

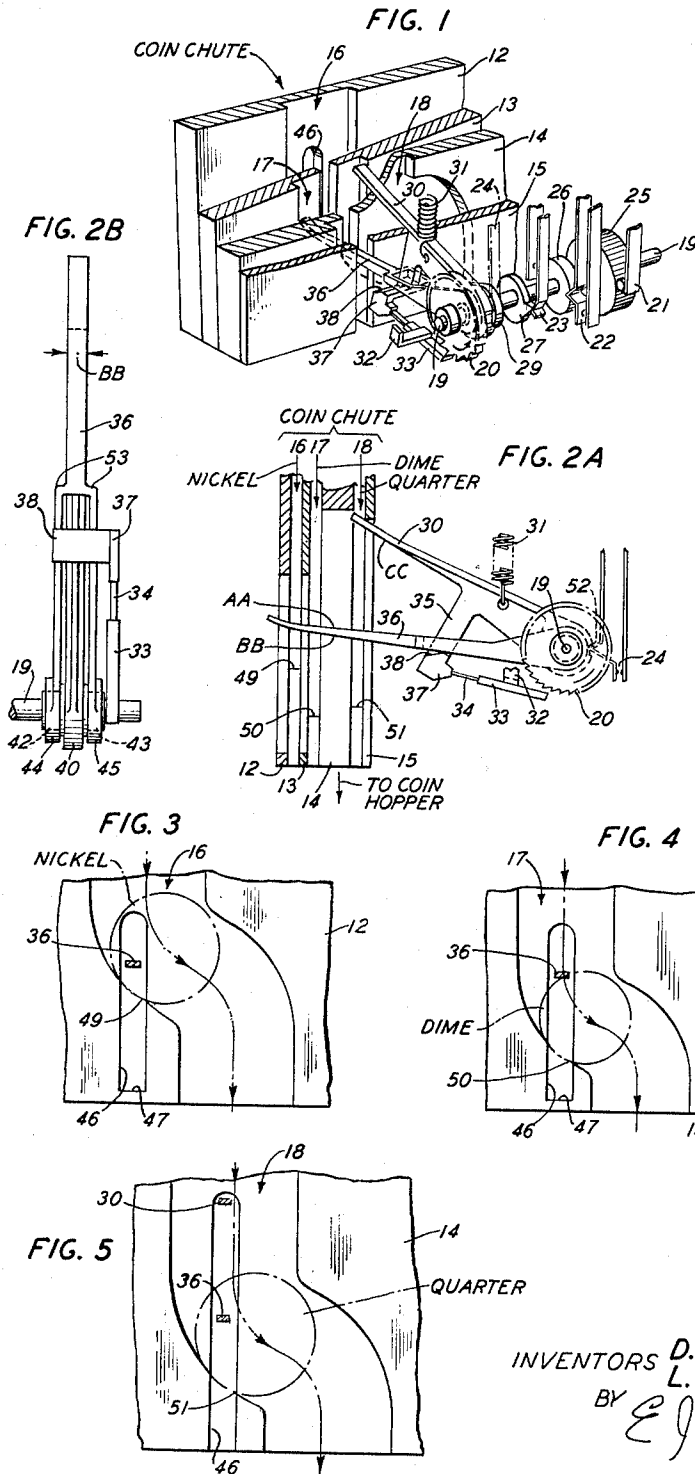
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COIN TELEPHONE TOTALIZER COIN ARM MECHANISM

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COIN TELEPHONE TOTALIZER COIN ARM MECHANISM

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This invention relates to coin-operated apparatus and more particularly to coin totalizer apparatus and its general object is to enhance the reliability of such apparatus.

Coin-operated telephones typically include a means for measuring the value of each deposited coin, a means for storing information indicative of that value, a means for reading out the stored information on demand from a central office and control means for performing the necessary logic functions incident to the transmission of coin signals and the processing of other supervisory signals.

The measuring function may be performed by any one of a variety of so-called "coin chutes," all of which operate to apply various tests to determine whether deposited coins are genuine or spurious and to place each genuine coin in a particular coin channel or run corresponding to the denomination of that coin.

A well known technique employed in the storage function is to utilize the energy attained during the gravity drop of each coin in its assigned channel to rotate a shaft through an angle which corresponds in magnitude to the denomination of the coin. Read out is accomplished by rotating the shaft in the opposite direction back to some preselected index position. The reverse rotation of the totalizer shaft is typically effected by the operation of a stepping electromagnet. As the shaft is stepped in angular increments by the action of the armature of the electromagnet, corresponding coin identification signals are applied to the line for transmission to the central office.

