April 14, 1959 C. S. BOWER 2,881,975

COIN REGISTER

Filed July 18, 1956 4 Sheets-Sheet 1

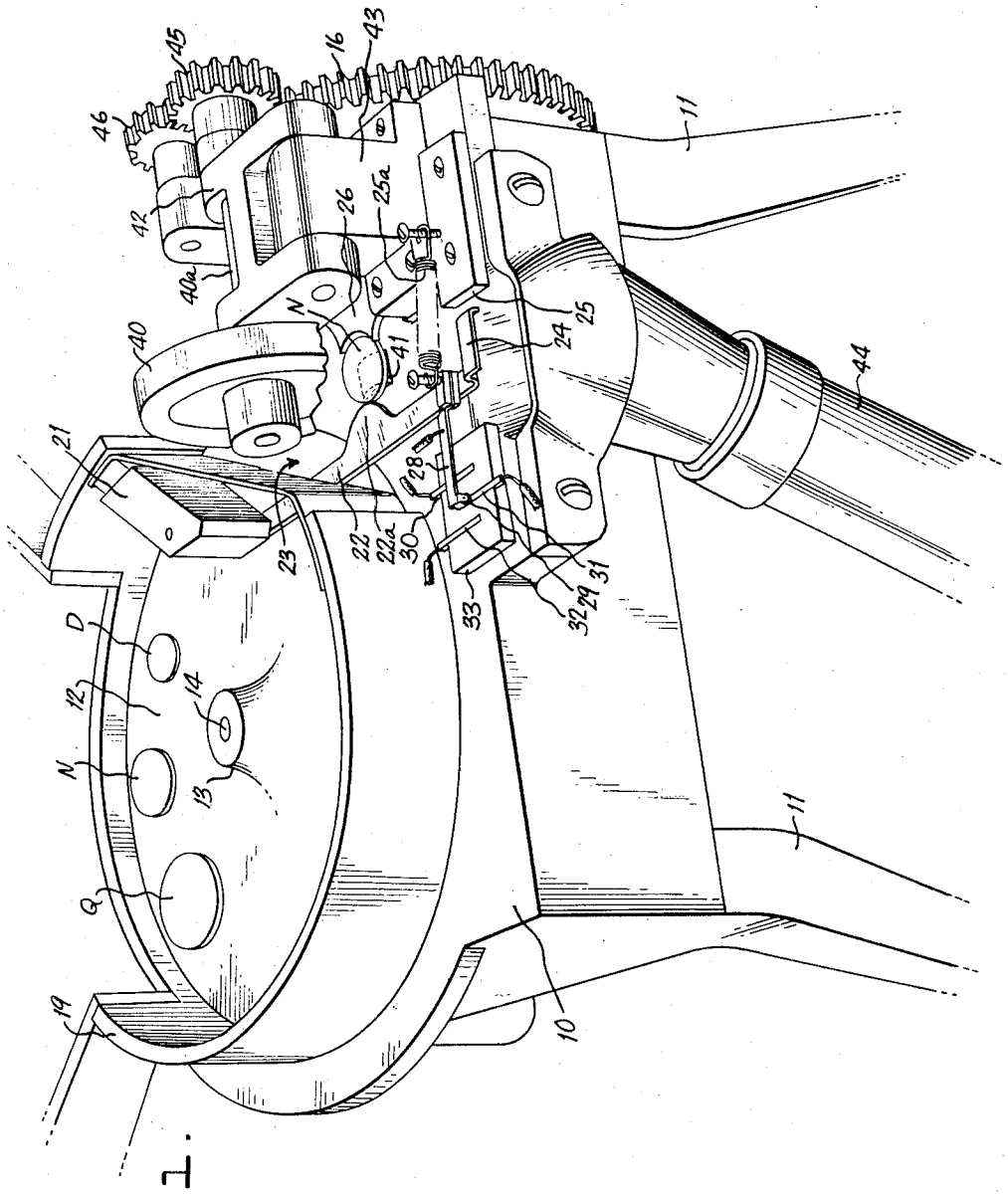


Fig. 1.

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Fig. 2.

