Aug. 19, 1958 A. R. GROSS 2,848,003

CHANGE-MAKING MECHANISM

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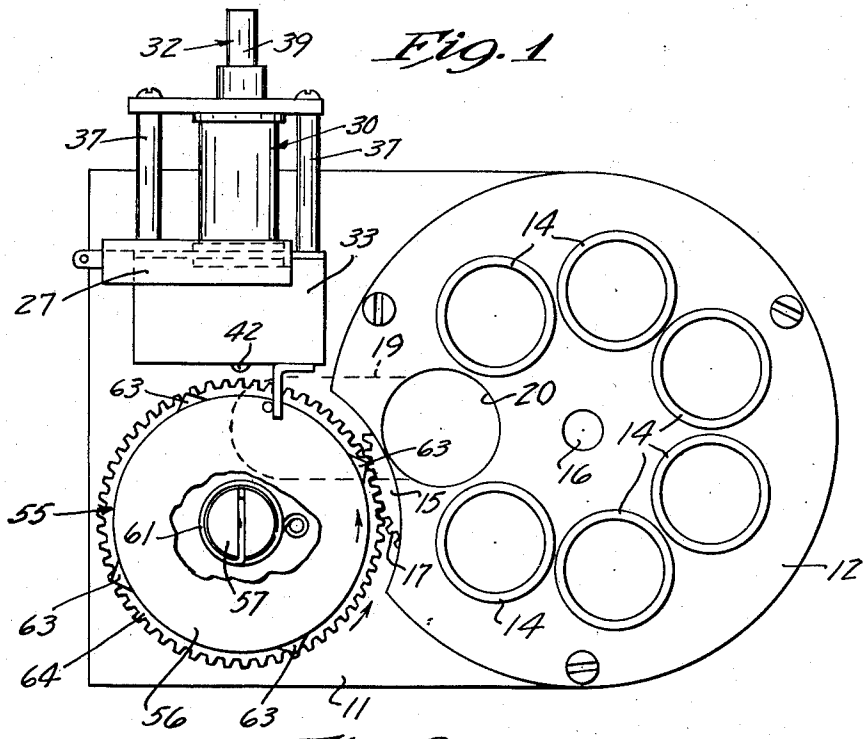
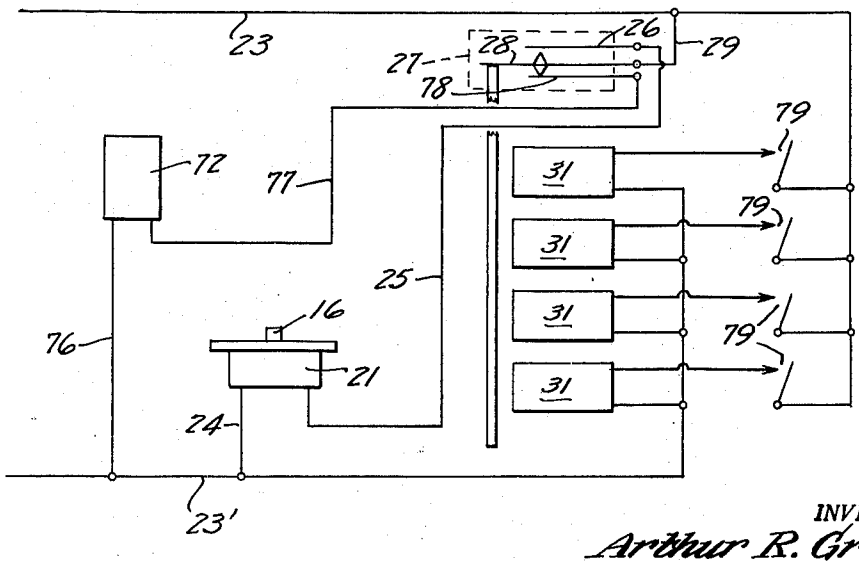


Fig. 1

Fig. 2



INVENTOR.
Arthur R. Gross
BY
Merchant & Merchant
ATTORNEYS

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Fig. 3

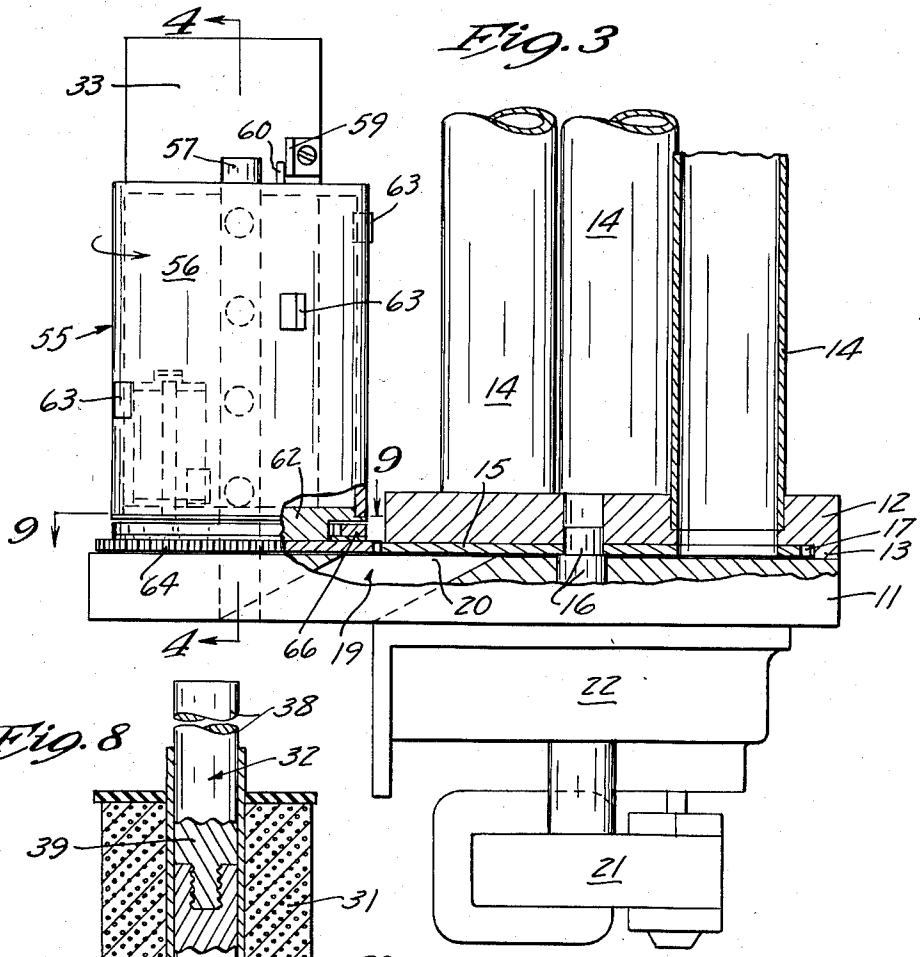
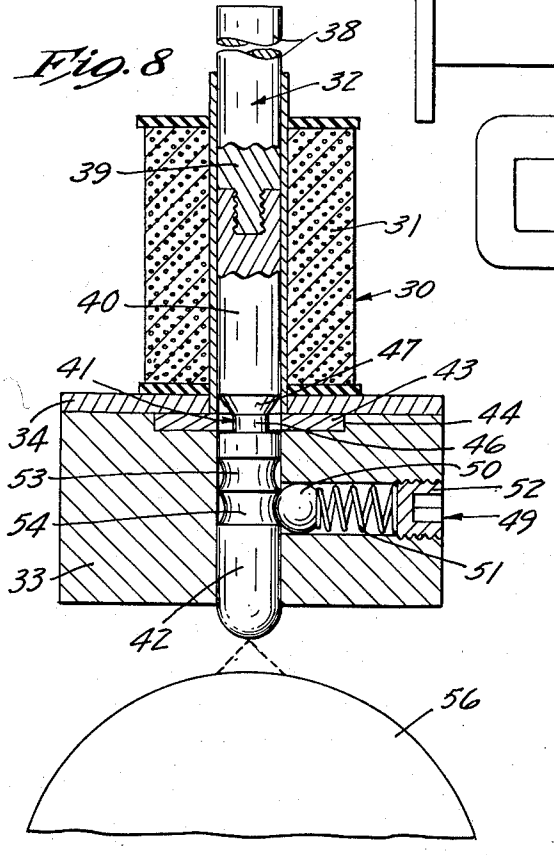


