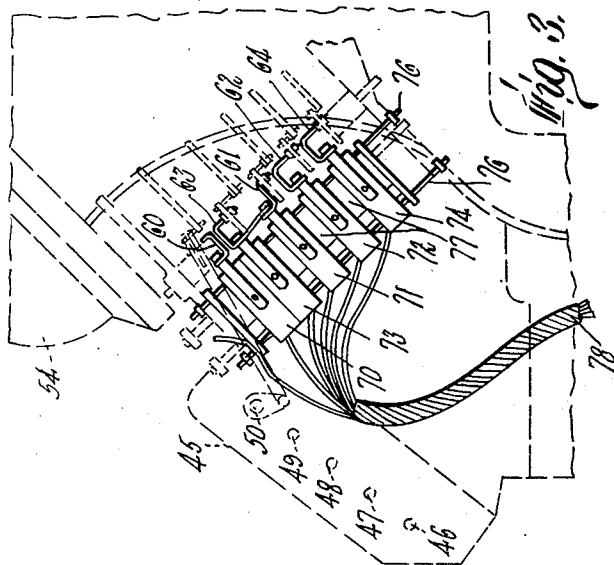
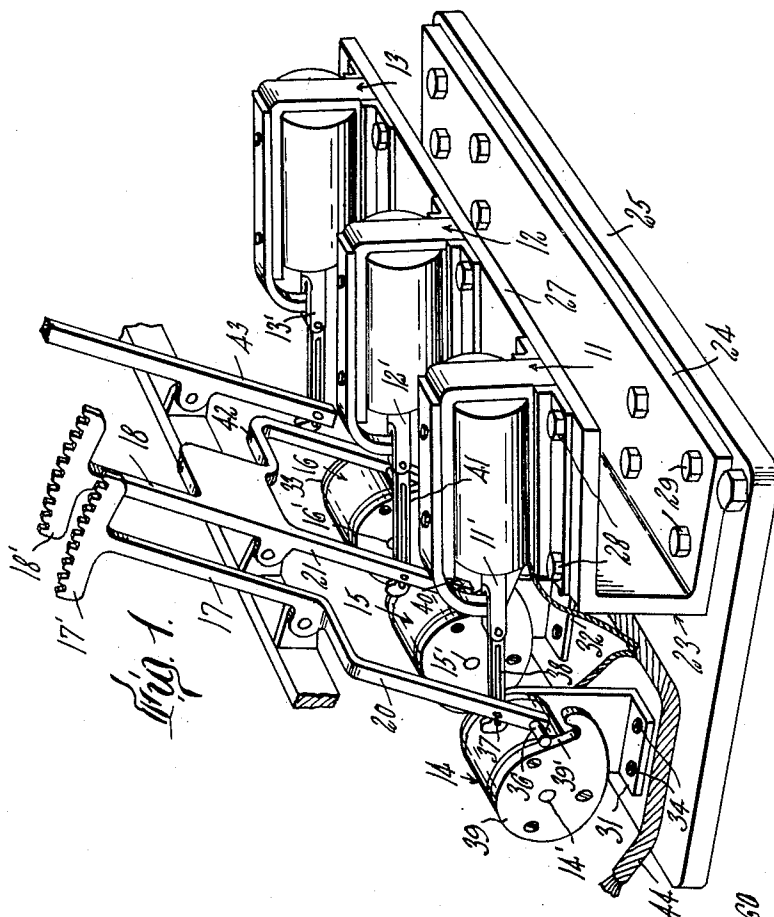
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2,804,266