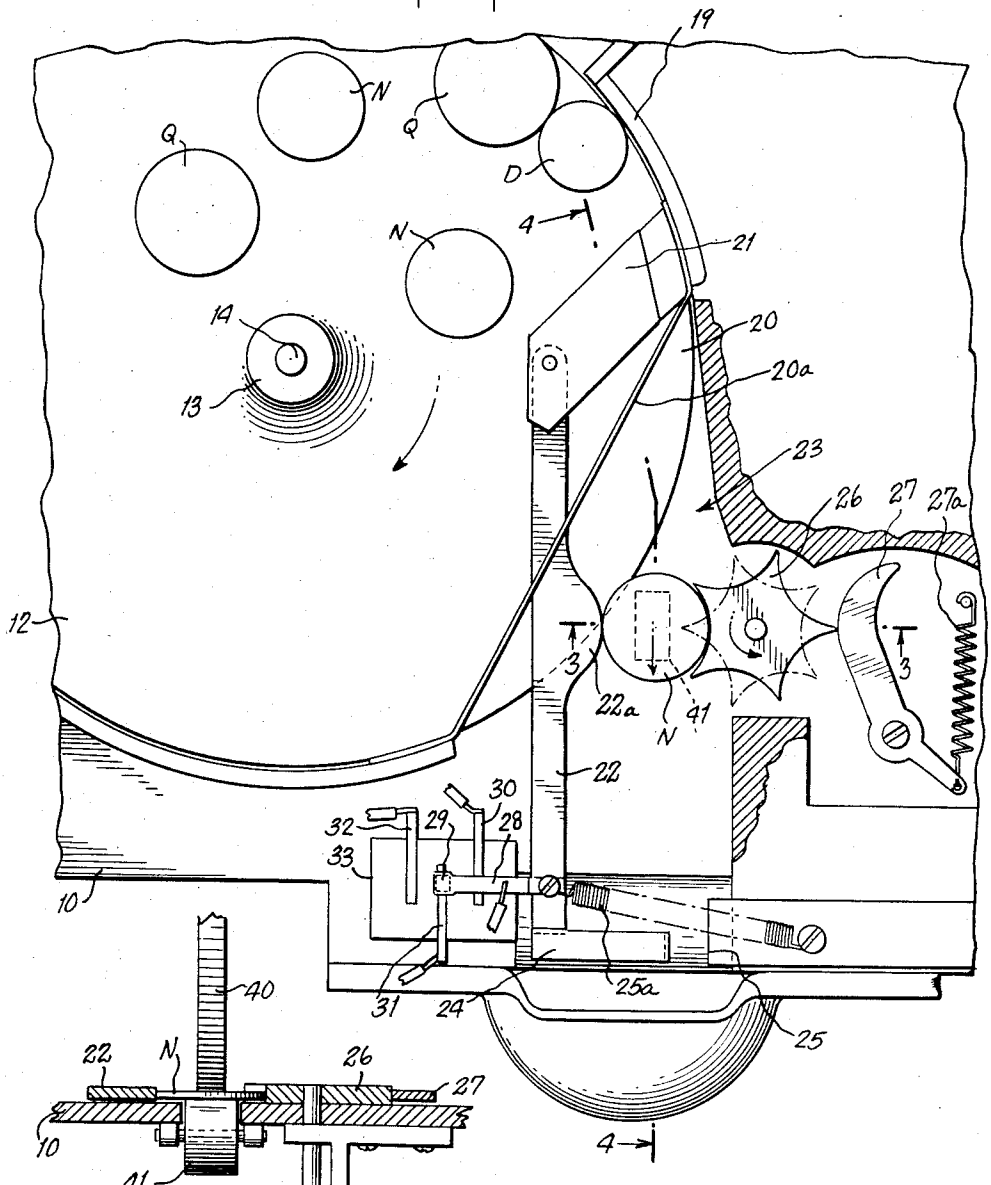
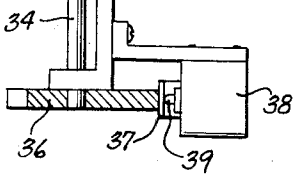


Fig. 3.



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Fig. 4.