In the sequence of operations described above, a persistent problem lies in the method employed for converting the gravity drop of each coin into a corresponding rotational movement of the shaft. A conventional method is to employ a single mechanical coin arm which is pivotally mounted in driving relation to the totalizer shaft. The free end of the arm is located under the expected drop path of the coins from the coin chute. Depending upon the height from which each coin is dropped, and the point on the coin arm at which each coin strikes, the arm is rotated along with the shaft through an angle which is designed to correspond to the value of the coin. One difficulty with this approach is the fact that all genuine coins of a particular denomination are not necessarily of the same weight. A new dime, for example, may be substantially thicker and therefore heavier than an old dime and accordingly the operation of the coin arm must allow considerable tolerance in coin weight for the registration of a particular coin value. In prior art arrangements the allowance of such tolerance has been difficult to achieve within desired limits of accuracy in registration.

Another problem results from the relatively small amount of kinetic energy which is available from the fall

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of a very thin dime. It is therefore desirable to drop the dime from a height as great as possible before it impinges on the coin arm, without exceeding the vertical space limitation which is inherent in the design of a coin telephone. Designs known heretofore have been unsuccessful in achieving consistently accurate registration for very thin dimes within the limited vertical coin-fall distance that is available.

Accordingly, a specific object of the invention is to increase the accuracy of coin totalizing apparatus.

Another object is to increase the total weight range of a coin for which accurate registration may be provided by a coin totalizer.

A further object is to extend the operating life of coin totalizing apparatus.

These and other objects are achieved in accordance with the principles of the invention by a coin totalizer employing two coin arms in lieu of the conventional single arm. One arm is designed to be actuated only by quarters and the other arm is designed to be actuated only by nickels and dimes. In accordance with the invention the two coin arms are uniquely mounted for pivotal movement and one of the arms, namely the quarter arm, is in driving relation to the totalizer shaft. More specifically, the quarter arm is mounted for free pivotal movement on the totalizer shaft but an attached spring member is arranged in driving relation to a ratchet wheel which is in turn affixed to the end of the totalizer shaft. Further, in accordance with the invention, movement of the nickel and dime coin arm rotates the quarter arm also and therefore the totalizer shaft.

An important aspect of the invention concerns the fact that the two coin arms, while pivoted at the same point, are angularly disposed one to the other, in a substantially common vertical plane when in their unoperated or index position. Specifically, the nickel and dime arm is substantially horizontal in the unoperated position and the quarter arm is inclined upwardly toward the top of the coin chute. As a result, a dime is afforded the maximum possible gravity drop before it impinges on its corresponding coin arm. However, sufficient vertical height is provided for the nickel and dime arm to permit rotation downwardly through an angle corresponding to a dime deposit.

In accordance with the invention the quarter arm must rotate through a correspondingly greater angle than the nickel and dime arm in order for the rotation of the shaft to correspond to the twenty-five cent value. This requirement is met by permitting the quarter arm to collapse on the dime arm as the quarter arm is driven down. Both arms thus rotate together and the full throw of the quarter arm is in no way restricted by the position of the dime arm. By disposing the two coin arms at different levels, as described, the principles of the invention provide for a maximum angular throw in the operation of the quarter arm, utilization of maximum gravity drop for dimes in the operation of the nickel and dime arm and the attainment of both of these operational advantages with the use of a minimal amount of vertical height.

Another aspect of the invention relates to the physical positioning of the coin arms with respect to the coin chute. The quarter arm is positioned for downward movement in the quarter channel without protruding during the traverse of its arc into either the nickel or

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dime channel. The nickel and dime arm, although it passes through the quarter channel as well as the nickel and dime channel, is protected from a falling quarter by virtue of the position of the quarter coin arm at a higher level.

Accordingly, one feature of the invention relates to the employment in a coin totalizer for coin-operated telephones of a first coin arm actuated only by quarters and a second coin arm actuated only by nickels and dimes.

Another feature pertains to the driving of a ratchet wheel by a straight wire spring mounted on a first coin arm and the engagement of a second coin arm with the first coin arm to initiate the driving of the ratchet wheel.