TOTALIZING APPARATUS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

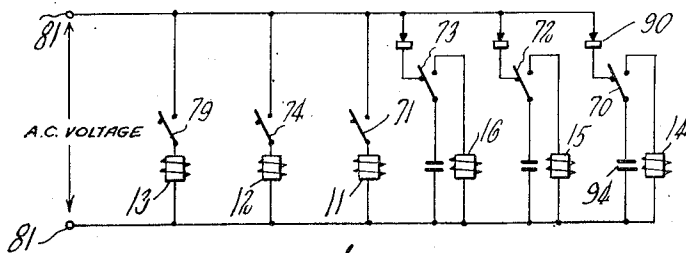
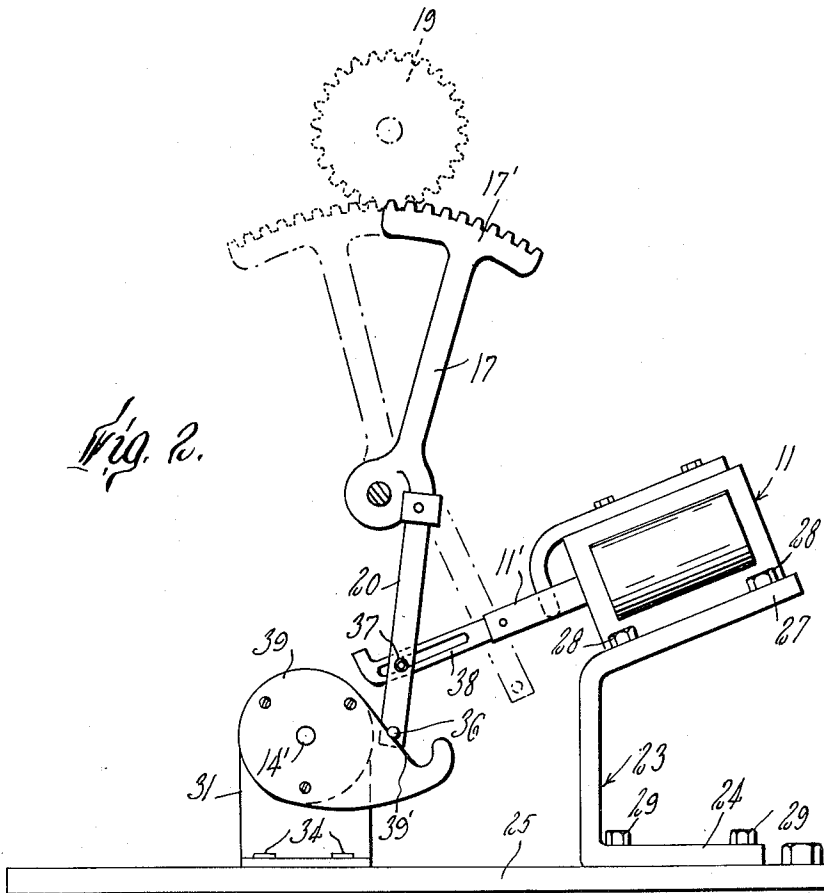


Fig. 5.

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TOTALIZING APPARATUS

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7 Claims. (Cl. 235—92)

This invention relates generally to coin assorting and counting apparatus, and more particularly it relates to apparatus for combining the functions of a coin assorting machine and an accumulator with the end in view of providing automatically, an indication of the aggregative cash value of a plurality of coins of differing denominations.

In certain commercial operations, it is required that large numbers of coins be tallied from time to time, and to expedite this work, there have been developed various machines for sorting coins automatically and with great rapidity, at the same time providing individual indications of either the total number of coins of each denomination sorted, or the individual cash amounts represented thereby. The difficulty with these sorting machines is that in order to complete a tally, it is then necessary for someone to add together the cash amounts represented by the coins in each denomination. Since the tallying of coins from various sources is carried on almost continuously in many businesses, the extra time and labor involved in translating the machine indications into such a final summation is often quite large.

According to the present invention, there is provided an accumulating unit, together with means to register in the accumulating unit automatically, respective numbers corresponding to coins as they are sorted by a coin assorting machine. Mounted on the assorting machine are a number of switches, each adapted to energize an electrical circuit when a corresponding denomination of coin is sorted, and mounted in the accumulating unit are a corresponding number of solenoids, individually connected in circuit with the respective switches. The actuating elements of the solenoids are in turn coupled to appropriate sector arms of the accumulating unit in such a way that the same are displaced by respective arcuate amounts corresponding to the various denominations of coins when the solenoids are energized. In this way, the coins are individually registered in the accumulator, as fast as they are sorted by the assorting machine, so that upon completion of the sorting of a particular batch of coins, an indication of their aggregative cash value may be obtained directly from the indicating medium of the accumulating unit.

It follows, therefore, that one object of the present invention is to provide apparatus which in combination with a coin assorting machine is adapted to provide automatically an indication of the aggregative cash value of a plurality of coins of differing denominations.

It is a further object to provide apparatus of the above-mentioned character which is relatively small and compact.