Fig. 8



INVENTOR.
Arthur R. Gross
BY
Merchant & Merchant
ATTORNEYS

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CHANGE-MAKING MECHANISM

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Fig. 4

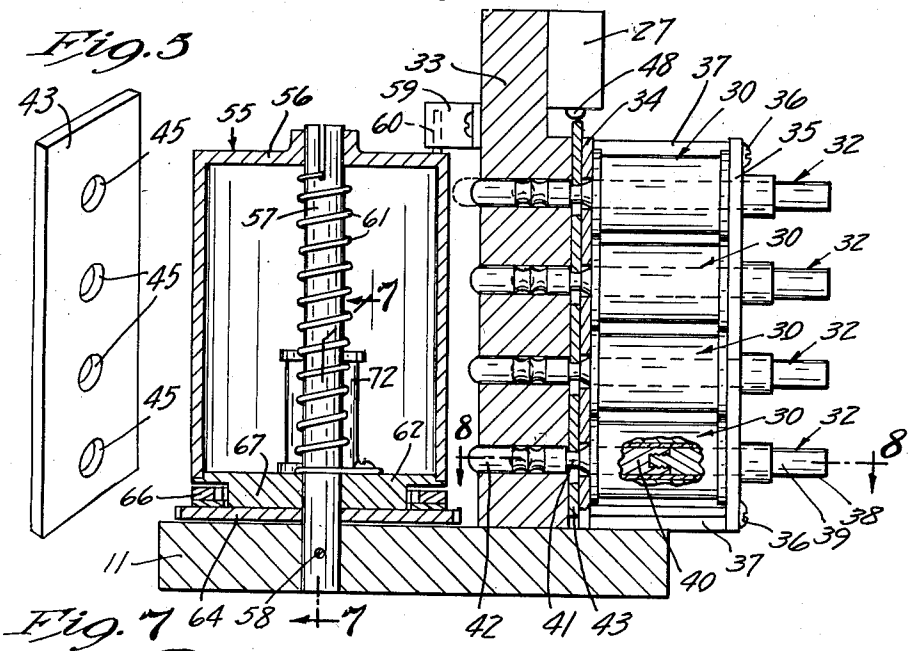


Fig. 5

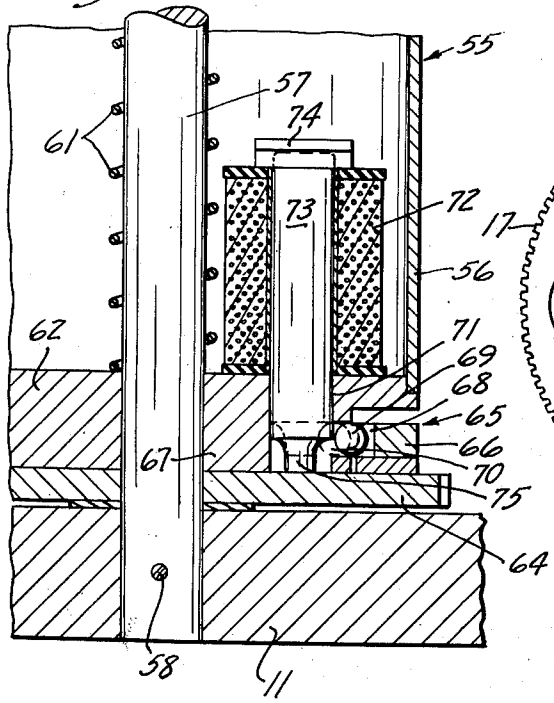
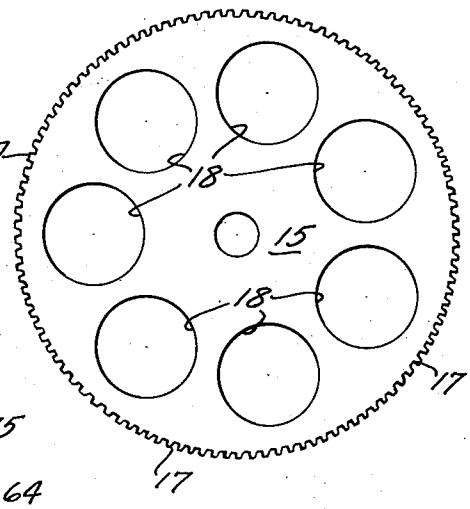