A further feature deals with a particular structural interrelation between the coin passages of a coin chute in a coin telephone and two totalizer operating coin arms, each physically disposed in the coin passages to permit the operation of one coin arm by quarters and one coin arm by nickels and dimes.

These and other objects and features will be fully apprehended from the following detailed description of an illustrative embodiment of the invention and from the appended drawing in which:

FIG. 1 is a perspective view of coin totalizer apparatus in accordance with the invention;

FIG. 2a is a side view of a part of the apparatus shown in FIG. 1;

FIG. 2b is a bottom view of the coin arms shown in FIG. 2a; and

FIGS. 3, 4, and 5 are interior views of the coin chute shown in FIG. 1, and in particular illustrate the roll-off points for a nickel, dime and quarter, respectively.

In FIG. 1 a coin totalizer mechanism in accordance with the invention is shown in cooperative relation with a substantially conventional telephone coin chute. The coin chute includes plate members 12, 13, 14, and 15 which are suitably fitted together to form coin passageways 16, 17, and 18 which are designed to guide the substantially free gravity fall of nickels, dimes and quarters, respectively. Coin chute mechanisms are well known in the art and typically include a plurality of means for testing the various properties of deposited coins to determine whether the coins are genuine or spurious. After coins have been determined to be genuine, they are placed in the coin channels 16, 17, and 18 and are eventually guided to the coin hopper from whence they are either collected in the coin box or returned to the customer.

The totalizer mechanism proper includes a shaft 19 which drives cams 26 and 27 and ratchet wheel 25. Cams 26 and 27 operate associated spring-loaded switches 22 and 23. Cam operated switches of this general type normally form a part of telephone totalizer control circuitry and are typically employed to detect when a preselected initial rate has been deposited, to short and unshort the telephone set in accordance with whether or not an initial rate has been deposited and to enable and disable a stepping electromagnet (not shown) which drives the totalizer through ratchet wheel 25 to a preselected index position after shaft 19 has been rotated in response to the deposit of coins. The spring-loaded roller 21 is designed to rest between adjacent teeth on wheel 25 and assists in centering or positioning shaft 19 precisely after each angular incremental step. A second ratchet wheel 20 is also mounted on shaft 19 and it is this wheel which drives shaft 19 during the coin deposit cycle. Various arrangements of apparatus and circuitry for performing such functions are well known in the art as shown for example in Patent 2,883,463, issued to W. D. Goodale, Jr., et al., April 21, 1959.

The mechanism which, in accordance with the invention, is employed to drive ratchet wheel 20, includes a quarter arm 30 and a nickel and dime arm 36. The two coin arms 30 and 36 are positioned within the coin chute for vertical movement within a slot 46 which extends through each of the coin channels 16, 17, and 18. As

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shown, coin arms 30 and 36 are angularly disposed with respect to each other and are pivoted about a common point on the axis of shaft 19. Quarter coin arm 30 includes a vertical support member 35, best shown in FIG. 2a, which supports a substantially horizontal bar member 38 and an associated vertical tab member 37. Anchored in tab 37 is a straight wire spring member 34. Wire spring 34 terminates at its opposite end in a driving pin 33.

Coin arms 30 and 36, ratchet wheel 20 and driving pin 33 may advantageously be formed from a molded plastic material such as Delrin, for example, which is light in weight yet highly resistant to wear. Wire spring member 34 may then be conveniently imbedded in tab 37 and in driving pin 33 during the molding process.

The pivot end of quarter arm 30 terminates in a bearing surface 40 which rotates freely on shaft 19. The bearing of quarter arm 30 also includes two projecting shoulders 42 and 43, best seen in FIG. 2b. The pivot end of nickel and dime arm 36 comprises a forked member 53 which terminates in two bearings 44 and 45 which rotate freely on the outer journal surfaces of bearing projections 42 and 43 of quarter arm 30. Quarter arm 30 is held in position by spring 31. Nickel and dime arm 36 is in turn held in position by quarter arm 30 in that the arms of fork 53 of nickel and dime arm 36 bear against horizontal bar 38 which is a part of quarter arm 30.

Operation of the mechanism described above is initiated by the relatively free gravity fall of a coin in one of the coin channels. Assuming, for example, that a quarter falls in coin channel 18, the quarter will impinge against the free end of quarter arm 30, thereby forcing quarter arm 30 to pivot downwardly. At this point drive pin 33 is still clear of ratchet wheel 20 and rests against guide bar 32. Approximately the first five degrees of travel of the quarter arm is so-called "dead space." During the dead space travel, drive-pin 33, directed by guide bar 32, is shifted into meshing relation with adjacent teeth of ratchet wheel 20. Ratchet wheel 20 is accordingly driven by quarter arm 30 during the remainder of its arc of travel.