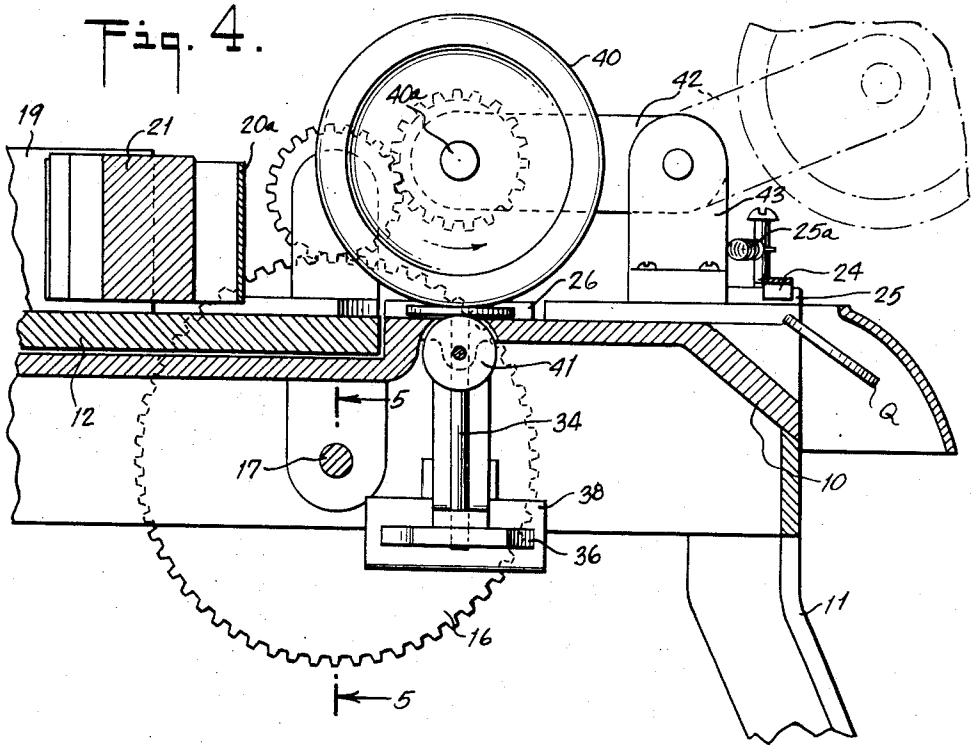


Fig. 5.

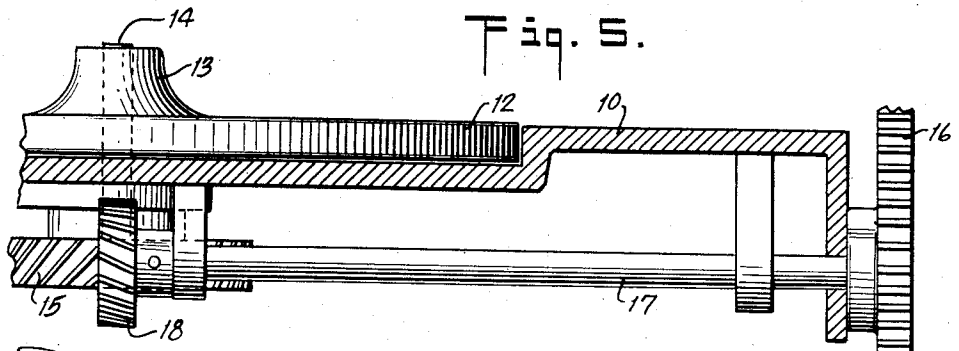
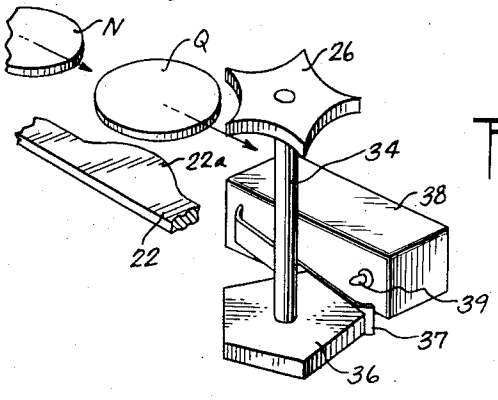


Fig. 6.