Fig. 6



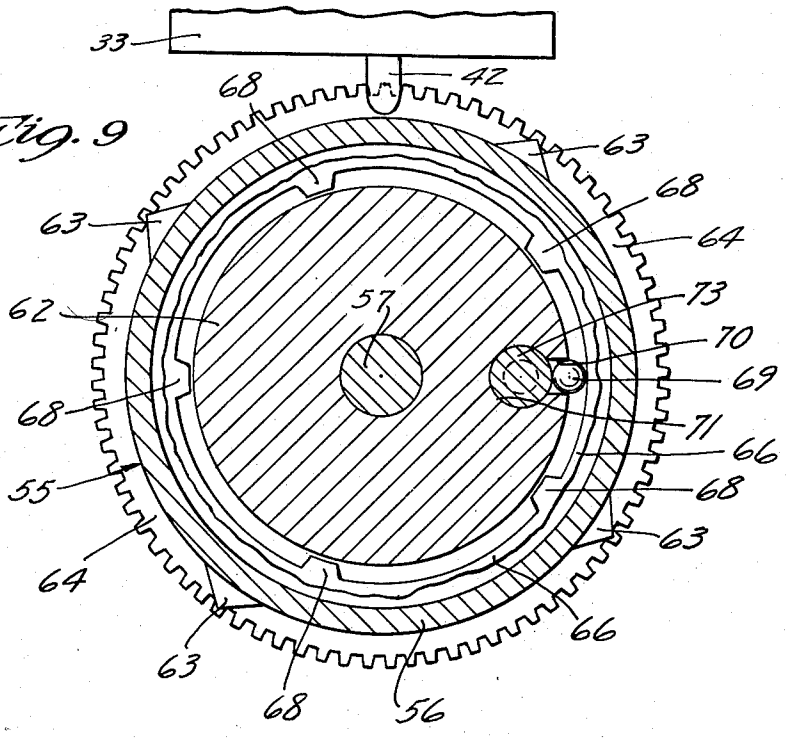
INVENTOR.
Arthur R. Gross
BY
Merchant & Merchant
ATTORNEYS

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Fig. 9



INVENTOR.
Arthur R. Gross
BY
Merchant & Merchant
ATTORNEYS

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2,848,003

CHANGE-MAKING MECHANISM

Arthur R. Gross, St. Paul, Minn.

Application June 2, 1955, Serial No. 512,617

11 Claims. (Cl. 133—2)

My invention relates to a change-making mechanism.

An object of my invention is to provide a novel and improved change-making mechanism which may be actuated by selective means to return one, two, three or more coins, or other various numbers of coins comprising multiple integrals of a small determined number thereof such as multiple integrals of two or three coins, of any one denomination.

The specific number of coins dispensed by my novel and improved change-making mechanism is dependent upon the duration of operation of a rotary motor, the overrun of which is a variable factor which normally results in the periodic discharge of an extra coin or coins. Therefore, it is another important object of my invention to compensate for the overrun of the motor to insure that only the proper number of coins are dispensed for each action of the selective means.

It is another object of my invention to compensate for motor overrun by means of a lost motion clutch disposed in the drive train between the motor and a timer mechanism.

Other objectives of my invention are to provide a novel and improved change-making mechanism which is adaptable to meet various specified requirements as to the number and varieties of coins dispensed, which is simply and easily operated, and simply built to give long and effective service.

These and other objects and advantages of my invention will become apparent in the course of the following specification and claims, reference being had to the accompanying drawings wherein:

Fig. 1 is a view in top plan, with some parts broken away, of my invention;

Fig. 2 is a schematic showing of the electrical circuits of my invention;

Fig. 3 is a fragmentary view in side elevation, with some parts broken away, of the structure shown in Fig. 1;

Fig. 4 is a view in vertical section taken on the line 4—4 of Fig. 3;

Fig. 5 is a view in perspective of the switch element of my invention;

Fig. 6 is a view in plan of the annular perforated disc of my invention;

Fig. 7 is a fragmentary enlarged view in vertical section taken substantially on the line 7—7 of Fig. 4;

Fig. 8 is an enlarged detail view in horizontal section taken substantially on the line 8—8 of Fig. 4; and

Fig. 9 is an enlarged fragmentary view in horizontal section, with some parts broken away, taken substantially on the line 9—9 of Fig. 3.

Referring more particularly to the drawings, wherein like parts will be indicated by the same numeral, the numeral 11 indicates a mounting base. A generally annular supporting plate 12 is anchored to the base 11 with a depending rim 13 thereof engaging base 11 to provide a recess generally between the plate 12 and base 11. Plate 12 is bored to receive the lower ends of a plurality of generally vertically extending circumferentially spaced

tubular members 14 which are adapted to receive and hold for distribution a supply of coins of a specific denomination which, for the purpose of this disclosure, will be specified as pennies. A generally horizontally disposed annular perforated disc 15 is disposed within the recess between plate 12 and base 11, and mounted on a shaft 16 for rotation on a generally vertical axis adjacent the lower ends of tubular members 14. Referring in particular to Fig. 6, disc 15 is provided with radially outwardly projecting teeth 17 about its periphery and a plurality of uniformly circumferentially spaced holes 18 which are equally radially spaced from the center and axis of rotation of disc 15. The holes formed in plate 12, which are adapted to receive the lower ends of tubular members 14, extend downwardly beyond the tubular members 14, reduced in diameter to the same size as the inner diameter of tubular members 14, to the recess between plate 12 and base 11. This provides an extension of the penny-containing channels formed by tubular members 14 so that they open into the recess between plate 12 and bore 11, wherein a plurality of circumferentially spaced stacks of longitudinally disposed pennies are maintained adjacent the rotatable disc 15.

Disc 15 comprises coin-dispensing means for controllably delivering the pennies stacked within the tubular members 14; wherein, during its rotation, the holes 18 pass into alignment with tubular members 14 and the reduced bore extensions formed in plate 12 to be able to receive, by gravity therefrom, a determined number of coins. In the particular disclosure of my invention herein shown, disc 15 is adapted to receive only one penny at a time in each of the holes 18, but it is clear that disc 15 could be formed to receive two or three or more pennies at one time in each of the holes. Base 11 acts to maintain the pennies received in holes 18 until they are carried thereby to a diagonally extending discharge chute 19 formed in base 11. The upper open annular end 20 of chute 19 is as large or larger than the holes 18 and is disposed beneath the holes 18 at one place in their path of travel; so that during the rotation of disc 15 and as each hole 18 passes over the open end 20, the penny carried therein will be deposited in the chute 19. Preferably, as particularly seen in Fig. 1, when one of the holes 18 is aligned with open end 20 each of the other holes 18 is axially aligned with one of the tubular members 14.

By providing the tubular members 14 circumferentially about the path of travel of holes 18, except over that portion directly above the discharge place defined by end 20 of chute 19, a large number of pennies may be contained in position for dispensing; and this eliminates frequent refilling of the supply of pennies to be dispensed. The tubular member 14 next adjacent open end 20 of chute 19 in the direction of rotation of disc 15 will be emptied first, and the member 14 next adjacent to it, in the direction of rotation of disc 15, will be emptied second, and so on until it is necessary to refill the tubular members 14.

