

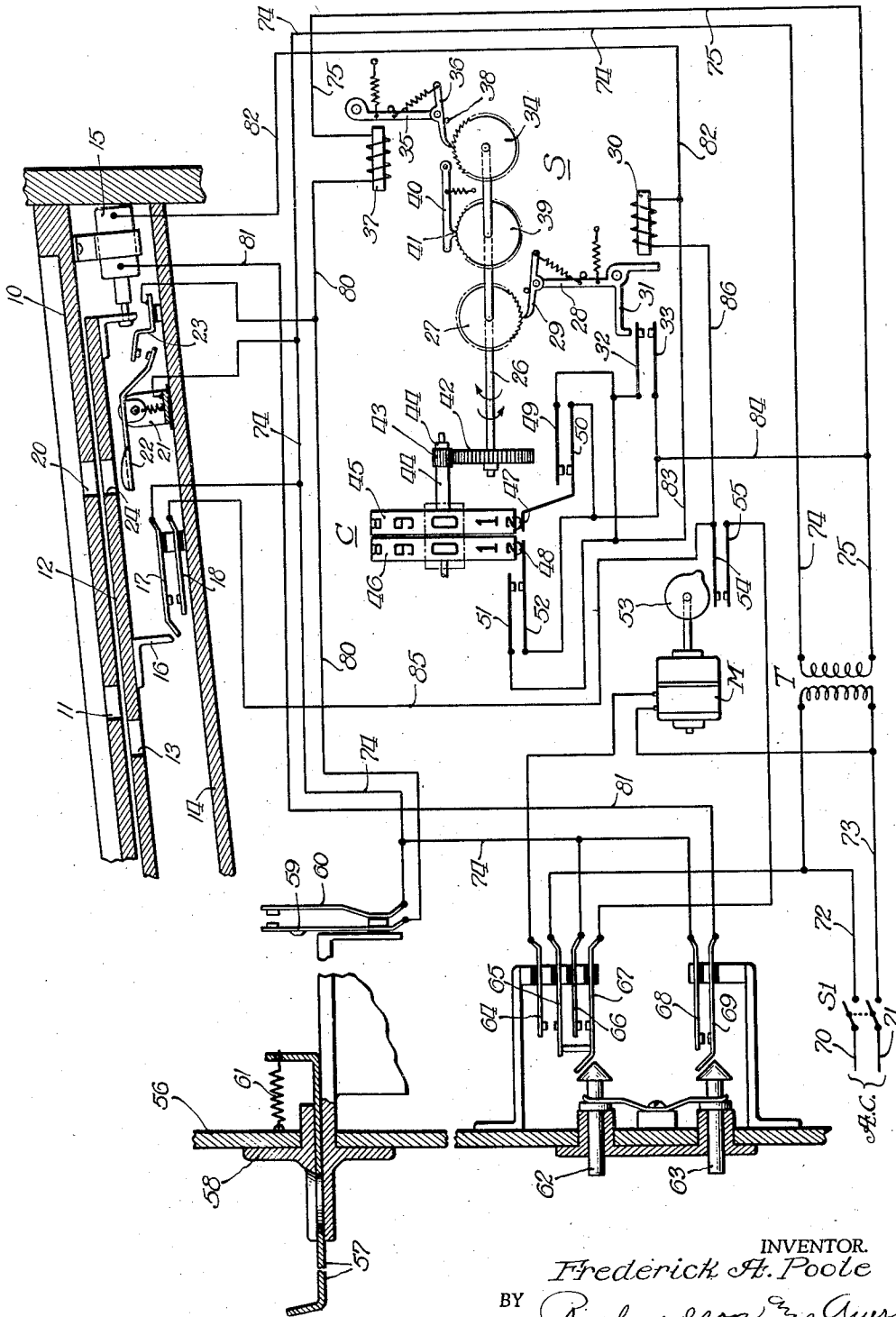
Feb. 6, 1945.

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2,368,874

REGISTERING AND COUNTING APPARATUS

Filed July 23, 1941



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UNITED STATES PATENT OFFICE

2,368,874

REGISTERING AND COUNTING APPARATUS

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Application July 23, 1941, Serial No. 403,615

8 Claims. (Cl. 235—92)

The present invention relates in general to registering and counting apparatus, and the object of the invention is to produce a new and improved apparatus of this character.

A special object of the invention is a counting device which is capable of integrating two series of events, one being taken in a positive sense and the other in a negative sense, and which at all times shows the difference between the number of events which have occurred in the two series. This counting apparatus may be referred to as an add-and-subtract counter.