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COIN REGISTER

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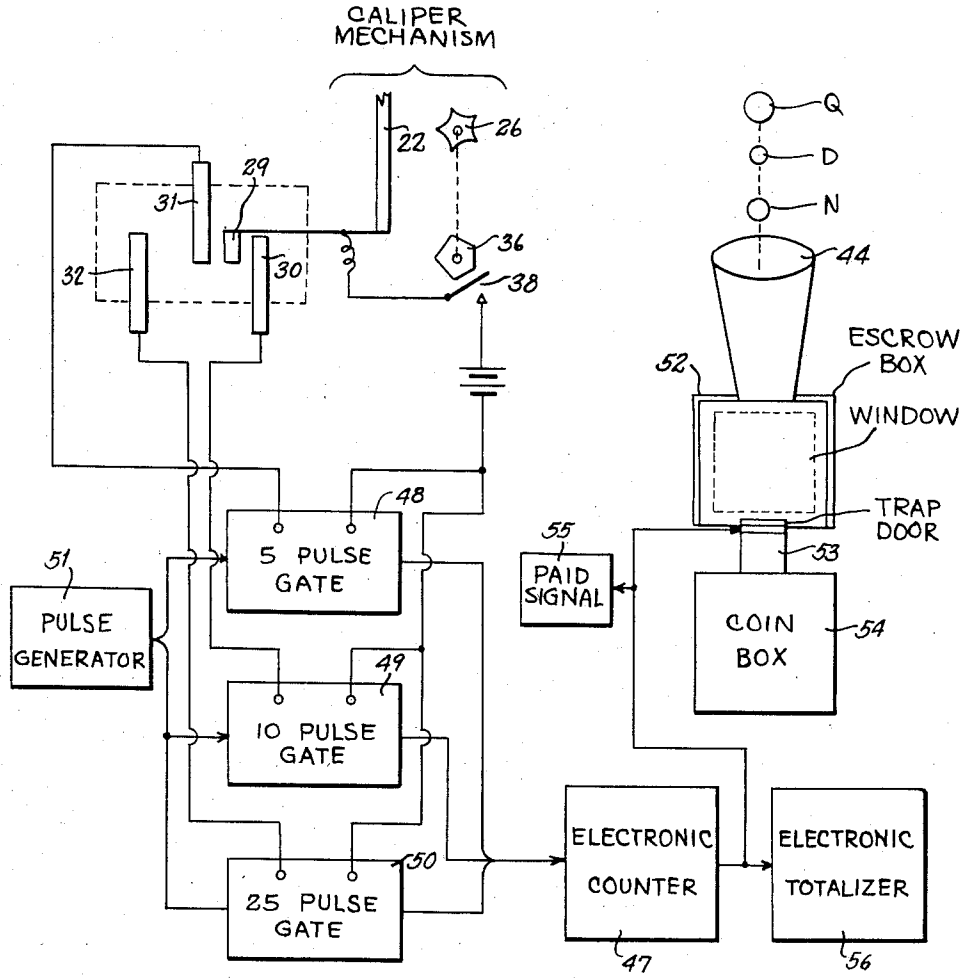


Fig. 7.

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United States Patent Office 2,881,975
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2,881,975

COIN REGISTER

Clyde S. Bower, Yeadon, Pa.

Application July 18, 1956, Serial No. 598,593
6 Claims. (Cl. 235—32)

The present invention relates generally to coin registering apparatus adapted to sort, accumulate and totalize coins of any denomination, and more particularly to such apparatus for use in conjunction with automatic toll collection systems.

For the purpose of raising revenue to finance the construction and maintenance of highways, bridges and tunnels it is the current practice in many states to collect tolls from vehicles making use of these facilities. Such tolls are ordinarily collected from the drivers of vehicles by attendants stationed in toll booths. In place of the attendants it is also known to provide automatic toll collectors which are arranged in various lanes at a toll station to receive a prescribed toll and to set off a go-ahead signal when the driver of the vehicle has deposited the proper fare.

In one such automatic toll collection system the driver must be prepared to deposit a coin of the correct denomination, say a quarter, in the coin box, otherwise he must go to a booth in another lane where an attendant will make change and collect the toll. Since a fair percentage of drivers entering a toll station do not have a coin of the proper size, the need for attendants to make change detracts from the advantages of automatic collection and delays the passage of vehicles through the station. In other known coin register arrangements where it is possible to deposit coins of different size in payment of a given toll, such coins must be carefully inserted one at a time. This slows down the payment of a toll and increases the amount of time necessary for a vehicle to pass through the unattended toll station. Thus an automatic toll collection system can be no more efficient than its coin registration apparatus.

In view of the foregoing it is the primary object of the present invention to provide a coin registering apparatus adapted to receive and count coins of any denomination. While the invention herein will be described in connection with road toll collection systems, this is by way of illustration only. It is to be understood that the coin register in accordance with the invention is useful in any situation requiring payment of coins. A significant advantage of the invention resides in the fact that to compute the amount of an aggregation of coins of different size it is not necessary to first sort the coins according to size. All that need be done is to deposit the various coins in the coin receptacle and the machine will automatically determine the values of the individual coins and compute the total amount thereof.