The novel features of this invention, together with further objects and advantages thereof, will become more readily apparent when considered in connection with the accompanying drawings in which:

Fig. 1 is a perspective view of the apparatus of the present invention;

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Fig. 2 is a side view of a portion of the apparatus of the present invention;

Fig. 3 is a side view in elevation of a portion of an assorting machine with a plurality of switches mounted thereon for selectively energizing the apparatus of the present invention;

Fig. 4 is a view in detail of one of the linkage mechanisms of the assorting machine whereby the switches of Fig. 3 are selectively actuated; and

Fig. 5 is a schematic diagram illustrating a preferred mode of connecting the switches of Figs. 1 and 2 to the apparatus of Figs. 3 and 4.

Referring now to Fig. 1, it will be observed that numerals 11—16 designate two groups of solenoids, certain ones of which are adapted to actuate a first sector arm 17 and certain other ones of which are adapted to actuate a second sector arm 18 of a conventional accumulating unit. Sector arms 17 and 18, as is well known to those skilled in the art, serve to register predetermined digits in the accumulator according to the amount by which they are displaced, and to this end each carries a sector gear 17', 18' adapted to mesh with certain other gears, such as gear 19 shown in Fig. 2, forming a part of the registry mechanism of the accumulator. Although many more such arms and gears are ordinarily provided in a conventional accumulator, one for each order of significance of the digits to be registered, for the purpose of the present invention only two such sector arms and their associated sector gears need be illustrated.

According to the present invention there are rigidly attached to the two sector arms 17 and 18, a pair of lever arms 20 and 21, respectively, each extending generally downwardly with the exception that lever arm 20 is offset somewhat from sector arm 17 so as to make room for the solenoids to be mounted. More specifically, solenoids 11—13 are mounted in spaced alignment on a channel shaped member or bracket 23 having one of its flange portions 24 secured to a base member 25, and its other flange portion 27, which is inclined somewhat with respect to the horizontal, mounting the aforementioned three solenoids. Any convenient means for attaching the solenoids to flange portion 27 may be employed, there being provided for this purpose in the preferred embodiment of Fig. 1 machine screws 28 extending through the mounting flanges of the solenoids. Similarly, as shown, flange portion 24 is attached to base member 25 by means of machine screws 29, although it will be understood that the same might optionally be welded thereto, for example.

To mount the other three solenoids 14—16 there are provided angle brackets 31, 32 and 33, the latter being hidden in the perspective view of Fig. 1 by solenoids 17 and 18. Brackets 31—33 are fastened to base member 25 by machine screws 34, and are so positioned that the solenoids 14—16 extend in spaced alignment parallel to member 23. Solenoids 14—16 are spaced a somewhat lesser distance above base member 25 than are solenoids 11—13, however, and are disposed on the opposite side of lever arms 20 and 21.

Solenoids 11—13 are of the linearly movable type whereas solenoids 14—16 are of the rotary type, and since both types are readily obtainable commercially, suffice it to say that each has an actuating element responsive to electrical signals, the actuating elements of solenoids 13—15, as designated by the numerals 11'—13', being linearly movable, and the actuating elements of solenoids 16—18, as designated by numerals 14'—16', being angularly movable.

With reference now to Fig. 2 it will be observed that projecting from lever arm 20 is a roller 36 near the extreme end of the lever arm, and projecting from an

intermediate point lengthwise of the arm is a screw 37. Screw 37 projects into a slot-shaped aperture extending generally lengthwise of a pull rod 38 permitting the lever arm to move independently of the pull rod, the latter in turn being pivotally connected to the movable element or the plunger 11' of solenoid 11. Pull rod 38 forms an acute angle with lever arm 20, owing to the orientation of solenoid 11. To engage roller 36 there is rigidly mounted on the movable element or shaft 14' of solenoid 14 a cam 39 having a camming surface 39' which extends generally in a plane which also forms an acute angle with lever arm 20 but of opposite sense to the angle formed with pull rod 38. Camming surface 39' is preferably terminated in the manner of a hook to limit the arcuate displacement of lever arm 20 and so also that of sector arm 17, as will be explained in the description of the operation of the apparatus according to the present invention.