A rotary motor 21 is in driving engagement with shaft 16 through gear reduction means 22 to drive the disc 15 in one direction. Fig. 2 shows schematically the electrical circuit connecting motor 21 to a source of current. Conductors 23 and 23' lead to the relative positive and negative terminals, respectively, of a source of current, not shown in the drawings. Motor 21 is connected to conductor 23' by a conductor 24 and is connected by conductor 25 to one contact 26 of a two-way switch 27. The movable switch arm 28 of switch 27 is connected by conductor 29 to conductor 23. Switch 27 is gravity biased to an open motor circuit position wherein movable switch arm 28 is out of electrical contact with contact 26. When switch arm 28 is moved to its other

position, switch arm 28 engages contact 26 to energize motor 21 which acts to rotate disc 15.

Preferably, I have provided disc 15 with seven of the uniformly circumferentially spaced holes 18 and as each hole 18 is adapted to receive and carry one penny to the discharge place defined by end 20 of chute 19, one complete revolution of disc 15 will act to dispense seven pennies. One penny will be discharged if disc 15 is rotated one-seventh of a revolution. Thus, the number of coins discharged by disc 15 is dependent upon its extent of rotation and this in turn is dependent upon the duration of operation of motor 21 which may be controlled through the actuation of switch 27. By controlling the rotation of disc 15 to multiples of one-seventh of a revolution, various integral multiples of the number of coins received and carried by each hole 18 may be controllably dispensed.

I provide switch actuating means comprising a plurality of electromagnetic relays 30. Each relay 30 comprises a solenoid winding 31 and a plunger 32 movable alternately in opposite directions inside its respective winding between an operative and an inoperative position. A generally vertically disposed mounting head 33 is anchored by welding or the like to base 11. A pair of parallel spaced plates 34 and 35 support the windings 31 in side-by-side relationship and are secured to mounting head 33 by bolts 36 which extend through spacer elements 37. Plungers 32 are horizontally disposed in spaced parallel generally vertically aligned relationship and project axially beyond the windings 31 in one direction through apertures formed in plate 34 and mounting head 33 and in the opposite direction through plate 35. Each of the plungers 32 comprises a shank 38, divided into a ferromagnetic portion 39 and a non-ferromagnetic portion 40 to prevent centering of the plungers 32, a recessed portion 41 and a head 42.

A longitudinally extending switch element 43 is mounted in a laterally outwardly opening longitudinally extending channel 44 formed in mounting head 33 for longitudinal movement alternately in opposite directions. Plate 34 retains switch element 43 in channel 44. Referring in particular to Fig. 5, switch element 43 is provided with a plurality of longitudinally spaced apertures 45, and each of the plungers 32 extends through a different one of these apertures. Switch element 43 is mounted transversely on plungers 32 adjacent the recessed portions 41 thereof, which are each substantially equally divided into a reduced cylindrical portion 46 and a cam-acting conical portion 47, the former being adjacent head 42 and the latter being adjacent the shank 38 of each of the plungers 32.

When all of the plungers 32 are at one position, which shall be defined as their inoperative positions, switch element 43 is biased by gravity to engage the vertically aligned reduced cylindrical portions 46 of plungers 32, which disposes apertures 45 eccentrically with respect to the plungers 32. The movement of any one of the plungers 32 from its previously defined inoperative position in a direction generally toward mounting head 33 is effected by the energization of its cooperating winding 31. This moves cam-acting conical portion 47 of the actuated plunger into engagement with switch element 43; and this acts to move switch element 43 generally vertically upwardly until apertures 45 are in coaxial relationship with the plungers 32, which defines the operative position of switch element 43.

Switch 27 is anchored to mounting head 33 to be disposed generally vertically upwardly from switch element 43. When switch element 43 is moved from its inoperative to its operative position, it engages a depending nubbin or push button 48 to move switch arm 28 from its biased open motor circuit position into engagement with contact 26, which is the closed motor circuit position of switch 27. When any one of the plungers 32 is at its operative position, switch element 43 is maintained in its operative position and it in turn acts to maintain switch 27 in its closed circuit position.

Referring in particular to Fig. 8, detent means, indicated by the general reference numeral 49, are each adapted to engage a different one of the plungers 32 at both its inoperative and operative positions to releasably maintain the plungers 32 at one of these positions until positively actuated to the other. Detent means 49 comprise balls 50 each positioned in a different one of a plurality of horizontally disposed spaced aligned apertures formed in the mounting head 33 in a manner so that each intersects a different one of the plungers 32. Thus, each ball 50 is associated with one of the plungers 32 and is yieldably urged toward it by a compression spring 51 disposed between the ball 50 and a screw 52 inset at the outward end of the aperture within which ball 50 is positioned. Each of the balls 50 is adapted to seat alternately in adjacent grooves 53 and 54 formed in the head 42 of the plunger 32 with which it is associated. Ball 50 is seated in groove 54 of the plunger 32 with which it is associated at that plunger's inoperative position, and it is seated in the adjacent groove 53 at that plunger's operative position.

I provide a timer, indicated in its entirety by the general reference numeral 55 for actuating the movement of plungers 32 from their operative position to their inoperative position which permits switch element 43 to return by gravity to its inoperative position and this permits switch 27 to open the motor circuit. Timer 55 is adapted to move each of the plungers 32 from its operative position to its inoperative position after a determined lapse of time which is different from that for any other of the plungers so that each of the plungers 32 acts to energize motor 21 for a different period of time.

Timer 55 comprises a hollow cylindrical drum 56 journalled on a shaft 57 fixed to mounting base 11 by pin 58 or the like. Drum 56 is mounted on shaft 57 for rotation alternately in opposite directions on a generally vertical axis which is at right angles to plungers 32. I provide stop means consisting of an L-shaped bracket 59, which is anchored to mounting head 33 and projects laterally outwardly therefrom. Bracket 59 engages a pin 60, carried by drum 56, at one position of the drum to define a starting position of drum 56. The upper end of shaft 57 is notched to receive one end of a helical torsion spring 61 which is coiled about the shaft 57 and at its opposite end is secured to the bottom wall 62 of drum 56. Spring 61 forms yieldable resilient means urging drum 56 in one direction to its starting position, wherein pin 60 abuts bracket 59. A plurality of timing lugs 63 are secured to the drum 56 in circumferentially and axially spaced relationship. Timing lugs 63 are axially spaced so that each is horizontally aligned with and adapted to engage a different one of the plungers 32 when the plunger is at its operative position, so as to positively move the plunger from its operative position to its inoperative position. Timing lugs 63 are circumferentially spaced to properly control the duration of operation of motor 21 and the extent of rotation of disc 15. This control will be explained in more detail subsequently.