More specifically it is an object of this invention to provide a coin register wherein any aggregation of coins may be dropped simultaneously into a hopper or receptacle, the machine automatically sorting and counting the coins and indicating when the correct amount has been deposited.

Also an object of the invention is to provide a coin register adapted to collect and count coins regardless

of their size, the register acting quickly and efficiently. A register in accordance with the invention when used in an automatic toll collecting station serves to speed the passage of vehicles through the station at a rate far greater than is possible with attendants.

Still another object of the invention is to provide a register of the above-identified type wherein the coins deposited are visibly displayed until such time as the correct amount is inserted, at which point the money is automatically dropped into a coin box.

A further object of the invention is to provide means to totalize the deposits so as to furnish a running audit on collections.

Briefly stated, in a coin register in accordance with the invention, the coins are fed onto a turntable from which they are ejected one by one into a channel containing a caliper mechanism which measures the diameters of the coins. The caliper mechanism is mechanically linked to an electrical selector switch which provides switching indicia representative of the diameters, which indicia are converted into pulses and then counted electronically.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description to be read in connection with the accompanying drawing wherein like components in the several views are identified by like reference numerals.

In the drawing:

Figure 1 is a perspective view of a preferred embodiment of a coin register in accordance with the invention.

Figure 2 is a top plan view of said coin register.

Figure 3 is a sectional view taken along the plane indicated by line 3—3 in Fig. 2.

Figure 4 is a sectional view taken along the plane indicated by line 4—4 in Fig. 2.

Figure 5 is a sectional view taken along the plane indicated by line 5—5 in Fig. 4.

Figure 6 shows in perspective a detail of the register.

Figure 7 is a schematic diagram of the electrical counting circuit operable in conjunction with the coin register.

Referring now to the drawings and more particularly to Figs. 1 to 6, the coin register in accordance with the invention comprises a base plate **10**, supported in a horizontal position by suitable legs **11**. Mounted for rotation in a clockwise direction above base **10** is a turntable **12** having a raised hub **13** of conical shape.

As best seen in Fig. 5, turntable **12** is rotatably supported at the upper end of a vertically disposed shaft **14** extending through base **10**, the lower end of the shaft being coupled to a gear **15**. Rotation of turntable **12** is effected by means of a main gear **16** keyed to one end of a shaft **17**, supported in suitable bearings below base **10**, shaft **17** terminating in a pinion **18** engaging the turntable gear **15**. The main gear **16** is coupled to a suitable drive mechanism (not shown). This drive mechanism may be in the form of a handle for manual operation, or electric motor for automatic operation. Obviously, when incorporated in an automatic toll system, a motor drive will be used.

Concentrically disposed about turntable **12** and affixed to base **10** is a circular guard wall or ring **19** having an exit gap **20**, the gap being partially closed by a straight metal strip **20a** which is raised above the turntable to permit the exit of coins therefrom. Coins such as a nickel N, dime D and quarter Q, as shown in Fig. 1, are deposited on the turntable through the hopper (not shown) and are carried by centrifugal force to the outer rim of the turntable.

Mounted on the inner wall of ring **19** adjacent the upper edge of gap **20** is a block **21**. Block **21** acts as

a height gauge and is spaced in elevation from turntable 12 to an extent permitting the passage of acceptable coins but rejecting those which are not. Thus the height may be adjusted to pass pennies, nickels, dimes, quarters and half dollar pieces while rejecting slugs or counterfeit coins of greater thickness or coins which are bent.

As best seen in Fig. 2, pivotally mounted below gauge block 21 is a lever arm 22, the lever arm being pivoted to the block adjacent the free end thereof to define an exit channel 23 aligned with the rim of the turntable such that only coins conveyed on the rim may pass successively therethrough. The minimum width of the channel is determined by a stop member 24 attached to and extending laterally from the free end of lever 22, the stop member cooperating with an abutment 25 affixed to base 10. The stop member 24 is normally held in engagement with abutment 25 by means of a helical spring 25*a* which is connected therebetween.