A further object of the invention is the provision of an add-and-subtract counter and suitable circuits for controlling it, which is especially adapted for use in connection with game apparatus, such as the well known pinball games. The invention will be described as applied to a game of this character.

The foregoing and other features of the invention are described hereinafter in connection with the accompanying drawing, which shows diagrammatically the counting apparatus, the various control circuits, and sufficient of the game apparatus so that the operation can be described and understood.

For details of the type of game apparatus to which the invention may be applied reference may be made to the patent to Bellah, Reissue No. 20,698, and to the patents to Firestone, No. 2,004,981, and Hansen, No. 2,134,185. A game apparatus of this type comprises a cabinet in which there is mounted an inclined playing board such as is indicated at 10, and means including a ramp and a ball projecting device whereby balls may be delivered to variable positions at the upper end of the playing board and allowed to gravitate toward the lower end thereof. The playing board 10 is provided with ball openings such as 11 in one of which a ball may come to rest in the event that it rolls into such opening in its course down the playing board. These openings may be equipped with contact devices and are usually assigned different values in accordance with the skill required to direct the balls into them. There is also provided a longitudinally movable ball releasing device such as 12, having ball releasing openings such as 13, through which balls which are caught by the openings 11 are adapted to pass when the corresponding openings are aligned by movement of the device 12. When released the balls roll down an inclined runway such as 14 to the player's end of the cabinet where they are collected on

a transverse runway and directed to a point adjacent the ball projecting device.

The reference character 15 indicates a solenoid which is provided for operating the ball releasing device 12. When the releasing device is operated, that is, moved to the right as seen in the drawing, a bracket 16 actuates a contact spring 17 to bring it against the contact spring 18. These contact springs may be mounted in suitable manner on the runway 14, so as not to interfere with the return of the balls.

A game apparatus such as referred to herein is usually provided with what is known as a free game feature. That is, the game is so arranged that if the player exhibits a certain amount of skill in playing the game, he is rewarded by being allowed to play again without depositing a coin. The arrangements for introducing this feature vary with the particular game to which it is appended. A free game may be allowed, for example, when the total of the values assigned to openings in which balls come to rest equals or exceeds a given amount. In this case some kind of totalizer is required. The invention is not concerned with conditions under which free games are awarded, and accordingly a comparatively simple arrangement is shown, which is similar in some respects to the arrangement disclosed in the Firestone patent previously mentioned herein.

In addition to the ball openings such as 11, the playing board 10 is provided with a free game opening 20, which may be located at a point on the board where its accessibility to the balls is somewhat difficult. Associated with the opening 20 there is a normally aligned opening 24 in the ball releasing device 12 and a pivoted contact member 22 which is mounted on a bracket 21. When a ball enters the opening 20 it passes at once through this opening and opening 24 and engages the contact member 22, rotating it on its pivot until engagement with the fixed contact member 23 is effected. The rotation of member 22 releases the ball from opening 24 and it passes off the end of member 22 to the runway 14. It will be seen, therefore, that a ball entering the free game opening 20 will be immediately returned to the player via opening 24, and that in escaping from the opening 24 the ball will momentarily close together the contacts 22 and 23. There may be several free game openings in the playing board, if desired, and when more than one such opening is provided the associated sets of contacts may be connected in parallel. The contacts 22 and 23 may be referred to as

"add" contacts and the contacts 17 and 18 are "subtract" contacts. These two sets of contacts together control an add-and-subtract switch which is indicated by the reference character S. This switch may be of any suitable and known type, but as shown herein comprises a shaft 26 and two ratchet mechanisms by means of which the shaft may be rotated step by step in either direction. One ratchet mechanism comprises the stepping magnet 37, armature 35, pawl 36, and ratchet wheel 34, and rotates the shaft 26 in a counter-clockwise direction, as seen from the right in the drawing. The other ratchet mechanism comprises the stepping magnet 30, the armature 28, the pawl 29, and the ratchet wheel 27 and is adapted to rotate the shaft 26 in a clockwise direction. The first or "add" ratchet mechanism is so arranged that when the stepping magnet 37 is deenergized the pawl 36 is withdrawn from the ratchet wheel 34, this being effected by the provision of a pin 38. The second or "subtract" ratchet mechanism is arranged the same way, so that either ratchet mechanism may be operated to rotate the shaft 26 without interference by the other ratchet mechanism. In order to retain the shaft in any position to which it is rotated by one of the ratchet mechanisms, a notched wheel 39 is provided, together with a pivoted arm 40 carrying a roller 41 which is held against the periphery of the notched wheel. This arrangement allows the shaft to rotate when one of the ratchet mechanisms is operated, the roller 41 riding over the raised portions of the wheel which lie between the notches and coming to rest at the bottom of a notch upon the completion of each step. The shaft 26 is thus held against retrograde movement during operation of either ratchet mechanism and is also held against accidental rotation which might occur due to a jar or shock.