I provide a drive train between motor 21 and drum 56 to drive the latter in one direction from its starting position against the yieldable bias of spring 61 which comprises a gear 64 journalled on shaft 57 adjacent the lower end of drum 56 and disposed in mesh with gear teeth 17 of disc 15, and a lost motion clutch between drum 56 and gear 64, indicated in its entirety by the numeral 65. Clutch 65 preferably comprises a driving clutch element 66 which, as shown, consists of two interconnected adjacent annular portions, which may be formed integrally together, anchored to gear 64 in axial alignment therewith. Clutch element 66 is disposed in concentric relationship with a reduced portion 67 of the lower end 62 of drum 56. One portion of clutch element 66 has a plurality of circumferentially spaced clutch

teeth 68 formed therein, which, preferably as shown, comprise radially inwardly projecting teeth. Clutch 65 further comprises a driven solenoid actuated clutch element 69 relatively movable into and out of driving relationship with the teeth 68 of clutch element 66. Conceivably, circumferentially spaced clutch teeth 68 might consist of circumferentially extending slots formed in the clutch element 66, which could underlie the end 62 of drum 56 and might consist of gear 64 itself, and clutch element 69 could be a reciprocating plunger of a solenoid movable in and out of the afore-mentioned slots.

Preferably, reduced portion 67 of drum 56 has a radially extending slot 70 formed therein which opens radially outwardly adjacent the generally circular path of rotation of projecting teeth 68, and reduced portion 67 has an axially extending off-center annular slot 71 formed therein which intersects the radial slot 70 adjacent the latter's inner end. A solenoid winding 72 is positioned within the hollow drum 56 and anchored to the end wall 62 thereof in generally axially aligned relationship with annular slot 71. A solenoid plunger 73 is positioned within winding 72 and annular slot 71 for longitudinal movement alternately in opposite directions. Clutch element 69 comprises a ball disposed in radial slot 70 for movement therein into and out of driving relationship with teeth 68 dependent upon the movement of plunger 73. Plunger 73 is gravity biased in one direction to the position shown in full lines in Fig. 7 wherein ball 69 is maintained by plunger 73 in driving engagement with teeth 68. When solenoid winding 72 is energized, plunger 73 is moved generally vertically upwardly to the limit permitted by bracket 74 secured to the winding 72, and positioned as shown in dotted lines in Fig. 7. The lower end 75 of plunger 73 is reduced so that when plunger 73 is in its dotted line position ball 69 is able to move radially inwardly out of the path of travel of teeth 68 so that drum 56 is out of driving engagement with gear 64. It is clear that when winding 72 is deenergized plunger 73 is moved by gravity generally downwardly and reduced end 75 thereof cams ball 69 into the path of travel of teeth 68 to be engaged thereby in positive driving relationship. The lost motion between clutch elements 66 and 69 depends upon the spacing of ball 69 from the clutch tooth which it is adapted to engage in driving relationship.

Clutch elements 66 and 69 are to be in driving relationship during the operation of motor 21 and during the rotation of disc 15, but are to be out of driving relationship after each actuation of motor 21 to permit drum 56 to return to its starting position so that timer 55 is in position for the next actuation of motor 21 by any one of the plungers 32. To accomplish this, solenoid winding 72 is connected to a source of current by an electrical circuit which includes switch 27. Referring in particular to the schematic showing in Fig. 2, solenoid winding 72 is connected by conductor 76 to conductor 23' and is connected by conductor 77 to the other contact 78 of switch 27. The center arm 28 of switch 27 is yieldably gravity biased into electrical contact with contact 78 to form a closed circuit which energizes winding 72 to position clutch 65 in its non-driving relationship. Thus, upon the actuation of switch 27 to close the motor electrical circuit by moving center arm 28 into electrical contact with contact 26, the circuit to solenoid winding 72 is opened to deenergize the winding, and plunger 73 moves downwardly by gravity to move the clutch elements 69 and 66 into their driving positions. Similarly, when the motor circuit is opened, the electrical circuit through solenoid winding 72 is closed so that clutch 65 is moved from its driving position to its non-driving position simultaneously with the opening of the motor electrical circuit.

The operation of my device is effected by change-making selective means not specifically shown in the drawings but indicated in Fig. 2 as switches 79; one of the switches 79 is disposed in each of the electrical circuits energizing a different one of the solenoid windings 31 of the preferred switch actuating means 30. Switches 79 may be separately manually actuated or separately automatically actuated by the insertion of a coin to selectively energize any one of the windings 31.

When the plungers 32 are in their positions shown in full lines in Fig. 4 and in Fig. 8, switch 27 is positioned so that center arm 28 is out of electrical contact with contact 26 and is in electrical contact with the contact 78; wherein, motor 21 is inoperative, solenoid winding 72 is energized and clutch 65 is out of driving engagement, and drum 56 is in its starting position in engagement with stop bracket 59; this represents the normal at rest position of my invention, wherein it is ready to be actuated by the change-making selective means indicated by switches 79.

It was previously mentioned that tubular members 14 and disc 15 have been assumed to be adapted to receive pennies, and that the disc 15, as disclosed herein, will dispense one penny for each rotation of one-seventh of a revolution. It is clear that my invention is not limited to the denomination of coin herein specified and is not limited to the number of such coins carried in each hole 18 herein specified, and further is not limited to the number of holes formed in disc 15. These factors may be varied to meet specific requirements. It will be assumed that the specific requirements to be met by my invention, as specifically disclosed herein, are that the selective means may be actuated to dispense one, two, three or four pennies. Thus, I have provided four of the switch-actuating electromagnetic relays 30. It will be assumed that the uppermost relay 30 may be actuated by the switch 79 in its winding circuit to dispense one penny; and the adjacent relay 30 may be actuated by the switch 79 in its winding circuit to dispense two pennies, the next relay 30 is to be actuated to dispense three pennies, and the lowermost relay 30 is to be actuated to dispense four pennies.

Preferably, I have provided disc 15 with one-hundred and twelve teeth 17 so that one-seventh of a revolution of disc 15 is a circumferential distance equal to sixteen of the teeth 17. Drum gear 64 is provided with eighty gear teeth so that the rotation of disc 15 one-seventh of a revolution acts to rotate gear 64 one-fifth of a revolution. Therefore, if there were no lost motion between gear 64 and drum 56, timing lugs 63 could be disposed so that the first is spaced circumferentially one-fifth of a revolution from the starting position of drum 56 and the other three timing lugs 63 are circumferentially spaced from each other equal to one-fifth of a revolution of drum 56; this disposition of timing lugs 63 assuming no lost motion between gear 64 and drum 56 would properly control the rotation of disc 15 to dispense one, two, three or four pennies.

The provision of lost motion clutch 65 affects the positioning of the first timing lug 63 with respect to the starting position of drum 56 because the first penny will be dispensed insofar as my invention is herein shown, after gear 64 has rotated one-fifth of a revolution but before drum 56 rotates one-fifth of a revolution; however, the second timing lug 63 which controls the dispensing of disc 15 for two pennies, is circumferentially spaced from the first timing lug a distance equal to one-fifth the circumference of drum 56, and a third timing lug 63 is spaced from the second timing lug 63 a similar distance, and likewise the fourth timing lug 63 which controls the extent of rotation of disc 15 for dispensing four pennies, is similarly circumferentially spaced from the third timing lug 63.