Although thus far only solenoids 11 and 14 and their relation to lever arm 20 has been described in detail, it will be observed with reference once again to Fig. 1 that solenoids 15 and 16 also have cams mounted on their output shafts, and that the movable element of solenoid 12 has connected thereto a pull rod 41 just like the pull rod 38 associated with solenoid 11. Each of these two last-mentioned solenoids is adapted to operate on lever arm 21 and to this end there is provided, as before, a screw on the lever arm 21 for engagement with pull rod 41 and a roller to be engaged by the cam on solenoid 15. In this way, provision is made for registering additional denominations of coins, such as dimes and fifty-cent pieces whose corresponding digits are of higher order significance than the digits associated with pennies and nickels for example. To register a quarter, means are provided to register simultaneously a five's digit of second order significance and a two's digit of first order significance. Thus, attached to sector arm 21 is still another lever arm 42 extending generally downwardly like lever arm 21 but offset somewhat from the sector arm 18 so as to space it from lever arm 21. Lever arm 42 is provided with a roller (not shown) for engagement with the cam on solenoid 16, and it is the function of lever arm 42 to register only a single digit in the calculator, namely the two's digit.

There is one other solenoid which has not been treated thus far, and that is solenoid 13 which serves to actuate the canceling lever 43 of the accumulator. Canceling lever 43 is coupled to solenoid 13 by means of a pull-rod and screw arrangement, the same as has been described in connection with solenoids 11 and 12. As shown, the leads to the various solenoids are brought out in a single cable 44 for connection to their individual energizing circuits.

Various ways of energizing the solenoids when coins of corresponding denomination are sorted by an assorting machine may be employed and one such way is shown by way of example in Figs. 4 and 5. In Fig. 4, there is shown a portion of a conventional assorting machine 54, including an indicator box 45, and the input shafts thereto 46-50, one for each denomination of coin. Each of the shafts is actuated by a separate linkage to the sorting mechanism of the machine 54, so that as the coins are sorted, they will be registered in the box which has an indicator column for each denomination. In Fig. 4, where one such linkage is shown in somewhat more detail, it will be observed that the same includes a bell crank 51 actuated by a lever 52, and connected to a crank assembly 53. Crank assembly 53 serves to jog its associated input shaft 50 whereby a penny, for example, is registered in the column for pennies such as column 55. On the bell crank 51 there is mounted in accordance with the invention an arm 60 simultaneously to actuate an electrical switch 70. Similar arms 61-64 extend from the bell cranks of the various other linkages for actuating similar switches 71-74 respectively, with

the single exception that arm 63 is adapted to actuate both the switches 73 and 71 simultaneously. A pair of rods 76 extending through the bodies of the switches and through spacer bars 77 therebetween serve to hold the switches in place on the sorting machine, and a multiwire cable 78 is provided for connection to the switches.

Fig. 5 illustrates schematically a preferred way of connecting the various solenoids 11 through 16 in circuit with the aforementioned switches. As shown in Fig. 5 there is connected to a pair of terminals 81 a suitable source of alternating current (A. C.) voltage and between the terminals there are a number of circuits in parallel relation to one another, each circuit including in combination one of the switches and one of the solenoids. Thus, solenoid 11 is connected across terminals 81 through switch 71 and solenoid 12 is connected across terminals 81 through switch 74 so that the solenoids will be individually energized when their associated switches close.

Solenoids 14 through 16 are connected in circuit with their respective switches 70 through 73 somewhat differently, however, owing to the fact that these latter solenoids are of the direct current (D. C.) type whereas solenoids 11 and 12 (so also solenoid 13) are of the A. C. type. Thus, one leg of solenoid 14 is connected directly to one end of a capacitor 94 and the other leg of the solenoid is connected to the other end of the capacitor through the normally open circuit of the switch 70. Switch 70, as is the case with all the other switches, also has a normally closed circuit and by means of this circuit the capacitor 94 is connected across terminals 81 through a rectifier 90. In this way solenoid 14 is energized for a brief interval only (until capacitor 94 discharges) when the switch 70 closes even though the switch remains closed for an abnormal length of time due to a coin being jammed in the assorting machine, for example, which eliminates the danger of burning out the solenoid. The same is likewise true of solenoids 15 and 16 which are individually energized by switches 72 and 73 in like manner as solenoid 14. Since solenoids 11 and 12 are of the A. C. type however this precaution is unnecessary as to them, and therefore, it follows that only the normally open circuits of the switches 71 and 74 are employed to energize solenoids 11 and 12.

There is one other switch, namely switch 79, by means of which canceling solenoid 13 is connected across terminals 81. Although this last-named switch has no counterpart in the other figures of the drawings its incorporation on the sorting machine in a manner to be actuated by the sorting machine canceling lever may be accomplished in any convenient manner well within the capabilities of those skilled in the art.