The armature 28 of the stepping magnet 30 is provided with an extension 31 for closing a pair of contacts 32 and 33 upon the energization of the magnet. The function of these contacts will be explained in the course of the explanation of the operation.

The counter is indicated at C and is located beneath a rectangular aperture at the rear of the cabinet where it may be observed by the player. The counter itself is of known construction. As shown, it comprises a units wheel 45 and a tens wheel 46, which are mechanically interconnected in the usual manner so that the tens wheel is rotated one division for each complete rotation of the units wheel. The counter is geared to the shaft 26 of the add-and-subtract switch. As shown in the drawing, a gear 42 mounted on shaft 26 is in engagement with a pinion 43, the latter being fixed to a tubular shaft 44 on which the units wheel 45 is also supported.

Gears are provided because it is not practicable to directly connect the counter with the shaft of the add-and-subtract switch, for various reasons. For one thing, if the counter and switch shaft were directly connected, each ratchet wheel would have to be provided with ten teeth, which is not the ideal number, for fast and accurate operation. It has been found that better results are secured if rather fine teeth are used, and since there is an objection to making the ratchet wheel too small, the result is that a ratchet mechanism designed for most satisfactory operation without regard to other considerations has a considerably greater number of teeth

than ten. The gear ratio depends on the number of ratchet teeth actually used in any case. If, for example, each ratchet wheel has forty teeth then the gear ratio is four to one.

The units number wheel 45 is provided with a cam 47 for controlling a pair of contact springs 49 and 50. The contacts are held open when the wheel is in zero position and are closed in all other positions. The tens number wheel 46 has a similar cam 48 for controlling a pair of contact springs 51 and 52 in the same way.

The reference character M indicates a small alternating current motor which drives a cam 53 at a speed of about ten rotations per second. Associated with the cam there is a pair of contact springs 54 and 55, which are closed together momentarily during each rotation of the cam.

The game is provided with the usual coin mechanism, which may be any suitable type, so long as it enables the player to close an electrical contact momentarily by the deposit of a coin. As shown herein, the coin mechanism includes a coin receiving device 58, which is mounted on the front wall 56 of the cabinet, and a coin slide 57. The coin slide is normally held in withdrawn position by a spring 61, and means is provided (not shown) for preventing the slide from being pressed in beyond a certain point unless a coin has first been deposited. With a coin in the slide, it may be moved inward freely and in its extreme inward position it closes a pair of contact springs 59 and 60. When the slide is released it is returned by the spring 61 and the contacts 59 and 60 are opened.

Two push keys or switches 62 and 63 are also provided on the front wall of the cabinet where they are accessible to the player. The key 62 is a counter restoring key and controls two pairs of contacts 64—65 and 66—67 for the purpose of restoring the counter C to zero position. The key 63 is the ball release key and controls a pair of contacts 68 and 69 to energize the solenoid 15.

Power is supplied to the apparatus over a pair of conductors 70 and 71, which may be connected to any convenient source of commercial alternating current. When the switch S1 is closed the conductors 70 and 71 are connected to conductors 72 and 73, which extend to the primary winding of the step-down transformer T, the secondary winding of which supplies current at a low voltage to the conductors 74 and 75. All the electromagnetic apparatus except the motor M is operated on the low voltage current supplied over these last mentioned conductors.

The operation of the complete apparatus may now be explained. For this purpose it may be assumed that all of the equipment is in normal position, as shown in the drawing, except the switch S1, which should be closed to supply the necessary power for operation.

Before starting to play the game, the player must deposit a coin. The coin is placed in the opening in the coin slide 57, which is then pressed in as far as it will go and released. The operation of the coin slide collects the coin in known manner and also closes the contact springs 59 and 60 together momentarily, thereby completing a circuit for the stepping magnet 37 which extends from conductor 74 by way of contact springs 60 and 59, conductor 80, and winding of stepping magnet 37 to conductor 75. The conductors 74 and 75 being connected to the terminals of the secondary winding of the transformer T, the stepping magnet is energized momentarily over

the above traced circuit and steps the add-and-subtract switch S forward one step, whereby the units wheel of the counter C is advanced one division to display the digit 1.