At approximately the midpoint of lever 22 there is provided a hump 22*a* projecting into channel 23 at one side thereof. At the other side of the channel in alignment with hump 22*a* there is rotatably mounted a five-point star wheel 26 having arcuate recesses formed between the points. The position of the star wheel in the absence of a coin is indicated by dotted lines in Fig. 2. When a coin of any denomination is ejected by turntable 12 through gap 20 into channel 23, the edge of the coin strikes a point on the wheel, causing it to shift angularly about its axis, whereby the coin is then lodged in the arcuate recess of the wheel. At the same time the lever 22 is deflected outwardly to an extent determined by the coin size, the hump 22*a* bearing against the edge of the coin. This position is momentarily maintained by means of a pawl 27 biased by a spring 27*a*, the pawl pressing against a point of the star wheel when a coin is received in an arcuate recess at the wheel. The shape of the pawl corresponds to the curvature of the star wheel recess whereby in the absence of a coin, the pawl lies within the recess. Thus the lever operating in conjunction with the star wheel acts as a caliper mechanism to measure the diameter of the coins introduced therein.

In order to indicate the size of the coin and register the payment thereof, a cantilever element 28 is secured to lever 22 and is movable therewith, the cantilever carrying at its free end an electrical roller contact 29. The roller contact 29 is adapted selectively to engage fixed contacts 30, 31 and 32 disposed at longitudinally spaced positions on an insulating strip 33, the cantilever projecting thereover. The spacing of the fixed contacts is such that when lever 22 is deflected outwardly by the presence of a dime, the roller contact 29 is caused to engage fixed contact 30, whereas the presence of a nickel effects engagement with contact 31 and that of a quarter, the contact 32. It will be obvious that while only three fixed contacts have been shown, a greater number may be installed to effect a response to pennies and half dollars or to disc-shaped tokens if desired, the position of the contact being determined by the diameter of the coin or token to be indicated thereby. The manner in which the respective contact engagements permit counting of coins will be later treated in connection with Fig. 7.

As shown separately in Figs. 3 and 6, star wheel 26 is mounted for rotation on the upper end of a shaft 34 which extends through base 10, the lower end of the shaft being coupled to a five-point cam 36 whose points are angularly disposed in correspondence with those on the star wheel. Cam 36 cooperates with a flat spring 37, one end of which is secured to the casing of a microswitch 38, the other end bearing against the cam. The arrangement is such that, as shown in Fig. 6, when the incoming coin Q is not interposed between hump 22*a* and a recess of the star wheel, the flat spring rests against the flat portion of the cam and is unactuated. But when the coin is so interposed, as shown in Fig. 3, the spring is depressed by a point of the cam to operate the actuator pin

39 of the switch 38 and thereby close the switch circuit. The manner in which this operation controls the electrical counting circuit will be discussed hereinafter in connection with Fig. 7.

As best seen in Figs. 1 and 3, the edges of the coin are gripped between the hump 22*a* of the lever and the star wheel 26, whereas the faces of the coin are inserted between an upper drive roller 40 and a lower idler roller 41. Idler roller 41 is supported for rotation in bearings below base 10, the rim of the roller projecting through a rectangular opening in base 10 to engage the under face of the coin. Upper roller 40 is provided with a hand rubber rim, the roller being supported for rotation on the end of a shaft 40*a*. Shaft 40*a* extends perpendicularly through the parallel upper legs of an H-shaped bearing member 42 which is pivotally mounted on a standard 43 affixed to base 10. This makes it possible to raise roller 40 and thereby gain access to the star wheel, etc.

The cooperating rollers 40 and 41 act to thrust the coin through channel 23 into the mouth of a coin outlet pipe 44 communicating with an enclosure having a transparent window to permit the depositor to view the coins fed into the machine and thereby check on the amount inserted. Roller 40 is driven by means of a gear 45 coupled to the other end of shaft 40*a* and intermeshing with a gear 46 engaging main gear 16, whereby the rotation of the main gear simultaneously causes rotation of turntable 12 and roller 40.

In operation, nickels, dimes and quarters may be dropped indiscriminately onto the rotating turntable 12 and thereby swept to the rim of the turntable. These coins will then be ejected one at a time through the gap 20 of the guard ring into channel 23, where they will enter underneath roller 40 to lodge momentarily between lever 22 and a recess in star wheel 26, the lever being deflected to a degree dependent on the size of the coin. The deflection of the lever by the coin effects engagement between roller contact 29 and a selected one of fixed contacts 29 to 32, whereas the movement of cam 36 causes actuation of microswitch 38. As each coin is inserted, the star wheel and the cam are shifted 72 degrees. Finally the coin is then pushed into the outlet pipe for collection. As will be explained more fully in connection with Fig. 7, the outlet pipe leads to an escrow box where the coins are held until a predetermined payment is registered, at which point the coins are dropped into a coin box.