The arc of travel of quarter arm 30 is designed to subtend an angle of approximately 50 degrees, 10 degrees being employed arbitrarily as an indication of a five-cent deposit. At a particular point near the end of the travel of the quarter arm, which is called a roll-off point 51, shown in FIG. 5, the configuration of the quarter channel 18 is such that the quarter is guided away from slot 46 and is accordingly no longer in contact with quarter arm 30. During the initial part of the downward travel of quarter arm 30, friction between arms 30 and 36 causes arm 36 to swing down also. After approximately 20 degrees of travel by arm 36 its lower surface BB strikes the closed end 47 at guide slot 46. Arm 30 continues in its downward arc, however, in effect collapsing on arm 36 until at the end of its travel surface AA of arm 36 and CC of arm 30 are approximately in juxtaposition. At this point the restoring force of extended spring 31 swings quarter arm 30 back to its initial or index position which is illustrated in FIG. 2a. During the upward or return travel of quarter arm 30, drive pin 33, once again guided by guide bar 32, is withdrawn from contact with ratchet wheel 20 and returns to a neutral position.

A dime deposit is directed into channel 17 where it strikes the upper surface of nickel and dime arm 36. Nickel and dime arm 36 accordingly travels downwardly, carrying quarter arm 30 along with it since the downward force of nickel and dime arm 36 is transmitted to quarter arm 30 by the fork members 53 bearing against horizontal bar member 38 of quarter arm 30. Engagement of drive pin 33 with ratchet wheel 20 takes place as described above. With the fall of a dime, nickel and dime arm 36 is rotated through a 20 degree arc, once

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again 10 degrees of rotation being employed to indicate a deposit value of five cents. As shown in FIG. 4, a dime, near the termination of its travel in channel 17, reaches a roll-off point 50 where it is diverted from a slot 46 and hence is no longer in contact with dime arm 36.

At the end of its travel, dime arm 36 is prevented from further rotation by a positive stop such as 47 at the bottom of slot 46. It should be noted at this point that the distance between the point on quarter arm 36 at which a quarter first impinges and the point on nickel and dime arm 36 at which a dime first impinges, is substantially equal to the additional free fall distance for a dime which is turned to account in the form of kinetic energy. It is this feature of the invention which allows the totalizer to be operated by a particularly thin dime of very small mass. In the case of a single coin arm, as employed in the prior art, roll-off points may be varied to obtain the desired force ratio between a dime and a quarter but in the light of the instant invention the space available for free dime fall is obviously not fully turned to account in prior art arrangements.

In the case of a deposit of a nickel, the coin is directed to channel 16 and drives nickel and dime arm 36 in substantially the same fashion as was described above in the case of a dime deposit. In the case of a nickel, however, nickel and dime arm 36 is rotated through an arc of only 10 degrees before the nickel roll-off point 49, shown in FIG. 3, is reached. As the nickel is diverted away from the nickel and dime coin arm 36, spring 31 once again takes control and raises both coin arms to the rest position shown in FIG. 2a.

The embodiment of the invention shown and described herein is intended as merely illustrative of the principles of the invention. Numerous other arrangements may be devised by persons skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In a coin telephone including a coin chute and a totalizer shaft for indicating by its rotational position the value of a deposited coin, apparatus responsive to the fall of a coin in said chute for rotating said shaft through an angle corresponding to the value of said coin comprising, in combination, a first coin arm mounted for pivotal movement about said shaft, said pivotal movement being responsive to the fall of a quarter in said chute and having an angular magnitude with a preselected proportional relation to the value of a quarter, a second coin arm mounted for pivotal movement about said shaft, said pivotal movement being responsive to the fall of a nickel or a dime in said chute and having an angular magnitude with a preselected respective proportional relation to the value of said nickel or dime, means responsive to the pivotal movement of said first arm for rotating said shaft, means responsive to the pivotal movement of said second arm for pivotally moving said first arm thereby to rotate said shaft, said arms being disposed in their index or nonpivoted position at different angles with respect to their common pivot point thereby to allow nickels and dimes to traverse a substantially greater free fall distance before striking said second arm than traversed by a quarter in striking said first arm.