The player has now deposited one coin and the counter shows that he has one game to his credit. He may proceed to play this game or he may deposit additional coins before actually starting play, which is a considerable convenience. The player may have decided, for example, to patronize the game to the extent of half a dozen coins, and these may all be immediately deposited one after the other. Each time a coin is deposited the stepping magnet 37 is momentarily energized and the add-and-subtract switch S is advanced one step. The counter C is also advanced each time and after six coins have been deposited will show a total of six games to the credit of the player.

In order to play a game the player must first release the balls, which is accomplished by momentarily operating the ball release key 63. When this key is actuated, a circuit is completed which may be traced from conductor 74 by way of contact springs 68 and 69, conductor 81, winding of solenoid 15, conductor 82, conductor 83, contact springs 49 and 50, and conductor 84 to conductor 75. It will be noted that this circuit cannot be closed unless one of the counter wheels is out of its zero position. Upon the completion of the circuit as traced, the solenoid 15 is energized and moves the ball releasing device 12 to the right, thereby releasing the balls and making them available to the player in known manner. The key 63 is only held operated for a second or so, or long enough to insure the release of the balls, and is then restored, whereupon the solenoid 15 becomes deenergized and the ball releasing device 12 is restored.

During the time that the ball releasing device 12 is held in releasing position by the solenoid 15, the contacts 17 and 18 are held closed by the bracket 16 and a circuit is completed for the stepping magnet 30 of the add-and-subtract switch, said circuit extending from conductor 74 by way of contact springs 17 and 18, conductor 85, conductor 86, winding of magnet 30, conductor 83, contact springs 49 and 50, and conductor 84 to conductor 75. The stepping magnet 30 is accordingly energized and steps the add-and-subtract switch S backward one step, the magnet deenergizing after the circuit is broken. The units wheel 45 of the counter C is also rotated in a backward direction for an angular distance of one division and subtracts 1 from the total previously registered. If the counter initially showed a total of six games, for instance, it will now show a total of five games remaining to the credit of the player. The player has one game less to his credit, but the balls have been released and the game may be proceeded with.

As the balls are propelled to the upper end of the playing board and gravitate to the lower end, some of them may lodge in the openings such as 11 in known manner. The player will naturally endeavor to direct the balls so that they will enter the free game opening 20, however. If he is successful in this endeavor, the ball will pass through the openings 20 and 24 and operate the contact spring 22 as previously described, thereby closing a circuit for the stepping magnet 37 of the add-and-subtract switch S. The said circuit extends from conductor 74 by way of contact springs 22 and 23, conductor 80, and winding of magnet 37 to conductor 75, and is effective to energize mag-

net 37 momentarily whereby the switch S is advanced one step. The counter C is also advanced and adds 1 to the total previously shown.

From the foregoing it will be seen that when the player succeeds in directing a ball into the free game opening 20 the result is the same as when a coin is deposited. In case considerable skill is exhibited, the player may gain a number of free games with one series of balls, that is, during the play of a single game.

The game is finished when all of the balls have been projected onto the playing board. The player may then prepare for playing a second game by operating the ball release key 63, with results as already described. That is, the balls are released by energization of the solenoid 15 and the switch S is stepped backward one step by the magnet 30, the counter C being also operated to subtract 1 from the total displayed.

In this manner a number of successive games may be played. If the player does not average at least one free game in each game played the total shown by the counter C will decrease and the counter will eventually be restored to zero position. It will be assumed that the player has been unsuccessful and that as a result the counter C has continued to subtract until only one game is left to the credit of the player. When the ball release key 63 is actuated to prepare for the last game, the solenoid 15 is energized to release the balls and also the stepping magnet 30 is energized. The energization of the stepping magnet steps the switch backward one step and returns the counter C to zero position. In returning to zero position, the units wheel 45 separates contact springs 49 and 50 and thus breaks the previously traced circuits of solenoid 15 and magnet 30. The energization of magnet 30, however, has closed the contact springs 32 and 33, which are connected in shunt of contact springs 49 and 50; and since springs 32 and 33 are adjusted to close before springs 49 and 50 become separated, the circuits of solenoid 15 and magnet 30 are maintained over the path through springs 32 and 33. This arrangement insures full operation of the solenoid 15 and stepping magnet 30. When the key 63 is released, the circuit of the solenoid is broken at the key and the solenoid is deenergized, restoring the ball releasing device 12. The circuit of stepping magnet 30 is therefore broken at contact springs 17 and 18 and the magnet deenergizes, separating the contact springs 32 and 33. The circuit of the solenoid 15 is now open and cannot be again closed by actuation of the key 63 until another coin is deposited to set up a game to the credit of the player on the counter C.