With respect to the positioning of the first timing lug as it is affected by lost motion clutch 65, I have provided five of the clutch teeth 68, one for each of the equal parts of drum gear 64 and drum 56; so that the distance between adjacent teeth 68 is approximately equivalent to the distance of rotation of disc 15 neces-

sary to dispense one penny. The clutch ball or element 69 is initially placed approximately centrally between two of the teeth 68 so that when the operation of motor 21 is initiated, drum gear 64 will partake of lost motion rotation for a distance of approximately one-tenth of a revolution or for a distance of approximately eight of the teeth in mesh with disc 15. Thus, I position the first and uppermost timing lug 63 to be circumferentially spaced from the starting position of drum 56 in the direction of rotation effected by gear 64, a distance equal to one-tenth the circumference of drum 56.

Referring in particular to Fig. 9, the positions of the four timing lugs 63 are shown with respect to plungers 32 when drum 56 is at its starting position at the moment when one of the plungers 32 has been moved by the change-making selective means to its operative position. The direction of rotation of gear 64 and drum 56 is indicated by the arrow. Gear 64 will rotate approximately one-tenth of a revolution before one of the clutch teeth 68 engages clutch ball 69 to initiate rotation of drum 56; subsequently, gear 64 and drum 56 will rotate together approximately one-tenth of a revolution before the first timing lug passes the vertically aligned plungers 32; they will rotate an additional one-fifth of a revolution before the second timing lug 63 passes the plungers 32; and they will rotate an additional one-fifth of a revolution for each of the other timing lugs to pass the plungers 32. For each one-fifth of a revolution of gear 64, disc 15 dispenses one penny. Thus, if the plunger 32 which is horizontally aligned with the first timing lug 63 is the one actuated by the change-making selective means, motor 21 will be deenergized after gear 64 has rotated only one-fifth of a revolution and only one penny will be dispensed. Similarly, if the plunger 32 which is horizontally aligned with the second timing lug 63 is the one that has been actuated by the change-making selective means, gear 64 will rotate two-fifths of a revolution before motor 21 is deenergized and two pennies will be dispensed. The operation is similar with respect to the third and fourth plungers 32 which are horizontally aligned respectively with the third and fourth timing lug 63.

The above brief description of the operation of my invention might be clarified by following through the specific steps in dispensing one penny.

When the change-making selective means is actuated to dispense one penny the uppermost plunger 32 is moved, upon the energization of its cooperating winding 31, to its operative position, shown in dotted lines in Fig. 4, which actuates switch 27 to energize motor 21 and initiate the rotation of disc 15 and drum gear 64. Simultaneously with the starting of motor 21, clutch solenoid winding 72 is deenergized and plunger 73 is moved by gravity downwardly to cam clutch ball 69 into its driving relationsip with clutch element 66 centrally between two adjacent clutch teeth 68. Disc 15 and drum gear 64 are rotated a distance approximately equal to eight of the teeth 17 before clutch ball 69 actually engages one of the teeth 68 to initiate the rotation of drum 56; and drum 56 is now revolved for a distance approximately equal to one-tenth of a revolution, or more precisely, equal to one-fifth of a revolution minus the lost motion rotation of drum gear 64, before the uppermost timing lug 63 moves the actuated plunger 32 from its operative position to its inoperative position. The retraction of the actuated plunger 32 to its inoperative position permits switch element 43 to return to its inoperative position which permits switch 27 to return to its normally open motor circuit and closed clutch solenoid winding circuit position. Thus, the uppermost timing lug 63 controls the duration of operation of motor 21 to limit the rotation of disc 15 to approximately one-seventh of a revolution wherein one penny is dispensed thereby.

When switch 27 returns to its open motor circuit and closed clutch solenoid winding circuit position, wherein center arm 28 is in electrical contact with contact 78 winding 72 is energized to move plunger 73 upwardly and thereby position clutch 65 in its non-driving position, which allows drum 56 to return to its starting position. This, in effect, resets the timer 55 for the next actuation of my invention by the change-making selective means.

A very important feature of my invention is the provision of lost motion clutch 65 which provides compensation for the overrun of motor 21 after its deenergization. The overrun of motor 21 is a variable factor which, unless compensated for, would result in periodically dispensing an additional coin or coins. In the event that the overrun of motor 21 drives disc 15 and gear 64 a distance equivalent to one, two or three or up to approximately six, of the teeth 17, the amount of lost motion between gear 64 and drums 56 will be decreased on the next succeeding cycle or actuation of my invention to the amount gained by the overrun of motor 21. Therefore, drum gear 64 will travel a correspondingly lesser distance before the first timing lug 63 passes the aligned plungers 32. Thus, the amount of overrun of motor 21 is automatically compensated for as long as this overrun is substantially uniform, so that my invention will always dispense the proper number of pennies or coins called for by the change-making selective means.

My invention has been built and tested and found to accomplish all of the afore-mentioned objectives and advantages. It will be obvious to those skilled in the art that my invention may be modified by many substitutions and equivalents and that this disclosure is intended to be illustrative only; therefore, I intend to be limited solely by the scope of the appended claims.

What I claim is:

1. In a change-making mechanism, a source of coins of a specific denomination adapted to be dispensed in different amounts responsive to change-making selective means, coin-dispensing means for controllably delivering said coins from said source comprising a perforated disc mounted for rotation, each of the holes formed therein being uniformly circumferentially spaced with their centers equally spaced from the axis of the disc and each being adapted to receive a determined number of said coins from said source at one time, said disc discharging the determined number of coins from each hole at one particular place in the generally circular path of travel of said holes and said source refilling each of said holes with said determined number of coins at each revolution of said disc so that each hole is adapted to deposit the determined number of coins carried therein at said discharge place and then be refilled once during one revolution of said disc, whereby said coin dispensing means is adapted to discharge various integral multiples of said determined number of coins dependent upon the extent of rotation of said disc, a motor connected in driving engagement with said disc, a motor circuit adapted to connect said motor to a source of current, a switch in said motor circuit being yieldingly biased to an open circuit position, a plurality of electromagnetic solenoid relays each comprising a winding and a plunger movably alternately in opposite directions inside the winding, each winding being adapted to be energized by the change-making selective means to move its cooperating plunger in one direction from an inoperative position to an operative position, detent means releasably maintaining each of said plungers at its operative position after deenergization of its cooperating winding, a switch element movable alternately in opposite directions between a motor circuit making position and a motor circuit breaking position being yieldingly biased in one direction to its circuit breaking position and engaged by each of said plungers to be moved to and maintained in its circuit making position by the movement of any one of said plungers to its operative position, each of

said plungers being disposed in spaced parallel aligned relationship, a timer for actuating the movement of said plungers from their operative to their inoperative positions comprising a drum mounted for rotation on an axis generally at right angles to said plungers, stop means engaging said drum at one position thereof, resilient yielding means urging said drum in one direction to abut said stop means, a plurality of timing lugs secured to said drum in circumferentially and axially spaced relationship and projecting radially outwardly therefrom, each of said lugs adapted to engage a different one of said plungers to move it from its operative to its inoperative position, a drive train between said motor and said drum to drive said drum in one direction from said stop means against the bias of said resilient yielding means, and a solenoid actuated clutch in said drive train movable from a drive position to a non-driving position, said clutch at its non-driving position disengaging said drum to permit said resilient yielding means to return the drum to its starting position in engagement with said stop means and at its driving position engaging said drum in driving relationship with said motor.