The operation of the apparatus according to the invention can perhaps be most clearly understood with reference first to Fig. 2, wherein only the two solenoids 11 and 14 are shown, the former being responsive to nickels, and the latter to pennies. Assuming first that a nickel has been sorted by the sorting machine, switch 71 is closed and solenoid 11 is energized causing movable element or plunger 11' to be retracted. As a result, pull rod 38 is moved upwards and to the right in Fig. 2, and after a small amount of lost motion engages screw 37 to cause lever arm 20 to be pivoted in a counterclockwise direction. As previously mentioned, the particular digit registered in the accumulator depends on the amount of arcuate displacement which sector arm 17 undergoes, and therefore in this example, solenoid 11, by virtue of its position relative to lever arm and the arrangement of the slot-shaped aperture in pull rod 38, is adapted to cause arcuate displacement of lever arm 20 by an amount corresponding to the five's digit.

When a penny is sorted by the sorting machine, solenoid 14 is energized by switch 70, causing cam 39 to be dis-

placed angularly in a counterclockwise direction and lever arm 20 to be pivoted in a counterclockwise direction also. In this case, however, much less arcuate displacement of sector arm is produced, namely that amount corresponding to the one's digit, which is insufficient to cause the pull rod 38 to be operatively engaged by the screw 37 on the lever arm 20. Towards the final portion of its travel, the hook shaped end portion of the cam 39 engages the pin 36 to absolutely limit the arcuate travel of lever arm 20 even though the free angular movement of the shaft 14' might not have been quite complete insofar as the free operation of the solenoid is concerned.

It should by now be apparent that solenoid 12 operates lever arm 21 to register fifty-cent pieces in precisely the same manner as solenoid 11 operates on sector arm 20 to register nickels. The same is likewise true of solenoid 15 as compared with solenoid 14, the former registering dimes by virtue of its connection to the sector arm 18 for digits of first order significance instead of pennies as is the case with the latter solenoid. The only solenoid whose operation differs appreciably is solenoid 16 which acts on lever arm 42 to cause displacement of sector arm 18 by an amount corresponding to the two's digit. This is accomplished by suitably changing the position of the cam associated with solenoid 16 so that lever arm 42 undergoes twice the angular displacement of lever arm 21. As was described in connection with Fig. 5, solenoids 11 and 16 are energized simultaneously through switches 71 and 73, each time arm 63 is actuated to register a quarter in the calculator.

In the preferred embodiment herein illustrated and described in detail, it follows that provision has been made for registering all U. S. coins, although it should be understood that a greater or lesser number of solenoids and associated apparatus may be employed depending on the number of different types of coins (or tokens) which will be encountered. Likewise, it is apparent that the apparatus of the present invention may be easily adapted to count articles other than coins. Various modifications of this nature that are within the spirit and scope of the invention will no doubt occur to those skilled in the art so that the invention should not be deemed to be limited to the preferred embodiment illustrated but should be deemed to be limited only by the scope of the appended claims.

What is claimed is:

1. Totalizing apparatus of the character described comprising: an accumulating unit having a plurality of sector arms each adapted to be displaced by discrete arcuate amounts which differ in proportion to the digits of the decimal number system; a first electro-mechanical actuator operable in response to electrical impulses representative of articles of a first denomination; a second electro-mechanical actuator operable in response to electrical impulses representative of articles of a second denomination; and means coupled to said actuators to cause arcuate displacements of an individual one of said sector arms in respective amounts which differ in proportion to a pair of digits of like significance, associated with said first and second denominations of articles, respectively.

2. Totalizing apparatus of the character described comprising: an accumulating unit having a plurality of sector arms each adapted to be displaced by discrete arcuate amounts corresponding respectively to the digits of the decimal number system; first, second, third, fourth and fifth electro-mechanical actuators, said first, third, fourth and fifth actuators being individually operable in response to electrical impulses representative of pennies, dimes, nickels, quarters and half dollars, respectively, and said second actuator being operable in response to electrical impulses representative of both nickels and quarters; means coupled to said first and second actuators to cause displacements of a first one of said sector arms in respective amounts corresponding to the one's and the five's digits respectively of the decimal number system; and means coupled to said third, fourth, and fifth actuators to

cause displacements of a second one of said sector arms in respective amounts corresponding to the one's, two's, and five's digits respectively of the decimal number system.