The electrical circuit for counting and totalizing the coins deposited as illustrated schematically in Fig. 7 where it will be seen that roller 29 mechanically linked to lever 22 and operating in conjunction with fixed contacts 30 to 32 acts as a selector switch whose functioning depends on the size of the coin as identified by the caliper mechanism. When a coin is inserted in the caliper mechanism to cause closure of the selector switch, the microswitch 38 whose operation is controlled by cam 36 is simultaneously closed. The values of the coins inserted are added by a suitable electronic adder device such as the binary counter 47 which is coupled through electronic gate circuits 48, 49 and 50 to a continuous pulse source 51. The electronic gate circuits may be of any conventional design adapted to pass signals therethrough for a predetermined interval.

Microswitch 38 is connected in series with a voltage source 52 and the selector switch (29—32) to gate circuits 48, 49 and 50, such that when switch 38 is closed as well as selector contacts 29 and 30, gate 48 is activated, while, when switch 38 is closed as well as contacts 29 and 31, gate 49 is activated, and when switch 38 is closed as well as contacts 29 and 32, gate 50 is activated.

The gates serve to admit a predetermined number of pulses to the electronic counter 47. Gate 48 which is activated when a nickel is inserted passes a series of five pulses, gate 49 which operates when a dime is inserted passing a series of ten pulses and gate 50 which operates

when a quarter is inserted passing a series of twenty-five pulses. The electronic counter **47** is adjusted to provide an output triggering pulse when a predetermined number of input pulses have been counted. Thus should the toll be 75 cents, the triggering pulse will be produced when 75 pulses have been counted as a result, for example, of the deposit of three quarters, or seven dimes and a nickel, etc.

The coins inserted, as previously pointed out, are dropped down the outlet pipe **44** of the register into an escrow box **52**, provided with a transparent window whereby the coins are visible to both patron and toll operator. The escrow box is provided with a solenoid-actuated hatch or trap door **53** which is actuated in response to the triggering pulse, such that when a proper toll is deposited, the coins are dropped into a locked cash box **54**. The same triggering pulse may be used to operate a light signal device **55** indicating the payment of the toll.

To provide a running audit of the payment of tolls the triggering pulse may also be applied to a totalizer mechanism **56**, such as a National Cash Register Model 52 unit. As each toll is registered, it adds into a locked counter a preset sum. By the use of a master clock system the totalizer may be impulsed hourly to furnish printed totals.

While there has been shown what is considered to be a preferred embodiment of the invention, it will be manifest that many changes and modifications may be made therein without departing from the essential spirit of the invention. It is intended, therefore, in the annexed claims to cover such changes and modifications as fall within the true scope of the invention.

What is claimed is:

1. A coin register comprising a turntable, a guard ring surrounding said turntable and provided with an outlet gap, inlet means to feed an aggregation of coins onto said turntable whereby said coins regardless of denomination are swept by centrifugal force toward the rim of said turntable for ejection through said gap, a channel communicating with said gap, caliper means in said channel including a pivoted lever on one side thereof and a rotatable star wheel on the other side thereof, said wheel being provided between seccessive points thereof with arcuate recesses to accommodate one edge of the coins fed through said channel, the other edge being engaged by said lever whereby the deflection of said lever depends on the diameter of said coin, indicating means coupled to said lever selectively to provide indications representative of the diameters of the coins inserted between said lever and said star wheel, and switching means operatively coupled to said rotatable star wheel to provide a switching action only when a coin is interposed between one of said recesses and said lever, said switching means being electrically coupled to said indicating means to render said indications operative only when said switching action occurs.

2. A coin register comprising a coin channel through which coins of any denomination are fed one by one, caliper means disposed in said channel to receive coins fed therethrough, said caliper means being deflected to an extent depending on the diameter of said coins, electrical means coupled to said caliper means to provide respective indicia representative of said diameters, means to convert each of said indicia into a series of pulses numerically related thereto, and an electronic counter responsive to said pulses, said caliper means in said channel including a pivoted lever on one side thereof and a rotatable star wheel on the other side thereof, said wheel being provided between successive points thereof with recesses to accommodate one edge of the coins fed through said channel, the other edge being engaged by said lever whereby the deflection of said lever depends on the diameter of said coin, said electrical means coupled to said caliper means including indicating means coupled to said lever selectively to provide indications representative of the coin diameters, and switching means operatively coupled to said star wheel to provide a switching action only when a coin is interposed between one of said recesses and said lever, said switching means being electrically coupled to said indicating means to render said indications operative only when said switching action occurs.