2. The structure defined in claim 1 in which said clutch comprises a lost motion clutch having a driving clutch element and a driven clutch element mounted for rotation, one clutch element comprising a plurality of circumferentially spaced clutch teeth and the other comprising a solenoid actuated clutch element movable into and out of driving engagement with the first-mentioned clutch element, the driving position of said solenoid actuated clutch element disposes a part thereof between two adjacent clutch teeth for limited relative movement between said adjacent clutch teeth one of which it is adapted to engage in positive driving relationship upon the rotation of the driving clutch element in one direction, a variable amount of lost motion between the driving and driven clutch elements being dependent upon the spacing existing initially upon the rotation of the driving clutch element of the solenoid actuated clutch element from the clutch tooth which it is adapted to engage in positive driving relationship.

3. The structure defined in claim 2 in which said twitch is a two-position switch disposed in the motor circuit and in the circuit to the solenoid of said clutch, at one position of said switch the motor circuit being open and the solenoid circuit being closed and at its other position the motor circuit being closed and the solenoid circuit being open so that said solenoid clutch is moved from its non-driving position to its driving position simultaneously with starting of said motor by the closing of said motor circuit and is moved from its driving position to its non-driving position simultaneously with the opening of the motor circuit.

4. In a change-making mechanism, a source of coins of a specific denomination adapted to be dispensed in different amounts responsive to change-making selective means, coin dispensing means controllably delivering said coins from said source, a motor connected in driving engagement with said dispensing means, an electrical circuit adapted to connect said motor to a source of current, a switch in said circuit being urged to an open position, a plurality of switch actuating means each adapted to be moved from an inoperative position to an operative position by the change-making selective means each at its operative position actuating said switch to a closed circuit position and maintaining said switch in its closed position, a timer for actuating the movement of said switch actuating means from their operative position to their inoperative position permitting said switch to open comprising a mounting base, a fixed shaft anchored to said base, a drum journalled on said shaft in coaxial relationship, stop means connected to said base adapted to engage said drum at one position thereof to define a fixed starting position of said drum with respect to said base, resilient yielding means urging said drum in one direction to abut said stop means, a gear journalled on said shaft in coaxial relationship adjacent said drum, a lost motion clutch between said gear and said drum comprising a pair of clutch elements relatively movable into and out of driving engagement one being carried by said drum and the other carried by said gear, one clutch element comprising a plurality of circumferentially spaced clutch teeth and the other comprising a solenoid actuated clutch element movable into and out of driving engagement with the first mentioned clutch element, the driving position of said solenoid actuated clutch element disposes a part thereof between two adjacent clutch teeth for limited relative movement between said adjacent clutch teeth one of which it is adapted to engage in positive driving relationship upon the rotation of the driving clutch element in one direction, a variable amount of lost motion between the driving and driven clutch elements being dependent upon the spacing existing initially upon the rotation of the driving clutch element of the solenoid actuated clutch element from the clutch tooth which it is adapted to engage in positive driving relationship, a drive train between said gear and said motor, a plurality of timing lugs secured to said drum in circumferentially axially spaced relationship and projecting radially outwardly therefrom, each of said lugs being adapted to engage a different one of said switch actuating means when the latter is at its operative position to move it from its operative position to its inoperative position after a determined lapse of time from its actuation by said change-making selective means which is different from the determined lapse of time for any other switch-actuating means so that each of said switch actuating means acts to energize said motor for a different period of time, whereby the number of coins delivered for each action of said selective means is directly proportional to the duration of operation of said motor effected by each actuation of one of said switch actuating means and said lost motion clutch compensates for overrun of said motor to insure that only the proper number of coins are delivered for each action of the selective means.

5. The structure defined in claim 4 in which said coin-dispensing means comprises a perforated disc mounted for rotation, each of the holes formed therein being uniformly circumferentially spaced with their centers equally spaced from the axis of the disc and each being adapted to receive a determined number of said coins from said source at one time, said disc discharging the determined number of coins from each hole at one particular place in the generally circular path of travel of said holes and said source refilling each of said holes with said determined number of coins at each revolution of said disc so that each hole is adapted to deposit the determined number of coins carried therein at said discharge place and then be refilled once during one revolution of said disc, whereby said coin dispensing means is adapted to discharge various integral multiples of said determined number of coins dependent upon the extent of rotation of said disc.

6. In a change-making mechanism, a mounting base, a plurality of generally vertically extending tubular members anchored to said base in circumferentially spaced relationship and adapted to receive and hold for distribution a supply of coins of a specific denomination, a generally horizontally disposed annular perforated disc mounted for rotation adjacent the lower ends of said tubular members, each of the holes formed in said disc being uniformly circumferentially spaced and equally radially spaced from the axis of rotation of said disc and during the rotation of said disc passing beneath the lower ends of said tubular members in axial alignment therewith to receive by gravity from said tubular members a determined number of coins which are carried by said holes until discharged at one particular place in the generally circular path of the travel of said holes, each hole being adapted to deposit the determined num-