2. Apparatus in accordance with claim 1 wherein said chute includes four substantially parallel plate members, adjacent ones of said plate members defining a channel for dimes, an outer one of said plate members and one of said adjacent plate members defining a passageway for quarters, the other outer one of said plate members and the other one of said adjacent plate members defining a passageway for nickels, a substantially vertical slot extending through all of said plate members, said first coin arm being positioned in a plane substantially perpendicular to said plates and positioned for arcuate movement in said passageway for quarters, said second coin arm being positioned in said plane for arcuate movement in all of

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said passageways, said second coin arm being positioned angularly below said first coin arm with respect to the direction of the fall of coins in said chute, whereby quarters are permitted to impinge only upon said first arm and nickels and dimes are permitted to impinge only on said second arm.

3. Apparatus in accordance with claim 1 wherein said shaft includes a journal surface in cooperative relation with a first bearing member on the pivot end of said first arm, the pivot end of said second arm being terminated by a two-arm yoke member, each of said arms terminating respectively in a second bearing member and in a third bearing member, the outer surface at each of the two axial extremities of said first bearing member comprising a journal surface in respective cooperative relation with said second and third bearing members.

4. Apparatus in accordance with claim 1 wherein said means for rotating said shaft comprises a first ratchet wheel fixedly mounted on one end of said shaft, means for engaging the teeth on said wheel to impart rotational force to said ratchet wheel and hence to said shaft, and means connecting said first arm to said engaging means.

5. Apparatus in accordance with claim 4 wherein said engaging means comprises a substantially straight wire spring member having its free end affixed to a driving member shaped for precise engaging relation between two adjacent teeth on said wheel, the other end of said engaging means being affixed to said connecting means.

6. Apparatus in accordance with claim 5 wherein said connecting means comprises means limiting the angular dispersion between said first and second arms, said other end of said engaging means being affixed to said limiting means, and means joining said limiting means to said first arm.

7. In coin-operated equipment including a coin chute and a totalizer shaft for indicating by its rotational position the value of deposited coins, apparatus responsive to the fall of a coin in said chute for rotating said shaft through an angle corresponding to the value of said coin comprising, in combination, first and second coin arms mounted for pivotal movement about a common point, said point being on the axis of said shaft, means for directing a quarter deposited in said chute to impinge against said first coin arm thereby to pivot said arm through an arc having a magnitude proportional to the value of a quarter, means for directing a dime or a nickel deposited in said chute to impinge against said second arm thereby to pivot said second arm through an arc having a magnitude proportional to said dime or said nickel, respectively, and means responsive to the pivotal movement of said arms for rotating said shaft through an angle corresponding to said pivotal movement.

8. Apparatus in accordance with claim 7 wherein said means for rotating said shaft comprises, a first ratchet wheel fixedly mounted on said shaft, a driving member shaped for engaging relation between adjacent teeth on said wheel, common means for connecting said driving member to said first arm and for limiting the angular dispersion between said first and second arms whereby pivotal movement of said second arm in excess of a preselected angular increment is translated into pivotal movement of said first arm and hence into angular movement of said shaft, and means for limiting the rotational movement of said shaft to a series of incremental angular steps.

9. Apparatus in accordance with claim 8 wherein said rotational movement limiting means comprises a second ratchet wheel mounted on said shaft for driving relation therewith, and a spring-loaded follower member bearing against the periphery of said second ratchet wheel, said follower member being shaped to rest in the space between adjacent teeth on said second ratchet wheel.

10. Coin operated apparatus including a rotatable shaft for indicating the value of deposited coins by its rotational position with respect to a preselected reference position, means for rotating said shaft comprising, in com-

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bination, first means responsive to the fall of a relatively heavy coin through a first distance for rotating said shaft through an angle corresponding in magnitude to the value of said heavy coin, and second means responsive to the fall of a relatively light coin through a second distance, greater than said first distance, for rotating said shaft through an angle corresponding in magnitude to the value of said light coin, said first and second means comprising, respectively, first and second coin operated arms mounted for pivotal movement in a substantially common plane, said arms being disposed in their normal position at a predetermined angle of separation, the

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difference between said first and second distances being equal to the difference in vertical height between a point on said first arm preselected as the impingement point for said heavy coin and a point on said second arm preselected as the impingement point for said light coin.

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