3. A coin register comprising a turntable, means to deposit an aggregation of coins of any denomination onto said turntable, whereby said coins are swept toward the rim thereof, a channel disposed adjacent the rim of said turntable to receive coins therefrom one by one, caliper means in said channel deflectable to an extent depending on the diameter of said coins, electrical means coupled to said caliper means to provide respective indicia representative of said diameters, means to count said indicia, and means coupled to said counter to indicate when a predetermined total is registered thereby, said caliper means in said channel including a pivoted lever on one side thereof and a rotatable star wheel on the other side thereof, said wheel being provided between successive points thereof with recesses to accommodate one edge of the coins fed through said channel, the other edge being engaged by said lever whereby the deflection of said lever depends on the diameter of said coin, said electrical means coupled to said caliper means including indicating means coupled to said lever selectively to provide indications representative of the coin diameters, and switching means operatively coupled to said star wheel to provide a switching action only when a coin is interposed between one of said recesses and said lever, said switching means being electrically coupled to said indicating means to render said indications operative only when said switching action occurs.

4. Coin registering apparatus for sorting, accumulating and counting coins of any denomination comprising a turntable, a guard ring surrounding said turntable and provided with an outlet gap, inlet means to feed an aggregation of coins onto said turntable whereby said coins are swept by centrifugal force toward the rim of said table for ejection through said gap, a channel communicating with said gap, caliper means in said channel including a pivoted lever on one side of said channel and a rotatable star wheel on the other side of said channel, said wheel being provided between successive points thereof with arcuate recesses to accommodate one edge of the coins fed through said channel, the other edge being engaged by said lever whereby the deflection of said lever depends on the diameter of said coin, indicating means coupled to said lever to provide indications representative of the diameters of the coins inserted between lever and star wheel, and switching means operatively coupled to said rotatable star wheel to provide a switching action only when a coin is interposed between one of said recesses and said lever, said switching means being electrically coupled to said indicating means to render said indications operative only when said switching action occurs.

5. Coin registering apparatus for sorting, accumulating and counting coins of any denomination comprising a turntable, a guard ring surrounding said turntable and provided with an outlet gap, inlet means to feed an aggregation of coins onto said turntable whereby said coins are swept by centrifugal force toward the rim of said table for ejection through said gap, a channel communicating with said gap, a height gauge block secured to said ring and disposed above the rim of said turntable adjacent said gap, said block being elevated to an extent passing proper coins through said gap into said channel, caliper means in said channel including a lever on one side of said channel and pivoted to said block and a rotatable star wheel on the other side of said channel, said wheel being provided between successive points thereof with arcuate recesses to accommodate one edge of the coins fed through

said channel, the other edge being engaged by said lever whereby the deflection of said lever depends on the diameter of said coin, indicating means coupled to said lever to provide indications representative of the diameter of the coins inserted between lever and star wheel, and switching means operatively coupled to said rotatable star wheel to provide a switching action only when a coin is interposed between one of said recesses and said lever, said switching means being electrically coupled to said indicating means to render said indications operative only when said switching action occurs.

6. Coin registering apparatus for sorting, accumulating and counting coins of any denomination comprising a turntable, a guard ring surrounding said turntable and provided with an outlet gap, inlet means to feed an aggregation of coins onto said turntable whereby said coins are swept by centrifugal force toward the rim of said table for ejection through said gap, a channel communicating with said gap, a height gauge block secured to said ring and disposed above the rim of said turntable adjacent said gap, said block being elevated to an extent passing proper coins through said gap into said channel, caliper means in said channel including a lever on one side of said channel and pivoted to said block and a rotatable star wheel on the other side of said channel, said wheel being provided between successive points thereof with arcuate recesses to accommodate one edge of the coins fed through said channel, the other edge being engaged by said lever whereby the deflection of said lever depends on the diameter of said coin, indicating means coupled to said lever to provide indications representative of the diameter of the coins inserted between lever and star wheel, a multi-pointed cam rotatably coupled to said star wheel, said cam points corresponding to said wheel points, and an electrical switch mechanically coupled to said cam and operated only when a coin is interposed in said caliper means, said switch being serially connected with the said indicating means whereby said indications are furnished only when said switch is operated.

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