ber of coins carried therein at said discharge place and then to be refilled by one of said tubular members prior to again passing said discharge place so that coins of said specific denomination are adapted to be dispensed by said disc from said tubular members in integral multiples of said determined number of coins received by each hole dependent upon the extent of rotation of said disc, a rotary motor anchored to said base and connected in driving engagement with said disc, an electrical circuit adapted to connect said motor to a source of current, a switch in said circuit being yieldingly biased to an open circuit position, a plurality of electromagnetic solenoid relays each comprising a winding anchored to said base and a plunger movable alternately in opposite directions inside its respective winding from an inoperative position to an operative position, said plungers being disposed in spaced parallel aligned relationship, each winding being adapted to be energized by change-making selective means to move its cooperating plunger from its inoperative position to its operative position, detent means releasably maintaining each of said plungers at its operative position after deenergization of its cooperative winding, a longitudinally extending switch element mounted transversely on said plungers axially outwardly beyond said windings for longitudinal movement alternately in opposite directions between an operative and an inoperative position, said switch element being biased to its inoperative position and the movement of any one of said plungers from its inoperative to its operative position moves said switch element from its inoperative to its operative position and maintains said switch element in its operative position until the actuating plunger is moved from its operative position, said switch element engaging said switch to move it from its biased open circuit position to its closed circuit position when said switch element is moved from its inoperative to its operative position, and a timer for actuating the movement of said plungers from their operative position to their inoperative position permitting said switch to open comprising a fixed shaft anchored to said base, a drum journalled on said shaft in coaxial relationship for rotation on an axis at right angles to said plungers, stop means connected to said base and adapted to engage said drum at one position thereof to define a fixed starting position of said drum with respect to said base, resilient yielding means connected to said shaft and said drum and urging said drum in one direction to abut said stop means, a gear journalled on said shaft in coaxial relationship adjacent said drum, a lost motion clutch between said gear and said drum comprising a pair of clutch elements relatively movable into and out of driving engagement one being carried by said drum and the other carried by said gear, said clutch elements being moved from their non-driving relationship to their driving relationship simultaneously with the starting of said motor and moved from their driving relationship to their non-driving relationship simultaneously with the opening of the motor circuit, the non-driving relationship of said clutch elements permitting said resilient yielding means to return said drum to its starting position abutting said stop means, a drive train between said motor and said gear, and a plurality of timing lugs secured to said drum in circumferentially and axially spaced relationship each adapted to engage a different one of said plungers to move it from its operative to its inoperative position when said drum is rotated from its starting position in the opposite direction from which it is urged by said resilient yielding means, each of said timing lugs moving its associated plunger from its operative to its inoperative position after a determined lapse of time from the actuation of said plunger by said change-making selective means which is different from the determined lapse of time of any other of said plungers, whereby the duration of operation of said motor and thereby the extent of rotation of said disc is controlled by said timing lugs so that said disc is rotated the proper amount to dispense the desired number of coins and said lost motion clutch compensates for a discrepancy in the operation of said motor, such as a uniform overrun, to insure that only the proper number of coins are delivered for each action of the selective means.

7. The structure defined in claim 6 in which said lost motion clutch comprises an annular clutch element mounted on said gear in axial alignment therewith and disposed in concentric relationship with one end of said drum and having a plurality of radially inwardly projecting uniformly circumferentially spaced teeth formed thereon, the afore-mentioned end of said drum having a radially extending slot formed therein radially outwardly opening adjacent said teeth and having an axially extending off-center annular slot formed therein intersecting said radial slot adjacent said radial slots inner end, a solenoid winding anchored to said drum generally axially aligned with said annular slot, an electrical circuit adapted to connect said winding to a source of current, a solenoid plunger disposed in spaced generally parallel relation to the axis of said drum and being longitudinally movable alternately in opposite directions within said winding and within said axially extending slot, and a ball disposed in said radial slot for movement into and out of driving engagement with said teeth dependent upon the movement of said plunger, the movement of said plunger in one direction camming said ball into the path of travel of said teeth to be engaged thereby in positive driving relationship and the movement of said plunger in the opposite direction permitting said ball to move radially inwardly out of the path of travel of said teeth so that said drum is out of driving engagement with said gear, said solenoid clutch plunger being biased in one direction and actuated in the opposite direction by the energization of said solenoid clutch winding, a switch in the electrical circuit of said solenoid clutch winding being actuated simultaneously with the switch in said motor electrical circuit so that said clutch is moved from its non-driving position to its driving position simultaneously with the starting of said motor and is moved from its driving position to its non-driving position simultaneously with the opening of the motor circuit.

8. The structure defined in claim 7 in which said switch in said motor electrical circuit and said switch in the electrical circuit of said solenoid clutch winding comprises a two-position switch disposed both in the motor electrical circuit and in the electrical circuit of the solenoid clutch winding, at one position of said switch the motor circuit is open and the solenoid circuit is closed and at its other position the motor circuit is closed and the solenoid circuit is open.

9. In a change-making mechanism, a source of coins of a specific denomination adapted to be dispensed in different amounts responsive to change-making selective means, coin-dispensing means for controllably delivering said coins from said source, a motor connected in driving engagement with said dispensing means, an electrical circuit adapted to connect said motor to a source of current, switch means in said circuit being movable between open and closed positions, a plurality of switch actuating means each adapted to be moved from an inoperative position to an operative position by the change-making selective means and each at its operative position actuating said switch means to a closed circuit position and maintaining said switch means in its closed position for operating said motor, the number of coins delivered being directly proportional to the duration of operation of said motor, each of said switch actuating means comprising an electromagnetic solenoid relay consisting of a winding and a plunger movable alternately in opposite directions inside the winding, each winding being adapted to be energized by said change-making selective means to move its associated plunger in one direction from its inoperative position to its operative

position which actuates said switch means to its closed position, means releasably maintaining each plunger at its operative position after de-energization of the winding, and a timer for actuating the movement of said switch-actuating means from their operative position to their inoperative position which causes said switch means to be opened comprising a lug-equipped rotatable drum engageable with said plungers at their operative position to move them from their operative position to their inoperative position after a determined lapse of time from the actuation of said plungers by said change-making selective means, the determined lapse of time for engagement of said timer being different for one than for another of said plungers so that said switch-actuating means acts to energize said motor for different periods of time.

10. The structure defined in claim 9 in further combination with stop means engaging said drum at one position thereof, resilient yielding means urging said drum in one direction to abut said stop means, a drive train between said motor and said drum to drive said drum in one direction from said stop means against the bias of said resilient yielding means during operation of said motor, and a solenoid actuated clutch in said drive train movable from a drive position to a non-driving position, said clutch at its non-driving position disengaging said drum to permit said resilient yielding means to return the drum to its starting position in engagement with said stop means and at its driving position engaging said drum in driving relationship with said motor.

11. The structure defined in claim 10 in which said clutch comprises a lost motion clutch having a driving clutch element and a driven clutch element mounted for rotation, one clutch element comprising a plurality of circumferentially spaced clutch teeth and the other comprising a solenoid actuated clutch element movable into and out of driving engagement with the first mentioned clutch element, the driving position of said solenoid actuated clutch element disposes a part thereof between two adjacent clutch teeth for limited relative movement between said adjacent clutch teeth one of which it is adapted to engage in positive driving relationship upon the rotation of the driving clutch element in one direction, a variable amount of lost motion between the driving and driven clutch elements being dependent upon the spacing existing initially upon the rotation of the driving clutch element of the solenoid actuated clutch element from the clutch tooth which it is adapted to engage in positive driving relationship.

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