It may be assumed now that the player is more successful and gains a number of free games. If his success continues he may run up a considerable total of games to his credit on the counter C. At this juncture the player may tire of the game for the time being, or he may notice that the time which he can spare for play has become exhausted. For one of these or other reasons the player may decide to quit play, and in this case will call the proprietor of the game and have him note the number of games to the credit of the player on the counter C. The proprietor may give the player a number of slugs equivalent to the number of games shown, wherewith the player may continue play at another time.

The proprietor of the game will now restore

the counter C to zero position in order to place the game in condition for use by another player. In order to accomplish this, the key 62 is operated. Upon the operation of the key a circuit is closed for the motor M at contact springs 64 and 65, these springs being effective to bridge the motor across the conductors 72 and 73. The motor now starts up and begins to rotate the cam 53. The key 62 also prepares a circuit for the stepping magnet 30 at contact springs 66 and 67, which is completed by cam 53 each time it closes contact springs 54 and 55. This circuit extends from conductor 74 by way of contact springs 66 and 67, contact springs 55 and 54, conductor 86, winding of stepping magnet 30, conductor 83, contact springs 49 and 50 (or contact springs 51 and 52 if the units wheel 45 is at zero and the tens wheel 46 is not), and conductor 84 to conductor 75. The cam 53 closes the above circuit intermittently and thus sends impulses to the stepping magnet 30, whereby the counter C is rapidly returned to zero position. The last step is accomplished by aid of the contact springs 32 and 33, as previously explained. The operation of the magnet 30 ceases as soon as the counter has been fully restored, and the proprietor will then release the key 62.

The invention having been described, that which is believed to be new and for which the protection of Letters Patent is desired will be pointed out in the appended claims.

I claim:

1. In a counting apparatus, a counter having number wheels of different numerical orders, a shaft for driving said counter, ratchet mechanism for rotating said shaft, said mechanism including two magnets for stepping the shaft in opposite directions, respectively, means for energizing a first one of said magnets at will, and means for energizing the other magnet only in the event that the first magnet has been previously energized, said last means including an off normal switch associated with each number wheel, and a circuit for said other magnet including all said switches in parallel.

2. In a counting apparatus, a numerical counter having units and tens number wheels, electromagnetic means for operating said counter to add one unit at a time to the total displayed, electromagnetic means for operating said counter to subtract one unit at a time from the total displayed, and means jointly controlled by said wheels for preventing the operation of the second electromagnetic means at a time when the total displayed is zero.

3. In a counting apparatus, a counter having a plurality of number wheels of different numerical orders, a pair of contacts associated with each wheel, means whereby each wheel opens its associated pair of contacts when in zero position, a circuit in which all said pairs of contacts are

connected in parallel, and an operating magnet for said counter also included in said circuit.

4. In a counting apparatus, a numerical counter, means including a stepping magnet for operating said counter to cause it to add, means including a second stepping magnet for operating said counter to cause it to subtract, and means operative at any time that the counter displays a total greater than zero for transmitting a variable predetermined series of impulses to said second stepping magnet to restore the counter, the number of impulses in the series being equal to the number displayed by the counter when the last means is operated.

5. In a counting apparatus, a numerical counter, operating means for causing the counter to add or subtract, said means including add-and-subtract stepping magnets, a switch, means responsive to the closure of said switch at a time when the counter displays a number greater than zero for automatically transmitting impulses to said subtract magnet, and means for automatically stopping the transmission of impulses responsive to the restoration of the counter to zero.

6. In a counting apparatus, a numerical counter having units and tens number wheels, means including a stepping magnet for operating the units number wheel to add, means including a second stepping magnet for operating said units number wheel to subtract, circuits for said magnets, respectively, two switches connected in parallel in the circuit of the second stepping magnet, and projections on said number wheels, respectively, for opening said switches, each projection being so located on its associated number wheel that the corresponding switch is opened when the number wheel is in zero position.

7. In a counting apparatus, a numerical counter, means including a stepping magnet for operating said counter to cause it to add, means including a second stepping magnet for operating said counter to cause it to subtract, and means including an automatic impulse sender adapted to actuate said second stepping magnet for operating said counter to restore it to normal.

8. In a counting apparatus, a counter, a stepping magnet for operating said counter one unit at a time, a circuit for said magnet including an intermittently operated switch disposed in series with a pair of switches connected in parallel with each other, one of said pair of switches being controlled by the counter and adapted to be actuated to open said circuit when the counter is operated to display a predetermined total, and the other of said pair of switches being controlled by said magnet and adapted to maintain said circuit to insure the completion of the operation of said magnet subsequent to the opening of the circuit over the switch controlled by said counter.

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