3. Totalizing apparatus of the character described comprising: an accumulating unit having a plurality of sector arms each adapted to be displaced by discrete arcuate amounts corresponding respectively to the digits of the decimal number system; a first solenoid having an angularly movable element, said solenoid being energized by electrical impulses representative of articles of a first denomination; a second solenoid having a linearly movable element, said second solenoid being energized by electrical impulses representative of articles of a second denomination; cam means coupled to the movable element of said first solenoid to cause displacement of one of said sector arms by an amount corresponding to a first digit associated with said first denomination when said first solenoid is energized; and coupling means between the movable element of said second solenoid and said one of the sector arms to cause displacement thereof by an amount corresponding to a second digit associated with said second denomination when said second solenoid is energized.

4. Totalizing apparatus of the character described comprising: an accumulating unit having a plurality of sector arms each adapted to be displaced by discrete arcuate amounts corresponding respectively to the digits of the decimal number system; a lever arm rigidly attached to one of said sector arms; a cam following element rigid with said lever arm; a first solenoid having an angularly movable element, said solenoid being energized by electrical impulses representative of articles of a first denomination; a cam mounted for angular movement with the movable element of said first solenoid, said cam being adapted to engage said following element to cause displacement of said sector arm by an amount corresponding to a first digit associated with said first denomination when said first solenoid is energized; a second solenoid having a linearly movable element, said second solenoid being energized by electrical impulses representative of articles of a second denomination; and a linkage between the movable element of said second solenoid and said lever arm to cause displacement of said sector arm by an amount corresponding to a second digit associated with said second denomination of coin when said second solenoid is energized, said linkage being adapted to permit said lever arm to move independently of said linearly movable element.

5. Totalizing apparatus of the character described comprising: an accumulating unit having a plurality of sector arms each adapted to be displaced by discrete arcuate amounts corresponding respectively to the digits of the decimal number system; a lever arm rigidly attached to one of said sector arms; a roller projecting from said lever arm; a first solenoid having an angularly movable element, said solenoid being energized by electrical impulses representative of articles of a first denomination; a cam mounted for angular movement with the movable element of said first solenoid, said cam being adapted to engage said roller to cause displacement of said sector arm by an amount corresponding to a first digit associated with said first denomination when said first solenoid is energized; a second solenoid having a linearly movable element, said second solenoid being energized by electrical impulses representative of articles of a second denomination; a pull rod pivotally attached to the movable element of said second solenoid and provided with a slot shaped aperture extending lengthwise of the rod; and a member projecting from said lever arm into the slot at an intermediate point lengthwise of the lever arm; said pull rod engaging said member to cause angular displacement of said sector arm by an amount corresponding to a second digit associated with said second denomination when said second solenoid is energized.

6. Totalizing apparatus of the character described comprising: an accumulating unit having a plurality of

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sector arms each adapted to be displaced by discrete arcuate amounts corresponding respectively to the digits of the decimal number system; a lever arm rigidly attached to one of said sector arms; a roller projecting from said lever arm at a point near its extreme end, a first solenoid having an output shaft adapted to be displaced angularly upon energization of the solenoid, the same being energized by electrical impulses representative of articles of a first denomination; a cam rigidly mounted on said shaft and having a camming surface in engagement with said roller to cause angular displacement of said sector arm by an amount corresponding to a first digit associated with said first denomination when said first solenoid is energized, said surface extending substantially in a plane which forms an acute angle with said lever arm; a second solenoid having a plunger adapted to be displaced linearly upon energization of the solenoid, the same being energized by electrical impulses representative of articles of a second denomination, and being disposed with its plunger at an acute angle to said lever arm of opposite sense to the angle formed between said cam surface and said lever arm; a pull rod pivotally connected to said plunger and

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provided with a slot shaped aperture extending lengthwise thereof; and a member extending from said lever arm into the slot at an intermediate point lengthwise of the lever arm, said pull rod engaging said member to cause angular displacement of said sector arm by an amount corresponding to a second digit associated with said second denomination when said second solenoid is energized.

7. Apparatus according to claim 6 wherein said camming surface in engagement with said roller is provided with a terminal portion of hook shaped configuration to absolutely limit the angular displacement of said sector arm to an amount corresponding to said first digit when said first solenoid is energized, irrespective of the amount of free angular movement said shaft and said cam are adapted to undergo upon energization of such solenoid.

References Cited in the file of this patent

UNITED STATES PATENTS

1,958,763 Mosfelt ----- May 15, 1934